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THE HEDGEHOG IN THE COAL MINE: EXPLORING HEDGEHOG EXTINCTION ACCOUNTING IN THE AGROCHEMICAL SECTOR

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Abstract

The ongoing 6th mass extinction has alerted the accounting community to the need to go beyond accounting for biodiversity. With over 1 million species currently threatened by extinction, the extinction accounting framework has been getting traction with the financial and investment sectors, alerting companies more than ever of the need to account for species as a double material risk. Following current literature in extinction accounting on bee extinction, the thesis focusing on the agrochemical industry in relation to hedgehogs extinction in the UK, the population of which has diminished in over 30% in urban areas and 50% in rural areas since 2000. To examine the implementation of the extinction accounting framework in the agrochemical sector and the hedgehog protection arena, the following research questions were posed:

1. Are the discourses identified in the texts working to ensure the survival of all living beings or is there a need to search for new stories? Which discourses are destructive, predominantly working against the ecosophy? Which discourses are ambivalent can beneficial discourses be found to resonate with the ecosophy?
2. How is the natural world represented and constructed by the agrochemical corporations via multimodal semiosis such as images and videos?
3. What discourses do other stakeholders and organisations such as NGOs, local authorities, hedgehog carers in the hedgehog arena use?
4. How can the extinction accounting framework improve agrochemical accountability in the UK context, in relation to disappearing hedgehogs?

To answer the research questions, the methodology, anchored in social constructionism, theorises that agrochemical companies construct a shadow reality, using Beck's (1992) application of Plato's allegory of the cave. The methodology positions accounting practices and reporting as a social construct that is discursively constructed. Therefore, through applying an ecolinguistic analysis of textual, multimodal of two agrochemical corporations and spoken discourse of 32 interviewees spanning a wide range of stakeholders within the hedgehog and agrochemical arena, the thesis examines the discourses against the researcher's ecosophy. A political theory of animals rights is applied as the ecosophy to argue that for disclosures to be truly emancipatory, they must be anchored in positive political rights awarded to animals.

The findings from the four empirical chapters are compared and contrasted to reveal that agrochemical companies reject the adoption of the extinction accounting framework as they deny the 6th mass extinction and biodiversity loss and do not view hedgehog extinction, or any other species, as a material risk. The findings demonstrate that companies de-legitimise NGOs in the hedgehog and environmental arena. In turn, the findings suggest NGOs do not acknowledge hedgehog rescuers' knowledge and expertise. In fact, beyond the economic and financial restricting factors faced by NGOs and local councils, their lack of coordination and accountability, coupled with pressures to appear 'metric' and 'scientific' presents an obstacle to halting hedgehog extinction. Finally, the thesis reveals that hedgehog rescuers, although disparate, are the ones who transmit the plight of hedgehogs.

Table of Contents

List of Figures

List of Tables

List of Images

List of Abbreviations

ADI – Allowed Daily Intake
ART – Animal Rights Theory
AVE – American Variety English
BAP – Biodiversity Action Plan
BHPS – British Hedgehog Preservation Society
CBD – Convention on Biological Diversity
CBI – Confidential Business Information
CDA – Critical Discourse Analysis
CIS - Counter Information Services
CEH – Centre for Ecology and Hydrology
CRD – Chemical Regulation Division
CRRU – Campaign for Responsible Rodenticide Use
DDT – Dichlorodiphenyltrichloroethane
DEFRA – Department for Environment, Food & Rural Affairs
EFSA – European Food Safety Agency
EPA - Environmental Protection Agency (USA)
ERA – Ecological Risk Assessment
ESG – Economic, Social and Governance
ESRD – End Stage Renal Disease
GBH – Glyphosate-Based Herbicide
GGP – Good Growth Plan
GMO – Genetically Modified Organism
GOG – Government Oversight Group
GRI – Global Reporting Initiative
HR(s) – Hedgehog Rescue(s)
HSE – Health and Safety Executive
IARC – International Agency for Research on Cancer
IGR - insect growth regulator
IPBES - Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPM – Integrated Pest Management
<IR> - Integrated Reporting
LBAP – Local Biodiversity Action Plan
LC_{50} – the concentration which kills 50% of individuals
LD50 – the dose which kills 50% of individuals
MCs - methylcarbamates
MRL(s) – Maximum Residue Level(s)
MS – Mammal Society
NE – Natural England
NPEOs - nonylphenol polyethoxylates
NGO(s) – Non-Governmental Organisation(s)
OPs – Organophosphate insecticides
PAC - Pesticides Advisory Committee
PAN – Pesticide Action Network
PBMS – the Predatory Birds Monitoring Scheme
PEC - predicted environmental concentration

POEA – PolyOxyEthylene Amine
PPPs – Plant Protection Products
PTES – People's Trust for Endangered Species
SDG(s) – Sustainability Development Goals
SDG 15 – Sustainability Development Goal 15: Life on Land
SER – Social and Environmental Reporting
SGARs – Second Generation Anticoagulant Rodenticides
TERs - toxicity exposure rations
UFs – Uncertainty factors
WHO – World Health Organisation
WIIS – Wildlife Incident Investigation Scheme
WIU - Wildlife Incidence Unit
WWF – World-Wide Fund for Nature

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: _____Mira Lieberman_____

Date: _____16 July 2021_____

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Chapter 1: Introduction

1.1 Extinction and accounting

I grew up in a town surrounded by strawberry fields and orange orchards: they are now decimated. Concrete jungles have risen in place of evergreen and fragrant pine trees that cooled the scorched earth. Hedgehogs, coyotes, hyenas, and owls are now refugees in the city, with its relentless heat reflected off the asphalt roads and concrete sidewalks. Thin meagre trees boxed in a square of sand stand alone and hopeless along the streets. Animals in the city are invisible, liminal, and ignored. I grew up developing an acute sense of animal sentience. Surviving on human refuse and cat food sometimes left out for the multitude of abandoned cats by kind souls, wildlife needs human protection and rights now more than ever. Intensive agriculture, urban development, and human activity all contribute to the loss of biodiversity.

In recent decades, human activity surpassed the Earth's ability to maintain life, resulting in ongoing mass extinction, climate change and rapid environmental degradation. Rockström et al. (2009) identify nine processes that are crucial to ensuring a continuous Holocene, suggesting that three have already surpassed the threshold: climate change, biodiversity loss and interference with the nitrogen cycle. Barnosky et al. (2011) argue that current projections for extinction rates are far higher than originally reported.

More recently, a landmark new report from the Intergovernmental Science-Policy platform on Biodiversity and Ecosystem Services (IPBES) stresses the unprecedented rates at which nature is declining: "Ecosystems on which we and all

other species depend is deteriorating more rapidly than ever. We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide" (IPBES, 2019). Alarmingly, the report estimates that 1 million species are threatened with extinction.

> "Ecosystems, species, wild populations, local varieties and breeds of domesticated plants and animals are shrinking, deteriorating or vanishing. The essential, interconnected web of life on Earth is getting smaller and increasingly frayed […] this loss is a direct result of human activity and constitutes a direct threat to human well-being in all regions of the world" (ibid: 2).

Importantly, the report finds that key indirect drivers for the decline of biodiversity include increased population and consumption and "issues of governance and accountability" (IPBES, 2019: 3).

If Rachel Carson and her colleagues were alerted to an ecological crisis when song birds were found dead in backyards due to the spraying of DDT, now the disappearance of animals is quiet, unseen but ever more insidious.

Rosenberg et al. (2019) estimate a 29% decline in birds across North America since 1970, and perhaps surprisingly, it is the most ubiquitous birds that are disappearing. This echoes what we see here in the UK, where the ubiquitous snuffles of the prickly nightly visitors, a once common sight in the British countryside, gardens, parks, and woodlands are now disappearing. Quietly. Extinction begins with an abundance loss of individuals (Rosenberg *et al*., 2019).

All hedgehogs are canaries, and their relative abundance masks their disappearance. Similar to the surviving 24 million eastern meadowlarks, the fact that 74 million are dead obfuscates the true crisis (Yong, 2019). Habitat loss and land

degradation are cited as the most influential factors attributed to the decline of hedgehogs (Williams *et al.*, 2018). Accompanying land degradation, pesticides, particularly neonicotinoid insecticides, are named as one of the main factors in the continuous decline of songbirds (Leahy, 2019; Peveling *et al.*, 2003; Raven and Wagner, 2021; Wagner *et al*., 2021). Hedgehogs are considered a bioindicator species of the health of ecosystems, indicative of soil health and the presence of insects (Morris, 2018). Hedgehogs are omnivorous, generalist feeders making them vulnerable to a wide range of poisons such as heavy metals and agricultural biocides that are designed to eliminate invertebrates. Like the weevil, aphid and caterpillar killing-DDT that was banned in 1986, the contemporary biocides such as glyphosate, the ubiquitous herbicide worldwide, and in the EU is also considered to be a bioaccumulator. Thus, mammalian predators such as hedgehogs consume contaminated prey, potentially absorbing a sub-lethal amount of poison that build up in their bodies, until a toxic level has been reached. Importantly, Peveling et al. (2003) examine the effects of insecticides on key non-target organisms in Madagascar. Theirs is the only study that found that the lesser hedgehog tenrec *Echinops telfairi* was not found in areas where fipronil, an insecticide, was sprayed. In other words, their absence was a direct result of a reduction in available insect prey.

Industrial fertilisers, insecticides and pesticides destroy soil biodiversity and cause even far-away estuaries to become dead zones (Dasgupta, 2021). In this way, businesses, and specifically in relation to this thesis, agrochemical corporations, need to account for the role they play in endangering species, and hedgehogs from a normative perspective.

The risks associated with biodiversity loss have severe financial and operational implications (Atkins and Atkins, 2016; Dasgupta, 2021). However, the Dasgupta report does not address the role of accounting in addressing extinction (Atkins and Macpherson, forthcoming). Far more robust disclosure and accounting tools (and legislation, although this is beyond the scope of this work) are needed to mitigate these risks and increase transparency and accountability. The adoption and implementation of the extinction accounting framework is selected and put to the test in the agrochemical sector, and the hedgehog protection arena, in this research study.

1.2 Research questions and context

Building on the concept of the above discussion and in order to examine species protection governance, the following is sought in the study:

1. Does the agrochemical sector disclose biodiversity information in their reports? Is extinction prevention disclosed in the agrochemicals Bayer and Syngenta's integrated reports? Once that has been identified, more specifically examined is:
    1.1 Are the discourses identified in the texts working to ensure the survival of all living beings or is there a need to search for new stories? Which discourses are destructive, i.e. predominantly working against the ecosophy? Which discourses are ambivalent, i.e. similar to the aims of the ecosophy but have differences, and can beneficial discourses be found to resonate with the ecosophy?

Agrochemical reporting on biodiversity does not acknowledge responsibility or even threat to species, bees or otherwise, from pesticides. Therefore, the biodiversity

disclosures from agrochemical companies are expected to be inadequate and insufficient, leading to the second research question:

2. How is the natural world represented and constructed by the agrochemical corporations via multimodal semiosis such as images and videos? What visual attributes are used on these corporate websites to communicate the company's stance?
3. In the hedgehog extinction arena, what are the dominant discourses of stakeholders, NGOs, local authorities, hedgehog carers and how are they position themselves, each other and hedgehogs?
4. How can the extinction accounting framework improve agrochemical accountability in the UK context, in relation to disappearing hedgehogs?

1.3 Thesis outline

This first introductory chapter aims to contextualise the project in the 6th mass extinction crisis, and the role companies, and agrochemical corporations in particular in this study, play in mitigating the loss of hedgehogs. The connection between pesticide use and hedgehog decline is sketched in this chapter, and further elaborated in chapters 4 and 5. The introduction presents the research questions and concludes with an outline of the thesis.

The second chapter lays the philosophical and ethical lens of the project. The theoretical framework weaves the notion of risk with emancipation in the context of accounting. Delving epistemologically and ontologically into the pillars of accounting, the chapter argues for its operationalisation as a socially and discursively constructed activity that contributes to a particular construction of reality.

The third chapter delineates the evolution of extinction accounting and the need for a comprehensive and detailed framework in the face of the limitations

presented by existing biodiversity accounting and accountability tools, such as those offered by the GRI, and even the paradigm presented in the integrated thinking of the 6 capitals of Integrated Reporting. Reporting and disclosures on biodiversity as currently practiced are not emancipatory, and would not lead to a radical change (Atkins and Maroun, 2018).

Particularly in these times of Covid-19, the need to protect all animals is painfully evident. Corporate governance needs to be more transparent and more robust to begin to halt the 6th mass extinction and protect species (Hassan *et al.*, 2021). More importantly, Covid and pandemics generally pose an economic risk. The latest IPBES (2020) report suggests that investing in conservation may avoid rising economic loss due to pandemics. For example, the report cites the 2014 Ebola outbreak having had an estimated economic impact larger than US$53 billion. The pandemic is closely linked to the exploitation of nonhuman animals through trade and killing (IPBES, 2020). However, the indirect killing of wildlife, like hedgehogs through avoidance is similarly due to anthropocentrism.

Amongst many contributors to species decline are pesticides, toxins and poisons that enjoy very little transparency and accountability. Chapter 4 provides a comprehensive review of pesticide research that bring together various aspects of toxicity and the way in which they may permeate the environment, and negatively affect biodiversity. Discussing all types of biocides: insecticides, neonicotinoid insecticides, herbicides, molluscicides, as well as rodenticides, the chapter reveals the policy issue in which combinations of the pesticides go unaccounted for. The chapter then expands on policy and weaknesses embedded within, including the influence of Brexit on pesticide registration and authorisation processes, and the elephant in the room: corporate lobby power. The chapter specifically relates these

inadequacies to the effect of pesticides on wildlife, humans and climate change, before concluding with alternatives to pesticides.

Following the general discussion of pesticides' risk, chapter 5 relates these specifically to hedgehogs, as an indicator species of the state of the environment, acting as the canary in the coal mine, signalling, by their absence, that the ecology is collapsing. The chapter provides a historical, ecological, cultural, and political account of hedgehogs, contextualising hedgehogs in the UK. The chapter specifically outlines the hedgehogs' plight for protection, both legal and physiological. The way in which pesticides harm hedgehogs is explicated and their exodus from rural and arable lands towards urbanised areas is described.

Chapter 6 examines once more the research questions presented in this chapter and the way in which they will be answered. The chapter explains the research methodology and design, outlining the relevant ecolinguistic lens through which data is analysed. The type of data collected for the project, including rationale for their choice is discussed. The chapter then describes in detail the ecolinguistic framework adopted, as well as how discourse is conceptualised in this project. A key element of the methodology is the ecological philosophy, or ecosophy, espoused and against which the discourses identified are judged.

Data analysis is divided into 4 chapters. The thesis then moves on to the first analysis, chapter 7, beginning with the written and multimodal discourse analysis of Bayer's 2018 integrated report. The analysis examines the ways in which nature is erased in the reports, the metaphors used to reflect Bayer as a person, the ways in which NGOs are referred to and the collaboration that is built (or not) and may present a challenge in addressing the complex issue of species protection. Finally, a multimodal analysis of Bayer's video is analysed using narrative theory.

Chapter 8 analyses Syngenta's 2018 written integrated report, examining the ways in which pesticides are named and the discourse used in the report to talk about nature and fields. Metaphors of nature are analysed, as well as discourses of science, agriculture and the erasure of nature's agency. Finally, the images (absent in Bayer's report) are analysed as well as Syngenta's video to discuss the political construction of reality.

The ninth chapter will discuss the findings from interview analysis of two leading agrochemical companies, and one chemical company that produces adjuvants (Company C, S, and D, respectively). The chapter tentatively introduces a new concept that builds on impression management in which companies deliberately omit information, in this case, regarding adjuvants and final formulation toxicity. The chapter also discusses companies' attitude to 'the business case' and materiality, and the reasons for not taking up the extinction accounting framework. Extinction denial is evoked by participants, contrasted by warm and 'fuzzy' feelings towards hedgehogs.

Chapter 10 will discuss findings from spoken discourse analysis of interviews with NGOs, hedgehog rescuers, academics, farmers and local authority members. This chapter widens the circle of hedgehog protection and examines attitudes towards hedgehog rescuers, a disenfranchised but caring group of people that is marginalised and downtrodden.

Recommendations and conclusion will be discussed in the eleventh and final chapters.

Chapter 2: Theoretical Framework

2.1 Reality and social construction

Following Berger and Luckmann (1966), reality is socially constructed. Berger and Luckmann (1966: 13) define *reality* as "a quality appertaining to phenomena that we recognize as having being independent of our own volition (we cannot 'wish them away')". *Knowledge* is defined as "the certainty that phenomena are real and that they possess specific characteristics". The sociology of knowledge is concerned with the analysis of the social construction of reality. How is it possible that subjective meanings become objective facts, and taken-for-granted 'reality'?

While the aim in this section, following Berger and Luckmann, is not to engage in the philosophy of reality, but engage in a sociological discussion in which reality is a lived fact for most members of society, it is nonetheless important to explicate the ontological and epistemological meaning of reality. From a phenomenological point of view, consciousness is the medium through which different realities are perceived. For example, the people we must deal with on a regular basis at work, or in any other everyday life are experienced differently than the people we see in our dreams (Berger and Luckmann, 1966). These different spheres of reality are experienced through our consciousness and we can move between them. The everyday life reality is the most prominent of all, the wide-awake reality is the one that is perceived as being "prearranged in patterns that seem to be independent of my apprehension of them and that impose themselves upon the latter" (Berger and Luckmann, 1966: 35). One of the ways in which the objects in everyday life reality become objectified and constructed as common sense is through language. Language designates our everyday tools, our social lives, the structure and fabric of

society and in this way “language marks the coordinates of my life in society and fills that life with meaningful objects” (ibid: 36). In other words, language attributes cultural and political meaning that function in society to create a way of life, or a reality in which we exist.

“Common-sense knowledge is the knowledge I share with others in the normal, self-evident routines of everyday life” (Berger and Luckmann, 1966: 37). Everyday life is also characterised temporally and spatially. The way in which everyday reality is perceived is impinged upon by the time in which we experience reality. For example, we currently live through a sixth mass extinction, compounded by a climate emergency and the outbreak of the pandemic of COVID-19. The discourses prevalent through, before, between and after these times affect the experience of reality, as Berger and Luckmann (1966: 42) note “the temporal structure of everyday life not only imposes prearranged sequences upon the 'agenda' of any single day but also imposes itself upon my biography as a whole”.

An important form of objectivation occurs through signifiers that carry meaning (Kress *et al*., 2001). For Kress et al., the text or language is the locus where social action manifests. Both the form and the meaning of a text arise out of social conditions and the interaction between participants, who in turn, shape discourse. Therefore, social order and the ‘way things are’ exists only as a product of human activity, language and being. The institutional world, thus constructed, requires legitimation, that is, ways by which it can be 'explained' and justified. Legitimation, according to Berger and Luckmann, takes an objectivied meaning, that is, an object that has meaning attached to it by social and linguistic actions, and applies it to an institutional order “Legitimation justifies the institutional order by giving a normative dignity to its practical imperatives. […] Legitimation is not just a matter

of values. It always implies 'knowledge' as well". Thus, knowledge is not an absolute, but a result of linguistic acts. The sociology of knowledge understands human reality as socially constructed reality.

Rose (1991: 676) argues that numbers, calculations and accounting technologies do not describe a reality distinct from a socially and politically constructed reality as he describes that "such numbers do not merely inscribe a pre-existing reality. They constitute it. Techniques of inscription and accumulation of facts […] render visible a domain with a certain internal homogeneity and external boundaries. In each case, the collection and aggregation of numbers participates in the fabrication of a "clearing" within which thought and action can occur". In this way, a qualitative lens describes a world that cannot be reduced to monetary and numerical values is manifested. The everyday life, the natural world, water, air, species, are contextually co-constructed. Berger and Luckmann's observation and analysis have touched on the local construction of everyday life. However, modernity and the global status quo require explanation. Or rather, how do we come to live through a socially constructed reality that we, as a global community share in? To attempt to provide an answer to this I turn to Beck's (1992) theorisation of the social construction of risk in a risk society.

2.2 Shadow representations of reality

"What becomes the subject of controversy as to its degree of reality is instead what everyday consciousness does not see, and cannot perceive: radioactivity, pollutants and threats in the future" (Beck, 1992: 73, emphasis added).

In the development of philosophy and the theory of science, reality was brought more and more into theoretical interpretation. Today, however, something quite different is happening. Beck is alarmed by the destruction of nature, the reification of powerful corporations and their ubiquity in everyday life. The

invisibility of toxins, nuclear power, pesticides, fertilisers effectively the slow ongoing poisoning of humans and the natural environment is a fundamental concern in his work, "[T]he invisible hazards are becoming visible. Damage to and destruction of nature no longer occur outside our personal experience in the sphere of chemical, physical or biological chains of effect" (Beck, 1992: 55). Invisible poisons act as a metaphor in Beck's work in a way I term 'meta-modernity'. In Risk Society, Beck discusses the current social reality as a point in time in which we have bypassed modernity, the production of technologies and the solving of problems. We are now at a stage of continuously mitigating and dealing with the risks brought upon us by modernity's developments. For example, if we have been concerned with poverty in the Western world, we are now concerned with obesity. Beck (1992: 4) defines risk as "the probabilities of physical harm due to given technological or other processes". Beck discusses three main risks. The first is that of social dependency upon institutions and actors who may well be - and arguably are increasingly - alien, obscure and inaccessible to most people affected by the risks in question. This is reminiscent of Tinker's (1984, 1985) discussion (see section 3.5.1).

Beck reinforces the notion of trust and the risk mitigation activities in which institutions adapt procedures and their self-presentation to influence their credibility. For example, dialectics are excluded from the social and political interactions between experts and social groups over modern risks, because of the presupposition of realism and objectivity in science. Beck provides a pertinent example of farm workers who, when claiming that herbicides were causing unacceptable health effects, the British government asked its Pesticides Advisory Committee (PAC) to investigate. The PAC, composed largely of toxicologists, turned automatically to the

scientific literature and because causality is nearly impossible to establish in matters of health, concluded unequivocally that there was no risk there. The PAC dismissed any further evidence from farmers as merely anecdotal, uncontrolled non-knowledge. This is echoed in the arena of hedgehog rescuers, as will be discussed in chapter 10. The government stipulated that as long as the farmers used the herbicides exactly as directed on the bottle, it should be fine. However, correct conditions and use are not reality, in which protective PPE is not available, and weather conditions ignored to get the spraying done.

Thus we are now in the thralls of moving from the production of wealth as experienced in early modernity to a preoccupation with risk. "[T]he production of wealth means the increase of risk. It is no longer about creating technologies for people, it is about managing the risks of the technologies, concealing them, managing and administering them" (Beck, 1992: 19-20). This is a world comprised of socio-ecological systems: hybrid realities co-produced by humans and non-humans (Cuckston, 2017) in which the word 'risk' in past days connoted bravery and adventure, it is now recontextualised to denote threat of self-destruction of all life on Earth. In this way, risk is a constructed notion. Beck further emphasises the deceptive and imperceivable nature of to risk today when he says that while hazards in those days "assaulted the nose or the eyes and were thus perceptible to the senses, while the risks of civilization today typically escape perception and are localized in the sphere of physical and chemical formulas" (ibid.: 21). In other words, risk may be viewed as a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself. To put it differently, in the risk society the unknown and unintended consequences come to be the dominant force in society.

The result of the increasing risks are seen throughout these days of crises, one after another: collapsing markets, devaluation of capital, Covid-19 - "what thus emerges in risk society is the political potential of catastrophes" (Beck, 1992: 24). The construction of a global reality in which risk dominates where pollutants "induce systematic and often irreversible harm, generally remain invisible, are based on causal interpretations, and thus initially only exist in terms of the scientific knowledge about them". Beck refers to a particular reality of the power of science is constructed an objective 'truth'. Risks from pesticides and other pollutants can thus be "changed, magnified, dramatized or minimized within knowledge, and to that extent they are particularly open to social definition and construction. Hence the mass media and the scientific and legal professions in charge of defining risks become key social and political positions" (Beck, 1992: 23). Beautifully put:

"Risks presume a normative horizon of lost security and broken trust. Hence, even where they approach us silently, clad in numbers and formulas, risks remain fundamentally localized, mathematical condensations of wounded images of a life worth living" (Beck, 1992: 28).

Risks have something unreal about them. In a fundamental sense they are both real and unreal. On the one hand, many hazards and damages are already real today: polluted and dying bodies of water, the destruction of the forest, new types of disease, and so on. On the other hand, there are hazards which, if they occur, would mean destruction on such a scale that action afterwards would be practically impossible. People cannot escape pollutants: "Breathing, eating, dwelling, wearing clothes - everything has been penetrated by them. Going away on a trip ultimately helps no more than eating muesli" (Beck, 1992: 163).

“Dangerous, hostile substances lie concealed behind harmless facades (Beck, 1992: 72). Everything must be viewed with a double gaze, and can only be correctly understood and judged through this doubling. In Plato’s 'Allegory of the Cave', the visible world becomes a mere shadow, a reflection of a reality that by nature escapes our possible knowledge. The world of the visible must be investigated, relativized and evaluated with respect to a second reality, only existent in thought and yet concealed in the world. The standards for evaluation lie only in the second, not in the visible world.

2.2.1 The hidden emancipatory side effects of global risk

Beck (2015) goes beyond the notion of world risk society to argue that global risks – like climate change, the financial crisis, and Covid-19 have presented or even forced humanity to reorient to new directions. What has been dealt with as a side effect, like climate change or mass extinction, is now central, and reforms ways of thinking and being. It is a social metamorphosis (Beck, 2015) that is seamless, embedded in everyday activities, a radical change of behaviour, consumption and lifestyle.

Importantly, Beck correctly and almost with a sigh concludes that “sooner or later the risks also catch up with those who produce or profit from them. Risks display a social boomerang effect in their diffusion: even the rich and powerful are not safe from them (Beck, 1992: 37). In the context of agrochemicals, the risk has been financially and operationally exemplified through the disappearance of bees (Atkins and Atkins, 2016).

2.3 Accounting practices as socially constructed realities

2.3.1 What is 'accounting'?

Accounting, like other forms of knowledge, is a man-made set of rules and processes that shifts adapts and shifts as the needs of (certain) people changes (Chua, 1986). Mainstream accounting is characterised by a 'value-free' stance, which in itself stands for the possibility of seeing the world objectively, ideology-free. However, accounting is both a moral and discursive practice, and accounting discourse is not simply reporting the facts (Francis, 1990).

Indeed, accounting is not simply a technical practice, but may also be viewed as a democratic endeavour (Medawar, 1976 in Gray, *et a*l., 1987: 19) relying on the status quo dominant ideologies[1], and it is therefore necessarily a political feat that changes as society evolves (Jones, 2002). Accounting technologies defined as, "the wide range of calculations, procedures, and mechanisms used to govern, have the power to define and delineate the world", and "operate as a dividing practice, establishing institutional norms of acceptable behaviour and thinking" (Dey and Russell, 2014: 4). Accounting achieves all that because it is discursively constructed as a rational and objective endeavour that dominates over the subjective and intersubjective (Dillard and Reynolds, 2008). "Accounting […] is the drawing of boundaries and distinctions and then categorizing the events that have been separated out" (Dillard and Reynolds, 2008: 569). This is evident in integrated reports and sustainability reports where the carbon emissions disclosures are separate to biodiversity disclosures (Weir, 2018a). The separatist representation of nature is a

[1] By 'status quo' I refer to a current privileging of a political and economic climate in which technocratic solutions put forth by powerful entities serve to maintain and reinforce their hegemony and control of all resources (financial, environmental, human, etc). This constructed reality is a result of assumptions that there exists a 'true' reality that is independent of social practice and discourse that created and is recreated by social actors (Hines, 1989).

particular world-view and the way in which nature is discursively constructed contributes to the creation of a particular relationship with the natural environment and nonhuman beings.

2.3.2 Accounting as a communicative discursive practice

Accounting is understood as an everyday life activity co-constructed by participants through the form of speech acts in its various forms: giving excuses, apologies, and explanations through the production of statements, records (Vollmer, 2019). Indeed, accounting is broader than solely professional accounting practices as it is a social practice where accounts are "linguistic forms that are offered for untoward action" (Scott and Lyman, 1968). In a sense, accountants are intermediaries that "connect human beings with their records and recordings, supply chains, territories, companions, souls and soils" (Vollmer, 2019: 29). By holding this role, accountants have power to demarcate the world and create or restrict relationships.

From the ancient time of Mesopotamia, records have been kept in numerical, symbolic and linguistic forms not only to keep track of transactions, but to establish control and accountability (Atkins and Maroun, 2020). To this day, accounting remains a technology through which those in power can hierarchically order, control and establish an order of things.

Language as a communicative tool creates dominant narratives through which the world is viewed (van Dijk, 1993). An important outcome of social and environmental reporting is that by performing the act of communicating the report on sustainability/biodiversity it can transform the behaviour of corporations (Jones and Solomon, 2013). On the flip side, accounting as a communicative act functions to instil and reify these discourses because "as a communicative social practice,

accounting can properly be viewed as having both emancipatory and repressive effects at any instant of time" (Gallhofer and Haslam, 2019). Additionally, Gallhofer and Haslam (1996) demonstrate how the critical social analysis of art which could be viewed as a multimodal semiotic analysis, provides insights for the critical appreciation of accounting. The context of art, including the media, gives more attention to form, or the representation/accounting of entities as well as the content and context in which the art is situated. Importantly, Gallhofer and Haslam note that "content and form function together as an organic unity" (1996: 26). Accounting in the authors' conceptualisation then cannot be separated from the subjective. The objective is but an illusion (ibid.: 28).

In any case, accounting can shape and construct reality (Jones and Solomon, 2013). Therefore, in reports, companies attempt to reinforces the focus on positive aspects only and project an idealized image of reality, a kind of shadow reality, which can contribute to greenwashing (Boiral, 2016). In this sense, the 'picking and choosing' of what to represent as reality, a certain shadow positions accounting as a creator of a particular lens of a lived reality in which "accounting, to the extent that it is a choice about how to affect our lived experience – our ends – is a practice grounded in moral discernment. Accounting is important precisely to the extent the accountant can transform the world, can influence the lived experience of others in ways which cause the experience to differ from what it would be in the absence of accounting" (Francis, 1990: 7).

The representation and construction of a reality is like a doily, a patchwork of visible and erased entities. Choudhury (1988: 550) discusses instances where accounting should be, but is absent, and nevertheless telling of the kind of reality and ideology it attempts to promote where "the absence of accounting may tell researchers a lot

about the nature of accounting and its existence […] the omissions -- what is not done, not said, and not emphasized -- are similarly informative".

The field of accounting research and praxis is informed by many disciplines such as environmental humanities, political science, philosophy, and geography. However, accounting was not always perceived as linked to the social and environmental world, "Accountants were cast in the role of insignificant players who were to do the bidding of those who used the results of the accountant's work" (Yamey, 1964 in Hines, 1989: 58). Funnell (1998: 439) further elucidates that "the link was rarely made between broader social consequences and the role of accounting as a constituent element in engendering existing social and political arrangements. Accounting research […] exposed these perceptions of accounting as inadequate and favourable to the status quo". Maunders and Burritt (1991: 12) write that accounting occupies a dominant role in decision making as well as representations of 'reality' as it quantifies, simplifies and "above all it serves an ideological function: one which has a vested interest in down-playing ecological impact", as can be seen in the arena of agrochemicals in which the economic factors of production often override questions surrounding the safety of use of pesticides (Donati, 2020; Atkins, Atkins and Biehl, forthcoming; Mesnage and Antoniou, 2018).

As Sullivan and Hannis (2017) emphasise, accounting is perceived as a tool that reinforces the legitimacy of human control and dominance over, and exploitation of, nature. Traditional accounting is often perceived as an objective and rational practice with its neutrality stemming from a political status-quo. As Miller (1990: 316-7) notes, "accounting is able to create new realities and visibilities" and corporate reporting is one mode in which such representations are cemented.

This research takes an interpretivist, normative, ontological approach that sees reality as socially constructed. As Hines (1989) claims, the pervasive, common sense assumption in accounting research and practice is that reality exists independently of social practice and social actors.

In turn, socio-economic political variables are closely linked to the construction of reality, meaning-making and knowledge (Gordon, 1991). Using the metaphor of a building surrounded by a fence, Hines relates how the idea of 'belonging' to the organisation is an arbitrary and abstract notion. This idea is reinforced by the paper's register. Written in a narrative form, a register that is not conventional for academic papers reinforces Hines' claim that reality is socially constructed. For example, crime, profit, and madness *are* socially constructed categories. Labels and categories are ways of seeing the world, and those in power are able to influence perception of reality by being in charge of categories. Furthermore, people, by participating in society through language, behaviour, political systems and education create society and reinforce the categories. The paper, written in this specific style is an example of entrenched norms and expectations of a certain genre. Many of reality's facts are taken-for-granted as preconceived presuppositions. Many studies are based on previous assumptions, previous acceptance of 'the way things are'. However, how those facts came to be seen as such, is left unquestioned (Hines, 1988). Furthermore, Hines states that it has not generally been acknowledged in social accounting literature that social reality gets constructed in interaction. A pertinent example of traditional accounting used to disguise unethical and immoral activities and behaviours is in Funnell's (1998) study of accounting in the Holocaust. The destruction of human life on the scale of the Holocaust, Funnell argues, could not have been accomplished solely by the hands of a few bureaucrats, but was a result of a complex collaboration of a system-wide, well-oiled machine. In his paper, Funnell highlights three themes, the most relevant of which is the accounting profession's escaping responsibility. Funnell's (1998) study on the Holocaust supports Hines' (1988, 1989) notion that accounting delineates reality. In fact, it achieves more than that, particularly when addressing extinction. Funnell (1998) demonstrates that the Holocaust, the attempt to get rid of a race (or species, for that matter) of humans, was a process of accounting by the hands of multiple bureaucrats. The way in which people were reduced to anonymity through numbers, and the discourse used by Nazis to reduce humans to animals in the Holocaust, has been compared to the fate of animals in the animal industry (Black, 2003).

Black (2003) links arguments against slavery and racism with arguments against the animal producing industry, undoubtedly one of the most questioned, and consequently regulated, "factory systems".

In a sense then, Funnell's (1998) study is a starting point for the intersectionality (Griffin, Nathan, 2014) in this thesis. In this thesis I utilized a participant-centred methodology, which focused on the lives, voices and experiences

of participants above all else, in order to make visible the experiences of hedgehogs and hedgehog carers. The intersectionality in the thesis crosses my identity as a Jewish woman, 3rd generation to Holocaust survivors, animal rights or in other words, speciesism, and the identities of interviewees. While hedgehogs are not subjected to the mass slaughter farmed animals are, they are being annihilated by the 'war on nature' perpetrated by agrochemicals. Accounting practices today are being criticised for playing a pivotal role in environmental destruction. By privileging certain categories as 'material', traditional accounting is denying the voice of the Other[2]: the natural environment, animals and marginalised groups.

2.3.3 The representation and discursive construction of the natural world in conventional accounting

Accounting discursively constructs society and the relationship between humans and nature (Hines, 1988; Tinker, Neimark and Lehman, 1991). Sullivan and Hannis (2017: 1471) in their effort to question underlying ontological and ethical assumptions concerning the value of the natural world in current conventional accounting, discuss the challenge of 'translating' ecological value into numbers and conceptualising nature as effectively a free service provider, an 'external thing' serving as a free resource for a company. The authors summarise the conversion of ecological entities into numerical figures as a process in which "every step [..] specific value-laden choices make and shape the value entities that get counted". Thus, the main problems identified by both Gray (2013) and Sullivan and Hannis (2017) concern representation and value – internalising the natural 'resource' from

[2] I draw on Critical Animal Studies literature that discusses the perception of animals and certain humans relegated to the category of 'Other' via dehumanizing processes or 'othering', a group's construction of a shared Us–Them representation of another group (Mann, 2011) where the dominant group is in control of this division, often linked to oppression of the Other (Laine and Vinnari, 2017:12).

an externality, and developing a new paradigm, based on a deep ecology, Gaia theory and systems theory, privileging the notion of the complex interconnectedness of ecological networks for conceiving of the value of nature and biodiversity.

Courchamp et al. (2018) identify the role of language and semiosis behind unsuccessful conservation attempts of some of the most critically endangered 'charismatic' species attributed to a cornucopia of their semiotic presence through toys, advertising, logos and films which may be a contributing culprit for the low public awareness of their true status. For example, three out of the four known species of giraffe, have declined by 52%–97% in the last 35 years. However, the number of Sophie giraffe baby toys, first marketed as a conservation awareness tool, sold in France (800,000 in 2010) is over 8 times more abundant than the number of actual, living giraffes in Africa. As Courchamp et al. (2018) illustrate, semiotically and virtually these animals are present in our daily lives. This highlights the importance of the way in which animals are represented in various media and modes, as this may have severe consequences for their protection and public awareness: "The perceived extinction risk, which is low, as it is influenced by highly abundant, virtual populations, masks the real, high extinction risk" (Courchamp *et al*., 2018: 8). This exemplifies the importance of investigating the effect of not only the textual mode, but also multimodality, the interaction and meaning-making of images, videos, photos, graphs, charts with texts.

2.3.3.1. Framing extinction as a crisis

Halliday (1992: 82) discussed Paul Ehrlich's important observation that human beings have not evolved to be able to notice gradual change, as he claims, "we are good at recognizing and responding to sudden catastrophic changes; but bad at recognizing and admitting to ourselves slow changes" like the frog in boiling

water. Extinction is largely happening 'out-of-sight-out-of-mind', gradually and abstractly. An important aspect of Ehrlich's observation is fundamental to the extinction accounting agenda, and the SEA research as a whole is that "we have to 'change the way in which we perceive the world'". In other words, the solution lies in radical change in value paradigms that govern society and the way in which businesses operate.

Extinction and mass extinction must be framed as a crisis. According to Krzyzanowski (Samec *et al.*, 2017: 70), defining an action or event as a crisis, awards it validity: "If one identifies a certain action, practice, event or occurrence as a crisis, what happens is that it provides an excuse, it becomes legitimate to take special measures, and to undertake actions which otherwise would not have the necessary validity and which would not gain public support". Although the example Krzyzanowski uses is of the refugee crisis, in which governments were able to gain support for turning away immigrants, this notion can be applied to extinction, where animals become refugees being forcibly turned out of their homes. Recontextualising an event is an act of preparing the ground for actions to come. By framing mass extinction as a crisis, the plight of animals, which is most often ignored and remains unheard and for which this project serves a voice, is given legitimacy.

2.4 Conclusion

This chapter discussed accounting as a linguistic and discursively constructed notion that contributes to the representation of reality. Engaging in a sociological discussion, I set out to define and explicate, following Berger and Luckmann (1966), the way in which objects and practices become part of everyday life, essentially becoming part of an unquestioned reality. One vehicle for this is through language, where both form and meaning of a text come from socially situated interaction.

When it comes to institutions and corporations who seek legitimation for their operation, those construct a particular kind of knowledge that results in a status quo of 'the way things are', or as we know it better – business as usual. Accounting, as part of corporate practices does much the same as it constitutes a reality it takes part in delineating.

In modern times of risk society (Beck, 1992) characterised by the sixth mass extinction we encounter risks that arise from social dependency on corporations that do not consider the loss of species a risk to their operations. More than that, agrochemicals create a shadow reality through deliberate omission of the harm pesticides cause, by propagating extinction denial, and denying that biodiversity is declining. Thus, species do not get 'counted', or accounted for, and they are erased from visibility. The extinction crisis and risk is urgent and there is a need for companies to acknowledge this, as it does not only represent a financial material risk, it represents the beginning of the end to all living beings.

Chapter 3: Literature Review

3.1 Introduction

3.1.1 Biodiversity loss, the 6th mass extinction and the domino effect: co-extinction

In recent decades human activity surpassed the Earth's ability to maintain life, resulting in ongoing mass extinction, climate change and rapid environmental degradation (Ceballos, Ehrlich and Dirzo, 2017; Rockström *et al.*, 2009; Ceballos, García and Ehrlich, 2010; Johnston, 2017).

The state of the natural environment as reported by the IPBES (2019) continues to reveal human activity as the principal culprit in the acceleration of the disappearance of wildlife, with more than 1 million species threatened with extinction. The report stresses the unprecedented rates at which nature is declining where "ecosystems on which we and all other species depend is deteriorating more rapidly than ever. We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide" (IPBES 2019).

As Ceballos et al. (2010: 1822) note, while the five previous mass extinction waves during the Ordovician, Devonian, Permian, Triassic, and Cretaceous geologic periods resulted in a catastrophic loss of global biodiversity, their impact was not random taxonomically, because "whole groups of species were lost while other related groups remained largely unaffected and the survivors were often not previously dominant evolutionary groups".

The loss of biodiversity is but the tip of the iceberg in the wider ecological breakdown. Rockström et al. (2009) identify nine planetary processes that are crucial in ensuring a continuous Holocene, a period of geological stability, suggesting that

three of these processes have already surpassed the threshold: climate change, biodiversity loss and interference with the nitrogen cycle.

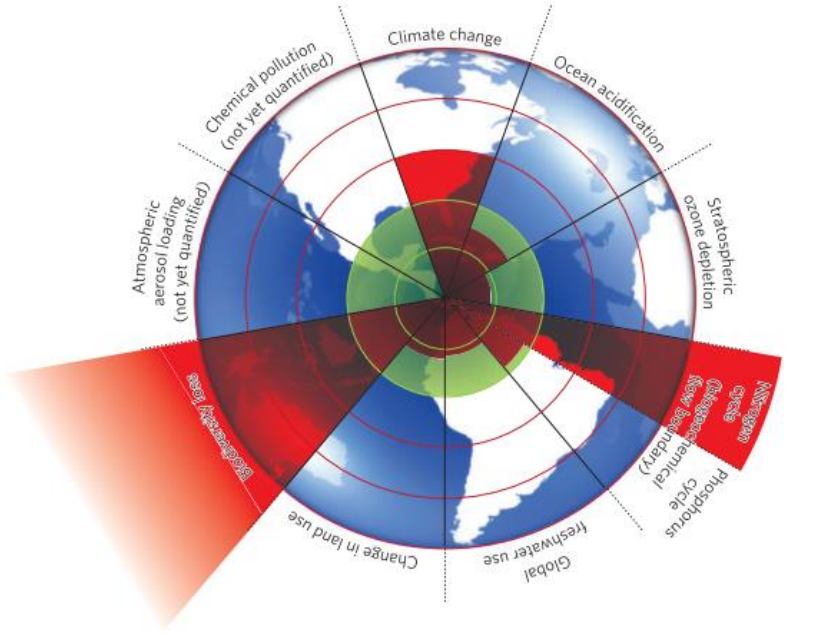


Figure 1 | Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded.

Fig 1: Planetary boundaries (Rockström et al., 2009: 472)

While species extinction is a natural process observable in Earth's history (Rockström *et al.*, 2009: 473), the authors claim the current rate has exceeded the normal pace: in pre-industrial times, analysis of fossils suggests the rate of marine life extinction was "0.1-1 extinctions per million species per year", and mammals 0.2-0.5. Today the rate of extinction is estimated to be 100-1000 times faster than the natural estimation with the primary cause being human activity and particularly chemical and agribusiness conversion of land use (Straub, Strobl and Neumann, 2020; Gossner *et al.*, 2016*)*. Mass extinction is characterised as an event in which the

Earth loses more than three quarters of its species in a geologically short period of time. Likewise, Barnosky et al. (2011) argue that current projections for extinction rates are much higher than originally reported.

Indeed, it is now acknowledged that the state of wildlife and the natural environment has been exacerbated: "Today, rapidly changing atmospheric conditions and warming above typical interglacial temperatures as CO2 levels continue to rise, habitat fragmentation, pollution, overfishing, overhunting, invasive species and pathogens [...] and expanding human biomass are all more extreme ecological stressors than most living species have previously experienced" (Barnosky *et al.*, 2011: 56).

Ceballos, Ehrlich and Dirzo (2017) find that the rate of population loss in terrestrial vertebrates is extremely high—even in "species of low concern. An insect Armageddon is described as three quarters of insects have declined over the past 25 years (Hallmann et al., 2017: 16). The loss of insects has a detrimental effect on the food chain and on flora and fauna, such as hedgehogs, who depend on insects as prey. Ecosystem 'services' by insects are estimated at $57 billion annually in the USA (ibid:1). Strona and Bradshaw (2018) term this type of disappearance as 'co-extinction', where species disappear following the depletion of their food sources. The authors demonstrate how "ecological dependencies amplify the direct effects of environmental change on the collapse of planetary diversity by up to ten times" (Strona and Bradshaw, 2018: 1). In other words, the loss of one species can make another extinct and can cause an entire ecosystem collapse. Even the shrinkage of populations sizes can trigger local disappearances of other species who depend on the first. Hof and Bright (2016: 407) emphasise that it is increasingly important to be aware of trends in species abundances in order to be able to "act ahead of possible

irrecoverable declines and extinctions". Pires et al. (2020) demonstrate that the more species depend on interactions with others, the more indirect effects increase.

The sixth mass extinction is now regarded as a global biodiversity crisis, and this begins with the loss of abundance of individuals that can result in changes of ecosystems. "Loss of biodiversity is therefore shown to be not only an environmental issue, but also a developmental, economic, security, social and moral issue" that affects 80%, 35 out of 44 targets of the SDGs (SDGs 1, 2, 3, 6, 11, 13, 14, 15) (Intergovernmental science-policy platform on biodiversity and ecosystem services - IPBES, 2019: 6). O'Neill et al. (2018) examine sustainable development concluding that "the ambition of the SDGs, has the potential to undermine the Earth-system processes upon which development ultimately depends" (O'Neill *et al.*, 2018: 93). The authors suggest that if people are to live within the planetary boundaries, resources will have to be reduces. Sustainable Development Goal 15 (SDG 15) Life on Land, identifies biodiversity loss as a challenge as follows: "To sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss" (UN, 2016: 1). Sobkowiak, Cuckston and Thomson (2020) problematise the UN's global standardised approach of SDGs to accounting for sustainable development, particularly in respect of the SDG-15 indicators on biodiversity performance. The authors argue that much more than reporting on the prescribed SDG indicators is required to address biodiversity loss.

3.2.1 The 6th Mass extinction and pesticides

If Rachel Carson and her colleagues were alerted to an ecological crisis when song birds were found dead in backyards due to the spraying of DDT, now the disappearance of animals is quiet, unseen but ever more insidious.

Rosenberg et al. (2019) estimate a 29% decline in the most ubiquitous birds across North America since 1970. This echoes what we see here in the UK, the ubiquitous snuffles of the prickly nightly visitors, once a common sight in the British countryside, gardens, parks, and woodland are disappearing quietly. Extinction begins with an abundance loss. Importantly, Rosenberg et al. (2019) found that 90 percent of the missing birds came from only 12 families including species such as sparrows, warblers, blackbirds, finches, larks, starlings, and swallows.

All hedgehogs are canaries, and their relative abundance masks their disappearance. Much like the surviving 24 million eastern meadowlarks, the fact that 74 million are dead obfuscates the true crisis (Yong, 2019). Habitat loss and land degradation are cited as the most influential factors attributed to the decline. However, pesticides, particularly neonicotinoid insecticides, are named as one of the main factors in the continuous decline of songbirds (Leahy, 2019). Importantly, the birds recovered, but the effect of exposure resulted in reduced reproduction and overall survival chances.

In the UK, Mathews et al. (2018) estimate one in five British mammal species are at a high risk of extinction, with hedgehogs classified as vulnerable on the UK priority species list and on the Mammal Society's first Red List.

3.3.1 Biodiversity loss in the UK context

There are 59,210 native species in the UK. The total number of known threatened species in Great Britain, including endemics and those assessed at the national scale, is 1,728; approximately 21% of species assessed (JNCC, 2019a).

Hayhow et al. (2019: 6) review the state of biodiversity in the UK in the State of Nature Report that feeds into the JNCC report, concluding "the abundance and

distribution of the UK's species has, on average, declined since 1970 and many metrics suggest this decline has continued in the most recent decade. There has been no let-up in the net loss of nature in the UK". The authors note that most CBD's target have not been met for the deadline set to 2020. "Deeply concerned that, despite many positive actions by Parties and others, most of the Aichi Biodiversity Targets are not on track to be achieved by 2020, which, in the absence of further significant progress, will jeopardize the achievement of the mission and vision of the Strategic Plan for Biodiversity 2011-2020, and the Sustainable Development Goals, 2 and ultimately the planet's life support systems" (CBD, 2019).

The State of Nature Report (Hayhow *et al.,* 2019) stands as an apt accounting practice, as it includes narrative elements of various stakeholders, quotes from young people and the way they relate to nature at the beginning, emphasising the intrinsic value of nature. "I have never seen a Hedgehog, although my parents used to see them all the time in the area. Many others my age have had the same experience. I'm worried that we're close to losing them from our countryside forever." James Miller, 17 (in Hayhow *et al*., 2019: 4).

3.2 Business and biodiversity

3.2.1 The role of business in species protection

Given the sixth mass extinction we are currently living through, it is imperative to make connections between species extinction and the role businesses have in driving extinction, but also the role they can have in protecting and halting the crises (Atkins and Macpherson, 2019).

As Atkins and Macpherson (2019) note, the value of 'ecosystem services' has been conceptualised and estimated along the various services attached to its exploitation such as provisioning, regulators, supporting and cultural services. Ecosystem services have been estimated to be worth $33 trillion annually (Constanza *et al.,* 1997). However, the authors importantly emphasise that it is not the size of the estimates that matters, it is the sheer "magnitude and enormity of our reliance, as a species, on all other species and their interdependence" (Constanza *et al.,* 1997: 5).

Indeed, businesses are beginning to acknowledge the importance of the natural world and the negative consequences of biodiversity loss, manifested as a business risk. For example, PWC (2010: 5) published its own report about the negative business consequences of biodiversity loss. Its Business Risk Report states, "This loss of biodiversity and degradation of ecosystems has dramatic consequences for business". The report carried out its 13th Annual Global CEO Survey 2010 and notes that 27 percent of CEOs view biodiversity loss as negatively impacting business growth and they are expected to provide solutions (Adler, Mansi and Pandey, 2018).

3.2.2 International biodiversity conservation efforts: businesses as leaders of change

3.2.2.1 Convention on Biological Diversity (CBD)

In order to address the current devastating loss of biodiversity, the CBD, formed in 1993, aims to bring together in partnership businesses, and government leaders (CBD, 2020). To put the plan in motion, 150 government leaders signed the Convention on Biological Diversity at the 1992 Rio Earth Summit.

The CBD, a legally binding treaty (CBD, 2016: 13) takes an anthropocentric view to biodiversity, framing the need for conservation and sustainability as first and foremost for the benefit of humans: "it is about people and our need for food

security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live".

Specifically, the CBD operates towards 3 main aims:

1. The conservation of biological diversity
2. The sustainable use of the components of biological diversity
3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources (CBD, 2020).

However, recent reports in the UK (JNCC, 2019a; Hayhow *et al.*, 2019) as well as the latest reports on the progress on the Aichi targets reveals the limitations and raises questions as to the efficacy of the organisation. The Aichi targets (CBD, 2018) link with national targets. However, in a recent document compiled as the end of the 2020 targets reveal that for most, there has been limited progress, and, for some targets, no overall progress. The CBD also reports that in terms of engagement, only a limited number of stakeholders have adopted their national biodiversity strategies and action plans. Perhaps most worrisome is that "only a limited number of national biodiversity strategies and action plans contain resource mobilization strategies, communication and public awareness strategies, or capacity development strategies" (CBD, 2019:5). In other words, signatory countries have done very little to allocate resource, plan and put in practice any of the targets.

Fig 2: The Aichi Biodiversity targets (CBD, 2018)

In terms of the new 2050 targets, the CBD notes that current trends, or "business-as-usual" scenarios, show continued loss of biodiversity, with major negative consequences for human well-being, including changes that may be irreversible. "Urgent action on biodiversity therefore remains a pressing global societal issue" (CBD, 2019: 12).

3.2.3 Corporate accountability: the early years

3.2.3.1 Environmental Accounting

Since the 1970s, following growing environmental activism, increasing awareness of the climate crisis and the introduction of environmental policies meant that business are increasingly under pressure to address sustainability.

The growing global awareness of the importance of the environment led to a profound impact on business, growth of ethical investment, and higher environmental standards. In 1990, the understanding that accountants hold the power and skill to contribute to business behavioural change was articulated in the emerging field of SEA (Gray, 1990).

Environmental accounting, in practice and as an academic field, is a relatively young discipline. The 1980s saw environmental accounting research as an extension of traditional accounting, attempting to explore environmental impact and its consequence on market activity. The dominant approach at the time to the inclusion of environmental accounting involved the monetisation of environmental resources (Mathews, 1984 in Russell *et al.,* 2017: 1434) although this is highly objected especially when it comes to transforming shared natural 'resources' such as rivers, waterways and air (Russell *et al.,* 2017: 1434). As Gray (1992: 416-417) advises "[nature monetisation] reinforces analytic and scientific solutions when, within a deep green context, one is attempting to do quite the opposite".

Within environmental accounting, environmental reporting has been taken up by companies in forms of separate sustainability reports, and has constituted a locus for research examination. Environmental reports (see section 3.3 for full discussion) have been critiqued for allowing "the organisation to appeal to the beliefs or values of important stakeholders, to garner support and to avoid additional scrutiny" (Mansoor and Maroun, 2016). Thereby adding to the extant critical literature that casts doubt on the ability of these reports to effectuate long-term change.

The accounting in 'environmental accounting' is not for nature. As Gray (2013) notes, nature does not need us to account for it. The accounting in this sense is for humans, our actions inflicted on the natural world and the endless taking we are doing.

3.3 From The Global Reporting Initiative (GRI) to Integrated Thinking

3.3.1 Emergence of corporate governance and voluntary sustainability reporting

The right to information stems from democratic principles. Business activity as part of, and largely acting on behalf of society must be disclosed and reported on in a manner that abides by this fundamental right, "warts and all" (Gray, 2013: 467). Crucially, accountability's role, following Gray (2013: 465) is to "hold the powerful to account […] our task as researchers is to find ways to seek to expose and enforce that accountability even when neither the demos nor the polity is able/willing to ensure it through extant regulatory forces". In this thesis, I will adopt Gray et al.'s (2014: 50) definition of accountability that states it is "a duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible". Although annual reports that disclosed social and

environmental information existed in the US and Europe even before 1980, this has been done under regulatory and litigation pressure (Tschopp and Huefner, 2015, in Idowu *et al.*, 2016).

Simultaneous to the emergence of social and environmental accounting and reporting practices was a rise in the concept of sustainability. The notion of sustainability, used in the sense of "capable of being continued at a certain level" was first used in 1965 (Online Etymology Dictionary, in Zappettini and Unerman, 2016). This meaning, according to Du Pisani (2006), has emerged as a reaction to neoliberal capitalism, challenging the notion of exponential, limitless growth. The report produced by scientists and economists called 'The limits of Growth' (Meadows, 1972 in Zappettini and Unerman, 2016: 522) captured the current challenge of depleting natural resources that are vital for sustaining life on Earth. With the publication of the United Nations Brundtland Report (United Nations World Commission on Environment and Development (WCED), 1987) the term 'sustainable development' was used, further supported by the Rio Earth Summit (1992) the first global environmental conference that sought to help governments find ways to rethink the economic model and halt the destruction of the environment (Zappettini and Unerman, 2016). These events were influential for the development of corporate practice and reporting and brought about an increase in voluntary social and environmental reports, with South Africa the only country in which they are a legal requirement for corporations with a primary listing on the Johannesburg Stock Exchange (JSE).

While Corporate Social Reporting (CSR) was concerned with reporting on social aspects such as employee reporting (Ullmann, 1979), Gray et al. (1987) raise the question whether CSR does in fact amount to nothing more than advertising, with

Gray (2013) revealing 16 years later that environmental accounts suffer from poor quality of communication and information transparency. Despite criticism of the effect of company reports, there has been an increase in stakeholder and investor pressure on companies to account for environmental risk, leading to the emerging of first, the Prince of Wales' Accounting4Sustainability (Daniels et al., 2018) in 2004, followed by Integrated Reporting (IR) (King and Atkins, 2016).

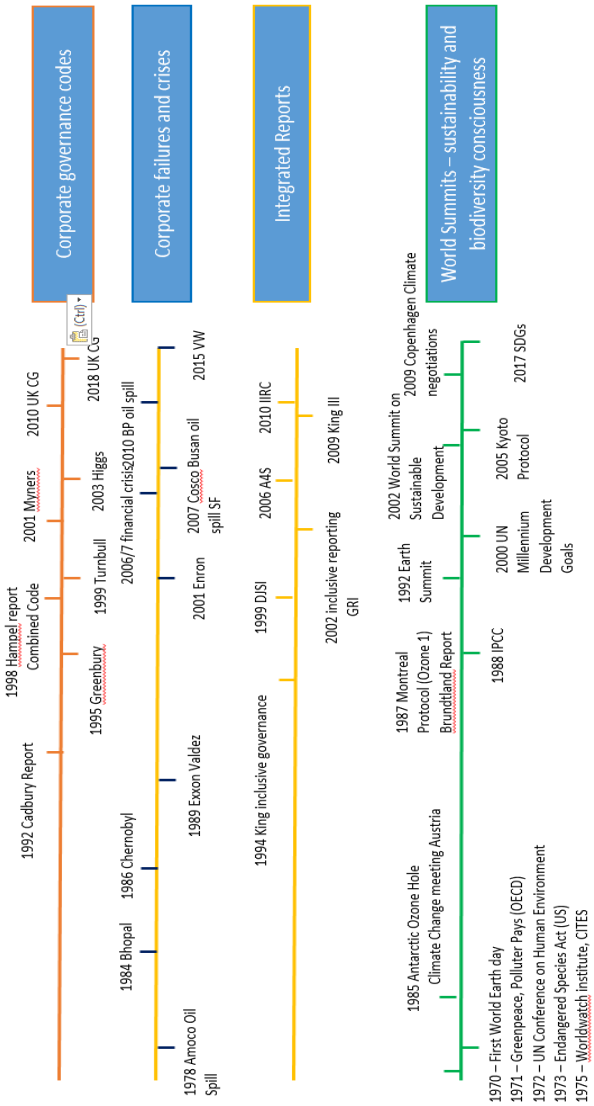


Fig 3: The coming together of global environmental consciousness. Following corporate governance failures, corporate governance codes have developed alongside the increasing reckoning of the destruction of the natural world and the role business plays as both the problem and the solution (author's own)

3.3.2 The Global Reporting Initiative (GRI)

The Global Reporting Initiative (2013), a pioneer of sustainability reporting established in 1997, aims to provide businesses with standards to "communicate their impact on critical sustainability issues such as climate change, human rights, governance and social well-being. […] The GRI Sustainability Reporting Standards are developed with true multi-stakeholder contributions and rooted in the public interest." The most important aspect highlighted by the GRI's mission statement in relation to biodiversity protection is their acknowledgement that the resources used by companies are vital for sustaining life (Global Reporting Initiative, 2013). The GRI aligns with the extinction accounting literature (e.g. (Atkins *et al.*, 2018; Maroun and Atkins, 2018) that regard corporations' power as one that can be harnessed for changing corporate behaviour.

The GRI is a globally adopted reporting framework for voluntary corporate reporting. GRI (2013) has four biodiversity indicators under EN11-14 in the environment category (See table 1).

G4-EN11	GRI 304	Biodiversity	304-1	Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas
G4-EN12	GRI 304	Biodiversity	304-2	Significant impacts of activities, products, and services on biodiversity
G4-EN13	GRI 304	Biodiversity	304-3	Habitats protected or restored
G4-EN14	GRI 304	Biodiversity	304-4	IUCN Red List species and national conservation list species with habitats in areas affected by operations

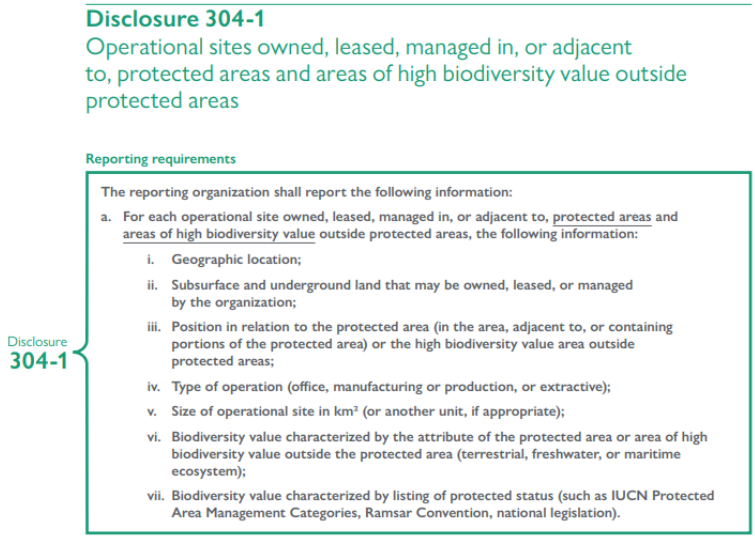
Table 1: GRI disclosure standards of biodiversity indicators (Global Reporting Initiative, 2017)

The GRI biodiversity indicators are not 'core' standards for companies to report on, but are voluntary (indicated by the empty boxes between the G4-EN numbers and the GRI 304 column). Companies who choose to report on biodiversity, are invited to include the location of their operations in or adjacent to protected areas (EN11), significant impacts of companies' operations on biodiversity in protected areas and areas of high biodiversity value (EN12), habitats protected and restored by companies (EN13) and a total number of IUCN red list species and national conservation listed species with habits affected by companies' operations (EN14). These indicators have been widely used in academic studies to examine companies' reporting for biodiversity (Rimmel and Jonäll, 2013, van Liempd and Busch, 2013), and to further develop the reporting and evaluation framework for biodiversity (Samkin *et al.*, 2014, Atkins *et al.*, 2014). However, Burgass et al. (2018) caution that while the use of the IUCN Red List for the identification of species at risk is beneficial, it may become a "one-stop-shop" for decision making, which may lead to discounting species that may not be listed as vulnerable, but are in danger of extinction nonetheless, particularly following the phenomena of co-extinction (Strona and Bradshaw, 2018).

The ISO 26000 (Integrated Reporting, 2021) reporting framework also provides guidance (subclause 6.5.6) to businesses on protecting the environment and biodiversity, and restoring natural habitats. The Flora and Fauna International's Working with Business for Conservation program was launched in 1997 to help businesses have a long term positive impact on biodiversity conservation (Adler, Mansi and Pandey, 2018).

Fig 4: GRI Core and additional performance indicators on biodiversity (GRI, 2016).

However, while the GRI has acquired the standing and aspires to a high standard of reliability and transparency through its indicators (see below), particularly when it comes to biodiversity, these indicators are difficult to subject to measurability precisely because of the nature of biodiversity, excuse the pun. Nature and living beings cannot be counted, bartered and subjected to a debt/cost effective technologies often used in financial accounting (Boiral, 2016; Gray, 2013).



Disclosure 304-1

Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas

Reporting requirements

Disclosure **304-1**

The reporting organization shall report the following information:

a. For each operational site owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas, the following information:
   i. Geographic location;
   ii. Subsurface and underground land that may be owned, leased, or managed by the organization;
   iii. Position in relation to the protected area (in the area, adjacent to, or containing portions of the protected area) or the high biodiversity value area outside protected areas;
   iv. Type of operation (office, manufacturing or production, or extractive);
   v. Size of operational site in km² (or another unit, if appropriate);
   vi. Biodiversity value characterized by the attribute of the protected area or area of high biodiversity value outside the protected area (terrestrial, freshwater, or maritime ecosystem);
   vii. Biodiversity value characterized by listing of protected status (such as IUCN Protected Area Management Categories, Ramsar Convention, national legislation).

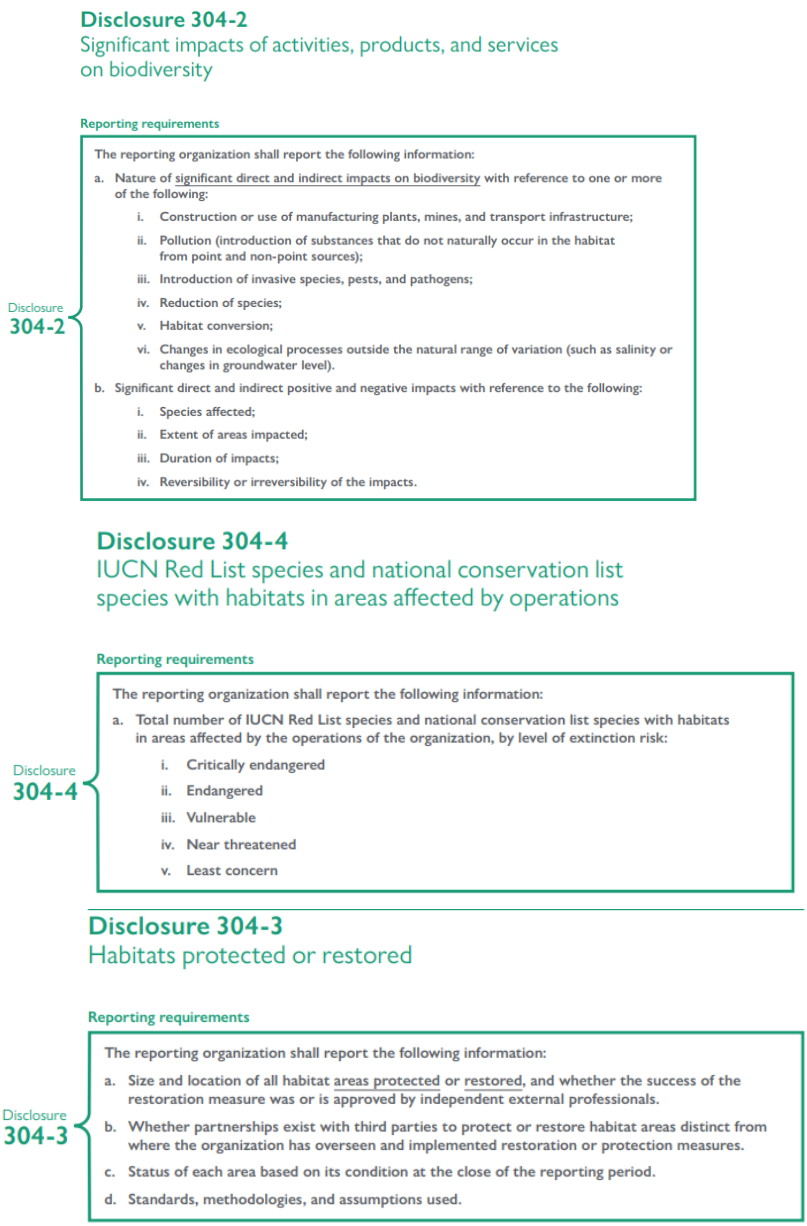


Fig 5: GRI biodiversity indicators for disclosures (Global Reporting Initiative, 2007)

3.3.3 Integration: the thinking behind integrated reporting

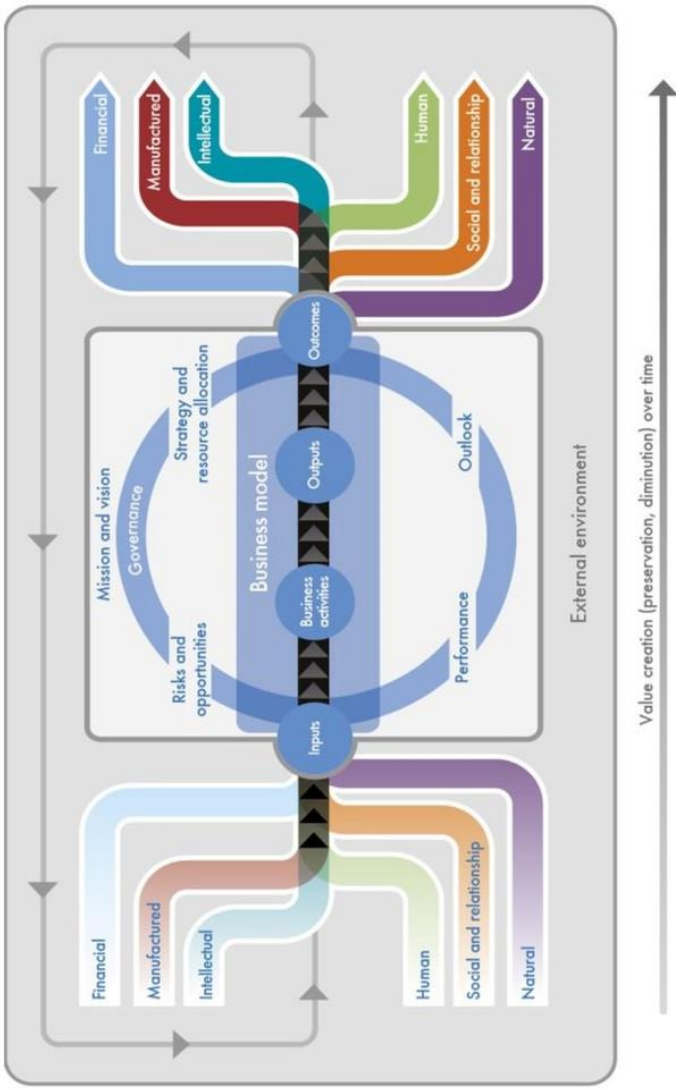


Fig 6: Integrated thinking and integrated reporting six capitals (IIRC, 2013)

Natural capital accounting has been proliferating with the rise of Integrated Reporting, where nature is categorised as "one of six capitals organisations draw on" (Russell, Milne and Dey, 2017: 1435). With the emergence of the International Integrated Report Council (IIRC) in 2011, established by a committee formed by A4S and the GRI convened by The Prince of Wales and chaired by Mervyn King, author of King III Principles and former chair of the GRI, further global standardisation of IR guidelines has been formulated, culminating in the international <IR> framework (IIRC, 2013). In this way, Integrated Reporting was developed as a way to overcome deficiencies in existing reporting frameworks by bringing to the fore the interconnectedness of the triple bottom line of the economic, social and environmental capitals (Pei-Chi Kelly, Maroun and de Villiers, 2020).

Integrated reporting, a term introduced by King III in South Africa in 2009 with the introduction of corporate governance principles was effectively a reconception of the triple bottom line: economic, social and environmental (Rowbottom and Locke, 2016). The integrated report effectively integrates social and environmental information into the company's main public communication pathway – the annual report. However, the IR is not simply an incorporation of the sustainability report into the annual report, as King argues, "[i]t incorporates, in clear language, material information from these and other sources to enable stakeholders to evaluate the organisation's performance and to make an informed assessment about its ability to create and sustain value […]. By its very nature an integrated report cannot simply be a reporting by-product. It needs to flow from the heart of the organisation and it should be the organisation's primary report to stakeholders" (Mervyn King's Foreword, IRCSA 2011: 1 in Solomon and Maroun, 2012). Indeed,

IR, as distinct from GRI and other reporting standards, is a principle-based framework, not simply a 'how to' guide (Deegan, 2020).

It is hoped that integrated reporting will promote a more sustainable and responsible business. However, as the next section will demonstrate, the road is paved with limitations and challenges.

3.3.4 Legitimacy and limitations of corporate accounts and disclosures

Annual reports, and within them, accounting technologies, have the potential to discharge responsibility towards stakeholders and affect lives. Funnell (1998: 442), analysing the impact of and facilitation of accounting in Second World War grimly notes that accounting reports "set up waves of consequences that radiate from the reports in a manner similar to the effect produced when a stone is thrown into a still pond. Even those at a great distance from the initial impact of an accounting report may have cause to regret its effects". The effectiveness and authenticity of company reports have been analysed and questioned extensively in the literature (e.g., Spence, 2007) with views ranging from seeing the reports as "attempts to engage in social change" (Burchell and Cook, 2006), a way to mitigate and minimize reputation risk (Jones and Solomon, 2013), and as an impression management exercise (Adler, Mansi and Pandey, 2018), while Milne et al. (2009) conclude that sustainability reporting is essentially based on words and justifications rather than actions. Gray (2013: 465) similarly adopts a cynical view of reporting, arguing it "is beset by a remarkable irony. On the one hand, the corporate world expends enormous efforts to produce extremely poor environmental reports whilst working hard to ensure that such reports are neither legislated for nor analysed in legitimate fora and exposed as the trivia that they are."

Sustainability reports are considered to be employed by organisations in order to achieve positive representation of the organisation and its activities (Zappettini and Unerman, 2016). Furthermore, Gray (2013: 465) explains environmental reports as accounts more darkly in that they "provide some combination of a signal to salient stakeholders (typically investors and regulators); a narcissistic articulation of the unchallengeable but clearly admirable qualities of the organisation […] an attempt at influence and manipulation often intended in ways of legitimation; or, on occasions, a genuine attempt to articulate the extent of an organisation's interactions with its non-economic". In other words, for Gray, company environmental reports do not amount to a true account of any mitigation of damage, but are an exercise in deception.

3.3.4.1 Limitations of IR

IR is confounding to practitioners (Gibassier, Rodrigue and Arjaliès, 2018). Its implementation and adoption has been staggered due to its ambiguous yet interdisciplinary nature (Pei-Chi Kelly, Maroun, and de Villiers, 2020).

Rowbottom and Locke (2016) delineate the development of non-statutory integrated reporting prior to the emergence and release of the international <IR> framework, and its aim to present a more holistic view of corporate activity that brings together previously separate sustainability and social reports with financial reports. Importantly, the authors highlight that the diversity of standard setters such as the GRI, A4S, entails different motivations, and intended audiences. In fact the GRI (2013) states that there are no global standards on what an IR should comprise, nor is there a clear definition of what an IR is. In relation to the development of the IIRC's international integrated reporting <IR> framework, Rowbottom and Locke

(2016) note that the outsourcing of standard setting to private organisations, such as the IIRC, is not without contention, as this raises questions as to which standards to focus on will be promoted by the organisation and what ideology will be set.

Zappettini and Unerman (2016) argue through the linguistic examination of selected IRs, that IR is a hybrid, mixed-genre text, which lends itself as a mere marketing strategy. Similarly, earlier analysis by Solomon et al. (2013) examines the interaction between companies and their investors in the setting of private social and environmental reporting (SER). Through the application of Goffman's (1974) concept of frames, the authors find that a 'green myth' is jointly constructed in the private meetings between companies and investors. The authors state that both companies and institutional investors became aware of a financial benefit in reporting SERs but in the sense that it affects their reputation and thus they engage in "reputation risk management" (Solomon *et al.,* 2013).

However, from the perspective of the way in which IRs are received and implemented by institutional investors, Atkins and Maroun (2015) highlight the positive reception of IRs "as an improvement in disclosures for investment decision-making", and as an initiative that promotes South Africa's reputation in global market competitiveness. However, interviewees in the study pointed to the length of the reports and recommended that shorter more succinct reports would be more effective, although they remain subject to the danger of impression management and hijacking of the agenda by auditors and reporting consultants.

Nevertheless, there is evidence to suggest that IRs constitute a vital tool in the change to company social and environmental accountability. Solomon and Maroun (2012) analyse annual reports of ten companies and found that there has been an increase in reporting on social, environmental and ethical reports. The authors

highlight that it is apparent that integrated reporting has created a different set of priorities for directors. In the UK, there has been some implementation of IR, mainly due to the Accounting for Sustainability (A4S) Connected Reporting Framework in 2007. The authors suggest that the IRs reflect an integration of social and environmental considerations in a way that the reader cannot simply skim over. Additionally, a recent study by Hassan et al. (2020) find that biodiversity and extinction related disclosures have been increasing and that organisations are becoming more aware of the need for urgent action.

3.3.4.2 Materiality as a roadblock to accounting for species

Materiality is strongly emphasised in the IR framework and is central in the reporting process (Deegan, 2020). How do organisations decide what is 'material', i.e., what to include that is fundamental (to their operations)? Or more importantly, what to exclude? The IR's guidance on materiality emphasises that the reporting should be on matters that strongly affect the organisation's ability to create value over the short, medium and long terms: "Integrated thinking leads to integrated decision-making and actions that consider the creation of value over the short, medium and long term" (IFAC International Federation of Accountants, 2015: 9). This statement reflects a challenge with regard to the conception and importance of stakeholders. Because the value creation is something financial providers invariably care about, it is difficult to see how stakeholders other than shareholders figure into the holistic framework IIRC attempts to promote (Deegan, 2020).

While the IIRC claims to "benefits all stakeholders interested in an organization's ability to create value over time, including employees, customers, suppliers, business partners, local communities, legislators, regulators and policy-makers" (IIRC, 2013: 7), if we look at the definition of stakeholders as defined by

the IIRC as, "[T]hose groups or individuals that can reasonably be expected to be significantly affected by an organization's business activities, outputs or outcomes, or whose actions can reasonably be expected to significantly affect the ability of the organization to create value over time. Stakeholders may include providers of financial capital, employees, customers, suppliers, business partners, local communities, NGOs, environmental groups, legislators, regulators, and policy-makers" (IIRC, 2013: 33).

An additional closely related issue arising within IR's approach to materiality is the notion of reporting boundary defined as "[T]he boundary within which matters are considered relevant for inclusion in an organization's integrated report" (IIRC, 2013: 33). As Deegan (2020) notes, this severely hinders accountability and disclosure and can render biodiversity and species protection an externality, as the company can decide what to report on, as long as it does not negatively affect value creation.

Businesses, individually and in accordance with organised initiatives such as the SDGs, GRI, IR, WBCSD, have taken the path to move away from business-as-usual in favour of more environmentally conscientious behaviour and reporting in certain domains such as carbon emissions. However, the arena of biodiversity the issue of materiality, and the business 'bottom line' coupled with the voluntary nature of biodiversity accounting (as opposed to the statutory requirement in the UK to report on carbon emissions) remains a challenging issue in the companies' self selection bias. This is strongly exemplified in the companies' annual reports in this study where concern to pollinators is selected as material but other species and their role in maintaining a healthy ecosystem is continued to be viewed as an externality.

However, the IR framework does provide hope. Through its six intertwined capitals, the framework promotes integrated thinking and the interrelation between the economic, environmental and social challenges the organisation faces. This hope can be illustrated in the case of South Africa where the IR framework has been interpreted to include a much broader stakeholder that emphasises inclusivity.

The point of departure for this thesis is that current corporate governance non-financial reporting is inadequate for disclosing activity that (negatively) affects species, and particularly species under threat of extinction. However, with the launch of Integrated Reporting by the IIRC, the concept of the eight services, and the ecosystem services being one on par with others, and the fact that IRs are mandatory in South Africa, made accounting for biodiversity more visible. Indeed, the IIRC had for its objective to create a globally accepted reporting framework which integrates financial, environmental, social and governance information in a clear, concise, consistent and comparable format (Thomson, 2014). However, Integrated Reporting is premised on the assumption of powerful citizens able and willing to monitor, reward, discipline and punish large self-interested organisations using dividing practices associated with corporate decency, and it is doubtful, whether 'decency' are enough to deal with the crisis of our unsustainable world. IRs are meant to provide a better reporting standard than sustainability reports, which are seen to be 'on the side' of financial reporting, a partial view that the IIRC aimed to rectify. Additionally, Thomson succinctly concludes that "there is a need for IIRC to develop a deeper understanding of the sustainability programmatic (political and scientific) (Bebbington and Larrinaga, 2014).

Another problematisation of sustainability reporting is the existence of the silos within it, and the difficulty of internalising the externalities (Unerman, Bennington, and O'Dwyer, 2018). For example, carbon emissions are separate to biodiversity or even water related disclosures.

The issue with both remains that they are characterised by an underlying anthropocentric motivation that takes economic logics as a priority (Weir, 2018). This is where extinction accounting offers a non-anthropocentric relief by incorporating deep ecology and emotive disclosures as part of the extinction accounting framework.

An important concept in the sustainability reporting and especially the biodiversity reporting space is that of dual or double materiality. Double materiality seeks to go beyond the financial materiality of species loss and biodiversity decline (Atkins and Macpherson, forthcoming).

The Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD) is the most global and prominent example. In this context of sustainability-related financial disclosure, double materiality is an extension of the key accounting concept of materiality of financial information. The concept of double materiality takes this notion one step further: it is not just climate-related impacts on the company that can be material but also impacts of a company on the climate – or any other dimension of sustainability, for that matter.

> "Finally should be considered, for the materiality of non-financial information related to biodiversity, the concept of *double materiality*, previously absent, as defined for climate change information by the EU group of Technical Experts on Sustainable Finance (TEG): Information on

> biodiversity communicated, if necessary, to understand the internal impacts on company's performance and outcome; Biodiversity information must even be disclosed, if necessary, to understand the external impacts of the company's activities" (R19-20, emphasis added, in Atkins *et al.*, 2020: 19).

3.3.4.1 The need for accounting for species protection

A pertinent example that illustrates the business case (Brown, George and Dillard, 2020), or the risk of not accounting for species loss can be seen in the colossal loss of bees (Atkins and Atkins, 2016; Reade *et al*., 2016). The value of pollination has been estimated in scientific and economics-based research to be around $64 billion. The IPBES (2019) report estimates that between $235 billion and $577 billion in annual global crop is at risk due to loss of pollinating insects. Bee populations decline is multifactorial: lack of floral diversity and abundance, pesticide use, habitat degradation, fragmentation and reduction, mono-agriculture and climate crisis (Atkins and Macpherson, 2019). In the EU, about 15% of bees are threatened or near threatened with extinction. Further, in North America, a loss of 96% in four wild bumblebee species has been recorded over the last 20 years. Atkins and Atkins (2016) review the global bee decline and develop a framework for businesses to adopt in order to address bee decline across the stakeholder value chain.

Not only insects, the protection of mammal species is also essential for agricultural production and the extinction of mammal species and disturbance of the food chain represents a true risk for agribusiness. Atkins and Macpherson (2019) provide a pertinent example of the materiality of species protection as a material financial risk in the case of the production of durian and fruit bats. Durian, a fruit farmed in Indonesia, Thailand and Malaysia is valued at $14 billion annually. However, large-scale durian farming involves the destruction of the habitat of the

endangered Malayan tiger, as well as elephants, monkeys, birds and importantly, flying foxes. Flying foxes have an important role in pollinating the durian trees and their survival is directly linked to the successful harvesting of durian. This highlights the interconnectedness and critical interrelationship between different species and the need to protect fauna and flora. The question is, to what extent is biodiversity reporting effective in mitigating the loss?

3.4 Accounting for Biodiversity

3.4.1 The natural world: from an externality to accountability

The environment, the air, soil, stones, fauna and flora have always been considered a free resource, an externality, primarily for human use in various activities. The engagement of environmental accounting with this notion of externality first began with Gray (1992) who proposes the theoretical framework which includes the notion of deep green, highlighting the need for a change in societal value paradigm towards a sustainable operation that will take into account the long term effect of humanity's destructive and unsustainable activities. This seminal work was followed by Jones (1996), who proposed a framework to measure the value of corporate natural assets. Essentially, Jones' framework was an inventory list of habitats of fauna and flora and their hierarchical model, not in valuation terms but to enhance their visibility. However, this framework did not take into account already destroyed habitats and lost lives of animals. Therefore, this framework does not consider biodiversity loss or ways in which biodiversity can be protected by business (Atkins and Maroun, 2018).

As discussed in a previous section, the Kyoto Protocol, initially concerned with climate change, was a catalyst in changing corporations' perceptions of the environment and the materiality these 'free' resources presented. Thus, businesses can have a considerable impact in accounting for damage their business creates (Weir, 2018a). Similarly, Gaia and Jones (2017) find that like private sector organisations, local councils "perpetuate the use of an instrumental approach to nature in their environmental accounting and reporting practices". In other words, biodiversity is considered on a cost–benefit term calculations in local government's decision-making, and similarly in the private sector, accounting for biodiversity is carried out on a materiality basis (Sobkowiak, Cuckston and Thomson, 2020). The BD Protocol (Endangered Wildlife Trust, 2020: 27) defines an impact on species as material "if consideration of its importance to internal and/or external stakeholders, as part of the set of information used for decision making, has the potential to alter that decision". Importantly, the Protocol highlights that companies should consider including particular species that are important in the context(s) in which they operate focusing their efforts on hedgehogs, as they are important from a conservation perspective.

Accounting can play an important role in setting measures and responsibilities for the protection of biodiversity based on reforming existing governance mechanisms. The most relevant research for this study are ones that investigate biodiversity reporting (Atkins, Grabsch and Jones, 2014; Boiral, 2016; Rimmel and Jonäll, 2013; Samkin, Schneider and Tappin, 2014; van Liempd and Busch, 2013). However, these authors find relatively low levels of reporting by organisations on how biodiversity and the risk of extinction are being addressed (Mansoor and Maroun, 2016; Adler, Mansi and Pandey, 2018).

Dey and Russell (2014) who analyse a case study of River Garry view the ecological problems surrounding the river as a multi-stakeholder issue. However, as my data later demonstrates, this can also be seen as a commonly neutralising technique (Boiral, 2016) used by corporations to deflect responsibility. While corporations do occupy the centre of the arena alongside rule enforcers in the concept, in reality as the thesis shows, the revolving doors and close association and power corporations hold over legislation suggest that corporations are major players in disseminating, withholding and controlling knowledge.

Jones and Solomon (2013) raise awareness of the need to protect biodiversity from extinction. By harnessing 'accounting for biodiversity', Jones and Solomon provide a framework for analysing the role of accounting in the protection of biodiversity. Jones and Solomon pose the question of the problematic phrasing of the term *biodiversity* itself which does not highlight the urgency of extinction. DeLong (1996) investigates the various meanings of *biodiversity* and suggests that the primary danger of using the terms is its vulnerability to the manipulation of interested entities to suit their needs. Further, Jones and Solomon (2013) indicate that *biodiversity* has over 80 definitions (Spicer, 2006, in Jones, 2014: 3), the most important of these, according to Jones (2014), was conceived by the Convention on Biological Diversity in 1992: "[T]he variability among living organisms from all sources including [among other things] terrestrial and other aquatic ecosystems and the ecological complexes of which they are a part [including] diversity within species and of ecosystems" (Spicer, 2006: 2, in ibid: 3). Therefore, biodiversity is important both from anthropocentric and eco-centric perspectives. Not only is the maintenance of ecological networks vital for the survival of human animals in terms of water

resources, food, and material resources such as wood, etc, but nature carries intrinsic, moral and ethical value in its own right (Jones, 2014: 5).

For the authors the main responsible entity for environmental and biodiversity destruction is humanity. The authors contend that the only way for humanity to survive is if other species survive too. In other words, the ecological stability assures the survival of all living beings.

Another significant issue is that of speciesism (although not specifically named so). Jones and Solomon (2013) highlight that accounting for species and wildlife means accounting for one animal and not another, thus giving preferential treatment to some over others. The authors locate problems in accounting for biodiversity and attempt to seek solutions. The first concerns philosophical and scientific problems. As mentioned above, defining biodiversity is not a simple task and there is not one agreed-upon definition. The definitions often exclude humans and most approaches are anthropocentric in nature, thus disregard intrinsic value: "Aristotle established a hierarchy whereby humans were positioned at the top, then animals and then plants" (Jones and Solomon, 2013: 673).

Jones and Solomon (2013) ask whether biodiversity should be accounted for. Accounting is a practice that is seen by many scholars as seeking to construct reality as discussed earlier in this section, therefore, it is not a neutral endeavour because by disclosing, measuring and reporting, accounting can render (certain) animals visible and frame them as more than objects. In this way accounting has emancipatory potential as Jones and Solomon highlight, "by reporting on biodiversity corporations can create a more informed society [...] and also transform both attitudes and behaviour in relation to biodiversity" (2013: 675).

However, the authors suggest there are many reasons not to account for biodiversity. Firstly, counting mobile animals is an expensive endeavour. Secondly, it is difficult to find 'added value' for accounting for certain species (compare bees versus sloths, for example) and to make the decision of which species to include or exclude in the counting.

3.4.2 Reporting and disclosures on biodiversity

Despite the presented challenges, Jones and Solomon urge that it is better to account inadequately than to do nothing at all. Accounting is not only about counting and calculating, it is a process of transforming behaviour and raising awareness of other categories of importance. A start has been made through the GRI and through IRs. More specifically, however, is the question of the role of individuals and stakeholders such as employees, citizens, suppliers, retailers, and companies and accountants in biodiversity accounting.

Reporting by companies is in itself exercising accountability to a certain extent. There are various approaches to biodiversity reporting. For example, Jones (2014: 7) collected reporting from the WBC corporate ecosystem valuation; a life cycle approach to biodiversity based on environmental management accounting; a governmental ecosystem approach, a natural inventory approach, a full costing approach to name a few. Accountants, Jones signals, are key participants because they are "experts at recording, measuring and reporting data" (Jones and Solomon, 2013: 676). In addition, they are "skilled at interacting with other groups and would seem well-placed to co-ordinate multidisciplinary biodiversity teams" (Jones and Solomon, 2013: 676).

However, as previously discussed, traditional accounting technologies are not enough to combat the rapid species loss currently experienced. Therefore, there is an urgent need to develop new tools for disclosing information on biodiversity which could include "assessing accounting externalities such as pollution or habitat destruction" (Jones and Solomon, 2013: 677). Practically, Jones and Solomon discuss methods for recording biodiversity. The first attempt at this was by Jones (1996), inspired by the Rio de Janeiro Earth Summit in 1992, in which he attempted to measure changes in biodiversity using a pyramid of hierarchical criticality with different levels for the risk animals were in with regard to extinction. In his article focusing on accounting for wildlife and wildlife habitats, Jones departs from previous studies advocating that the monetization of critical natural 'capital' would increase their visibility, arguing for the non-valuation of nature and biodiversity. Another approach was by the World Business Council for Sustainable Development (WBCSD) using an ecosystems approach which deals holistically with biodiversity but, according to Jones and Solomon (2013), proved to be subjective. This issue of subjectivity and rationality has been vastly discussed in Critical Discourse Studies. Macgilchrist (2016: 269) suggests that rationality is dialogical: "Rationality is subjective in the sense that the subject is multiply positioned, situated and embedded in technoscientific, cultural, social, political and ethical spaces". In other words, rationality, as discussed in section 4, is not a universal 'truth' but a constructed, positioned and political stance. Important still, Macgilchrist closely links subjectivity with validity and claims that researchers always operate from a certain standpoint; therefore, in choosing what to account for there is an expressed political, economic, cultural and, importantly, ethical stance.

Feger and Mermet (2017) propose a new ecologically-centred accounting based on a case study with the Natural Capital Project, examining the challenges conservation practitioners have with regard to the use of evaluative information systems for conservation (EISC). Feger and Mermet concede that most accounting for biodiversity research today is based on existing accounting entities either organizational or national but as the authors suggest, none of which are fit to address conservation issue. This is because the conservation of ecosystems or species depends on more than one organization and so they state that "even an ambitious and relevant SEA scheme for a company can rarely suffice to inform and organize our collective accountability" (ibid: 1513). The authors believe that in addition to the integration of biodiversity in accounting systems of companies, and in addition to the incorporation of national accounting systems for natural capital, there is a need to include a stand-alone "wider-entity accounts" (Feger and Mermet, 2017: 1514) beyond direct action on specific organisations. This notion is also reinforced in the Chilean contexts where salmon and forestry sectors have been examined (Smith, Paavola and Holmes, 2019). The authors concede that corporate reporting in annual reports is only a partial element in coaxing businesses to take action to tackle biodiversity loss.

Finally, Jones and Solomon (2013) discuss the monetisation of biodiversity. From a deep ecology perspective espoused in their approach, any attempt to put monetary value on living beings is immoral (Naess, 1973). Living beings should be protected and valued for their intrinsic value with the reporting action being the most important, because, as the authors signify, only when reporting occurs, so does accountability.

Boiral (2016) offers a different perspective on biodiversity reporting and examines the way in which companies in the mining industry use neutralizing tools when reporting to stakeholders. Due to the grave impact of the mining industry on fragile ecosystems, mining organizations must disclose this information to their stakeholders. This, Boiral suggests, involves a considerable amount of impression management: "Impression management appears to be a low-cost and easy alternative to more substantial actions for improving social legitimacy" (ibid.: 754). Legitimacy is defined by Lindblom (1993: 2, in Deegan, 2014) as "a condition or status which exists when an entity's value system is congruent with the value system of the larger social system of which the entity is a part. When a disparity, actual or potential, exists between the two value systems, there is a threat to the entity's legitimacy". As Deegan (2014) emphasises, legitimacy of an organisation is not about a truism of factual truth but rather a construction of perceptions and representations. Therefore, legitimacy can be seen as a relative concept to the social norms and dominant hegemonic discourses, coupled with a limited acknowledgment of the social contract. The tactics used by organizations to achieve legitimacy is what Boiral (2016: 752) terms neutralization that rationalizes unethical behaviour and negative impacts. Corporate accountability is the justification corporations give to stakeholders with regard to their activities' impact on the environment and biodiversity. While there are corporate biodiversity conservation programs, these, as signalled by Boiral, are severely lacking in follow-up, transparency and impact.

Another problem posed by biodiversity accounting as discussed by Boiral (2016) is that it is necessary to have clear indicators. The GRI's measurement and comparability indicators are unclear and so organisations' disclosures remain unaccountable in this respect. Using content analysis methods, GRI sustainability

reports were analysed and the information collected was analysed through three main categories: 1) emphasis on the seriousness of biodiversity issues, 2) corporate commitment, and 3) problems with measurements. Boiral finds that using neutralization techniques is the halfway between the need and constraint to report (credibility, compliance) and the need to maintain legitimacy. There are four neutralization techniques: 1) claim of neutral impact, 2) denying any significant impact; 3) "distancing from impact"; and 4) "dilution of responsibility". Denying negative impact is concomitant with stressing the use of biodiversity offsetting. Boiral concludes that companies are unable to produce good sustainability reports because there is no reliable way to reinforce accountability.

3.4.3 From biodiversity accounting to extinction accounting

Given the above challenges inherent in accounting for species, Maroun and Atkins (2018: 111) highlight the inherent problem with the term biodiversity which they see as "a catch all phrase which means very little without an appreciation of specific species and their value to the ecosystem as a whole. These notions were raised in previous literature criticising biodiversity reporting where the use of the term itself creates an unclear, generalised view of 'natural capital' which is difficult to understand and, given its generality and non-specific approach, may be in effect meaningless". To address some of the issues of accounting for biodiversity Büchling and Maroun (2021) develop an integrated biodiversity report of SANParks, demonstrating the interconnections between biodiversity and the different resources which are required to manage it.

As discussed in the previous section, many scholars working within biodiversity accounting report that there has been a negative current of corporate reporting and a 'hijacking' of environmental and sustainability discourse that is

reframed into managerial and financial 'greenwashing' (Tregidga, Milne and Kearins, 2014). Maroun and Atkins (2018) highlight that responsibility is shifted onto governments or environmental agencies, further allowing corporations to continue business-as-usual. However, Maroun and Atkins (ibid.: 6) report that, "95% of the world's largest companies prepare sustainability reports (or equivalent) which include details on their CSR or environmental, social and governance (ESG) practices and that the number of these reports filed with the GRI has grown exponentially", particularly within biodiversity reporting, due to the GRI's position on the protection of wildlife. At the same time, criticisms of the GRI include their lack of transparent and clear definition of the concept of sustainability and, perhaps more importantly that they lack a concise and pragmatic guideline for companies to follow in their accounting of species that their activity influences. Even with the development of the IIRC's integrated reports, initial reviews of biodiversity reporting under the IIRC's integrated reporting framework have revealed a number of weaknesses (Maroun and Atkins, 2018). The first obstacle is presented in the lack of uniformity of defining biodiversity. Another problem is highlighted in the difficulty of moving away from an anthropocentric approach to accounting for biodiversity as the focus is on the financial risk rather than on life itself. In addition, Atkins et al., (2014: 106) report that there is "very little species specific reporting, except for 'charismatic' species and 'attractive' mammals". Despite hedgehogs being attractive and popular in the UK, they remain unseen to national protection levels (Morris, 2018).

Tregidga (2013) discusses the notion of biodiversity offsetting that is linked with biodiversity 'management'. It incorporates within it monetary valuation of animals, dangerously opening a gateway into animal trading. To examine

accounting's role in biodiversity offsetting, Tregidga draws on the concept of governmentality (Burchell, Gordon and Miller, 1991), and the way in which accounting functions as a technology of government. The case study under analysis here is Solid Energy, a state-owned NZ coal mining company which practices biodiversity offsetting. Specifically, Tregidga shows how Solid Energy accounts for three key species: the carnivorous snail, the blue duck, and the Great Spotted Kiwi. When the loss of biodiversity is taken into consideration, it is the financial and economic repercussions that are the factors behind offsetting, rather than moral implications: "unfortunately, biodiversity loss and ecosystem degradation are continuing to escalate, thereby putting business at risk" (WBCSD, 2011: 2: in Tregidga, 2013: 808). There is a continuum for offsetting and measuring impact, with air pollutants at one end, easily measured and quantified, and biodiversity, at the other end which is very difficult to contend with. Despite these challenges, Tregidga notes that biodiversity offsetting is becoming very common and questions whether biodiversity offsetting and biodiversity accounting was in fact a loophole for companies to continue justifying habitat destruction.

In view of the challenges of biodiversity accounting, the concept of extinction accounting proposes a form of reporting and disclosure that could support companies in their mitigation of biodiversity loss and species extinction, and protection of living beings, informed by deep ecology to which I turn to in the next section.

3.5 Emancipatory Accounting

3.5.1 The emergence of emancipatory accounting

It was in the roots of Tinker's (1984, 1985) early conceptualisation of emancipatory accounting that gave rise to its usage today. Tinker's engagement with

critical thinking was concerned with examining actual accounting, but also envisaging possible ones, a critical starting point for the project of utopian accounts (Atkins *et al.*, 2015).

To counter alienation in the imaginary, possible accounts, Tinker (1984) suggests three options. The first he terms *marginalist entity accounting*, a way of assuring information and resources are correctly and rightly allocated to owners. The second refers to what Tinker (1985) terms *social constituency accounting*, a form of today's social accounting, only Tinker was specifically referring to two kinds of social alienation. The first regards mitigating a sort of social inequality arising from insider trading, where one party has more power and access to information than another underprivileged social group. A current example for this would be the insider opportunistic trading that has occurred during the Covid-19 pandemic in the US where senators took advantage of their privileged position to use their knowledge to sell stock and profit at the time of crisis (Voytko, 2020). The second type of social alienation is in fact social and environmental, and it is combating externalities.

The third account brings us to the notion Tinker (1984, 1985) terms emancipatory accounting, "rather than support the status quo, engenders tension by representing the exploitative and repressive functioning of the status quo—and thus tends towards the latter's transformation" (Gallhofer and Haslam, 2019: 4).

However, as Gallhofer and Haslam (2019) note, Tinker's later works, although he still views accounting as sometimes emancipatory, span the realm of accounting as a mechanism that participates in the struggles and oppressive processes.

3.5.2 Emancipatory Accounting Theory

3.5.2.1 German critical theory and critical accounting

Critical accounting and emancipatory accounting have their roots in Critical Theory. The German critical theory refers originally to the work of interdisciplinary research members of the Institute of Social Research founded in Frankfurt in 1923 (Laughlin, 1987), thus, it also known as the Frankfurt School of Critical Theory (Gallhofer and Haslam, 1991). It is a diverse set of thought primarily based on four key philosophers: Max Horkheimer, Theodor Adorno, Herbert Marcuse and Jurgen Habermas.

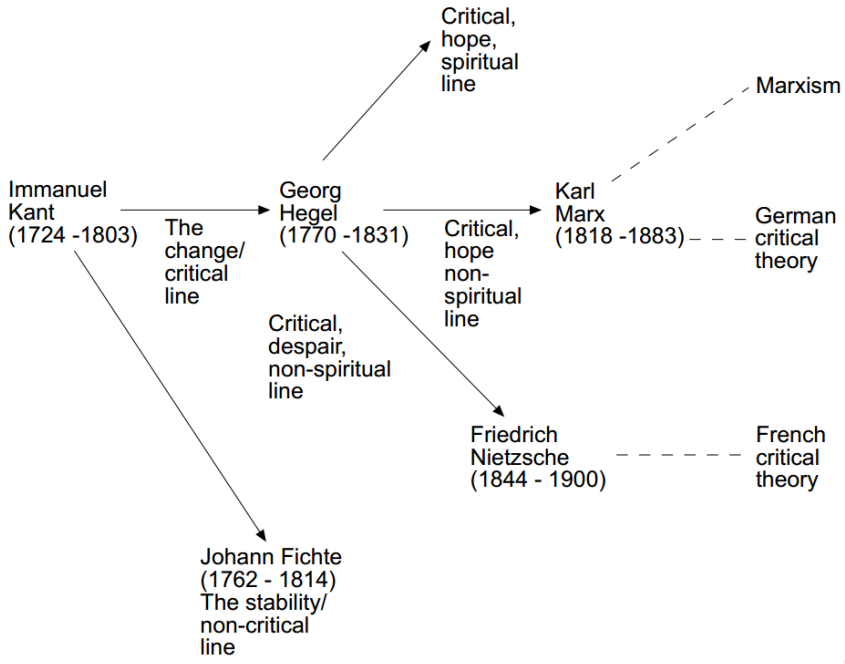


Fig 7: An overview of the Kant/Hegel line of theoretical and methodological thought (Laughlin, 1995: 73)

At the core of the Frankfurt School of critical theory was the visceral need to act, and fight for human freedom from injustice and inequality. Critical theorists then and now seek to uncover, highlight, raise awareness, and enact radical social change. Critical theory therefore, inevitably deals with the notion of transformation, but must always begin with understanding and conceptualising reality (Laughlin, 1987). The 'critical' in critical theory is therefore looking at 'what is', that is, at reality as it 'seems', constructed and subjective, and questioning forces within it, in an attempt to alter, transform this particular reality into a new, better reality. In this way, any kind of analysis, historical, linguistic, political is not value free, as everything is submerged in ideology (Herzog, 2018). History, and any kind of narrative is man-made and creates a reality.

There is the sense of injustice produced by economic exploitation, "the indignity resulting from the arbitrary exercise of power, the contempt for stupidity, and simple aesthetic disgust" (Bronner and Nelson, 2002: 172). This was the sense that guided critical theory thinkers. And Marcuse was one such thinker, a utopian pessimist that engaged with critical theory for solidarity and political practice, and in some ways the researcher identifies with this position. For Marcuse, theory must inform praxis. His views on the culture industry as stifling emancipation and turning everything into a commodity for sale is very apt for the times we are finding ourselves in these days under the threat of Covid-19.

3.5.3 Emancipatory accounting: a critical pragmatist perspective

Following and building on Tinker's development of emancipatory accounting, through the lens of Critical Theory inspired from the Frankfurt School, that also forms the pillars of Critical Discourse Analysis, Gallhofer and Haslam (1991) refine and broaden the use and definition of the concept to affect and impact

social change beyond the accounting arena, constituting a pertinent difference between Tinker's early works (1984, 1985) and Gallhofer and Haslam. In effect, Gallhofer and Haslam (1991) elaborate a multimodal approach to accounting, a holistic view that takes account of the content, form and aura. Precisely because accounting is a communicative act, Gallhofer and Haslam (1991) are concerned with who the audience is, and the capital, or social value accounting gains in a social context and from hence deriving its power, this the authors term the aura of accounting.

While for Tinker (1984, 1985), the crux of the social change lies in the content of the accounts, refining the concept led Gallhofer et al. (2015) to articulate that emancipatory accounting praxis' explicit goal is to empower marginalized people and help them challenge their oppression, a concept that could be extended to nonhuman animals and therefore an important element in biodiversity and extinction accounting. Indeed, emancipation is "understood in terms of a radical and absolute liberation from a repressive set of chains", taken from the early elaboration of Marxist thought (Gallhofer and Haslam, 2019: 7). This is followed up through post-structuralist and post-modern approaches by the authors to highlight and engage with the pervasiveness of structures and to allow for the development of a new form of pragmatism in the face of persistent constructed social, political, economic realities.

Seeing the push-and-pull of the social and ideological forces, Gallhofer and Haslam (2003) acknowledge that accounting, as a communicative social practice, encompasses both emancipatory and repressive effects at any instant of time (Gallhofer and Haslam, 2019). Integral to Gallhofer et al.'s (2015) way of seeing emancipatory accounting is a pragmatic and discursive commitment to otherness that circumvents relativism to argue in favour of a differentiated universalism, that is, the

plurality and considering the other seriously. This should be achieved through agonistic and democratic communication.

As Atkins and Maroun (2020) note, accounting is conceptualised as an agent of change, and not simply and abstractedly processing information. Corvino, Bianchi Martini and Doni highlight that "The magnitude of environmental issues requires an accounting of meaningful importance, namely, an emancipatory accounting" (2021: 3). As Scott and Lyman (1968: 46) write, giving accounts can "throw bridges between the promised and the performed, its ability to repair the broken and restore the estranged". In this sense, accounting has a transformative capacity to change things in the world (Francis, 1990). Therefore, accounting is conceptualised as an emancipatory set of technologies that are not a fixed toolkit, rather its operationalization shifts with changes in political and social perception (Maroun and Atkins, 2018; Gallhofer, Haslam and Yonekura, 2015; Gallhofer and Haslam, 2019, 2004).

Gallhofer, Haslam and Yonekura, (2015) discuss the relationship between accounting, democracy and emancipation, with an emphasis on accounting as situated in context. This is an important discussion for attempting to answer the question of how the extinction accounting framework for species protection can be implemented by companies through their reporting. The authors highlight the positive promotion of a broader stakeholder engagement as an important component of pluralist democracy (Burchell and Cook, 2006; Dey and Russell, 2014). Emancipation in this context is to be considered as a progressive, incremental process that occurs in the context of the current political and economic environment. As Gray (2002: 700) passionately notes, the motivations for developing the approach of emancipatory accounting are those of "outrage, engagement, passion, disruption

and empowerment". In order to instigate change in corporate behaviour and visibility, Gray et al. (1996: 42) discuss the limitations and extensions of accountability calling for a development of accounting that would reflect a participatory democracy and build a society that promotes empowerment and equality.

According to the authors, the fundamental prerequisite for participatory democracy is accessibility (and right!) to information. For increasing transparency, the authors identify the development of three necessary levels of communication. The first concerns the need for more aspects of organisation's activity to be made visible, which entails the second level of communication - the wider the spectrum of disclosure, the more visible other recipients become. Therefore, the behaviour of the company is seen to influence more than one actor. Finally, the third level of communication borne out of the previous two levels concerns the intrapersonal relationship between actors, which is of particular importance in addressing the notion of stakeholder engagement and broadening the definition of stakeholders.

Another level of visibility is explored by Gallhofer and Haslam (2017: 856) who analyse how accounting is made transparent and visible not only through the accounting content itself but also through the mode, what they term 'aura', the image accounting holds in society and its usage: who uses it, why and how. These elements then interact to engender social impact.

To conclude, this section traces the development of emancipatory accounting starting with Tinker's (1984, 1985) initial construction of the concept situated in Marxist thought. However, this dichotomous, black and white narrow view is insufficient to achieve the aims of emancipation. There is a need for a more nuanced, multi-dimensional and multimodal approach, developed in subsequent works of

Gallhofer and Haslam (Gallhofer and Haslam, 1991, 2003, 1996; Gallhofer, Haslam and Yonekura, 2015). In order to open up the construct of emancipation, move away from the washed-out indexicality of the term but still providing a strong critical theoretical foundation, a new pragmatist approach delineates emancipatory accounting along communicative and contextual praxis that is sensitive to otherness (Gallhofer and Haslam, 2019). Out of these advances, the praxis of extinction accounting is borne.

3.6 Extinction Accounting

The natural environment is under attack (Gray, 2013; WWF, 2016) and following the challenges presented in accounting for biodiversity, there is a need to develop a framework that would more effectively allow the deceleration of species loss by corporate activity. In addition, an important point made by Gallhofer, Haslam and Yonekura, (2015) in relation to praxis is that accounting is not constrained to accounts of monetary representations or calculations and can take on many other forms from art, narrative and qualitative content. However, the theoretical ground for an extinction framework discussed below veers away from the neo-Marxist theory followed by other SEA scholars (e.g., Gallhofer and Haslam, 2017).

Maroun and Atkins (2018) reinforce the position that the accounting community cannot rely on technocratic solutions for extinction prevention. For example, Maroun and Atkins (2018) draw attention to poor lexical choices of ‘natural resources’. Within the technocratic approach to engagement, environmentalists believe that everyone is a reasonable person and that arguments can be won if only people are presented with facts. The technocratic approach divides and treats each problem

separately: a solution to pollution, a solution for waste, etc., where the view should be towards a systems approach.

Maroun and Atkins (2018: 8) explore current practice in integrated reports and propose a new framework to account for extinction, "that must have an emancipatory potential which is more effective and transformative than previous types of biodiversity reporting forms". Echoing this stance, this project adopts a position that views the extinction accounting framework as an emancipatory, pragmatic tool that can be used to report on corporate governance and responsible investment which urges companies to take responsibility for unsustainable activity. Maroun and Atkins note that, "Practitioner-focused books have emerged making a clear business case for reversing declining trends in animal and plant populations in the interest of long-term corporate sustainability" (ibid: 2). These use reporting frameworks to assist companies in reporting on specific species that are affected by the company's activity.

Maroun and Atkins (2018) develop an extinction accounting framework which can be embedded in integrated reports and through accounting and accountability mechanisms can help prevent extinction. This is exemplified in research on rhinos (Atkins *et al*., 2018), and in the context of the threat to bees and bumblebees, Atkins and Atkins (2016) emphasise the adverse impact of neonicotinoid insecticides and other pesticides on bees, and the role agrochemicals can play in mitigating their decline. In fact, large-scale investment institutions have become increasingly engaged in dialogue, the practice of responsible investment, with agrochemicals on environmental, social and governance (ESG) issues. Investors perceive now more than ever, the risk associated with the overuse of pesticides which can significantly affect investment returns.

This research builds on this work, and extends the concern from bees to hedgehogs, as a bioindicator species of environmental and soil health (Hof and Bright, 2016; Hof, 2009) Species extinction has been identified as a material risk pervasive across all business sectors (Atkins and Macpherson, 2019). “Given this looming environmental disaster, the accounting and business community cannot simply assume that a scientific solution will be found to prevent extinction and associated risks which it poses to humanity” (Maroun and Atkins, 2018: 102).

Atkins and Atkins (2019) investigate two pathways of bringing species protection to the fore of business activity, leading to the development of an extinction accounting framework for reporting disclosures, for corporations, NGOs, public sector or any other kind of organisation. Firstly, by developing ways to value what is termed ‘ecosystem services’. These valuations demonstrate human activity’s complete reliance on the health of the ecosystem.

As Atkins and Macpherson (2019) emphasise, it is not the actual figure of the valuation that is important, but how irreplaceable it is: “where an ecosystem service disappears and cannot be replaced by some artificial alternative then that service has become INvaluable”. Furthermore, “the contribution of each and every species to the healthy functioning, and indeed continuance, of every ecosystem, is scientifically unknown until a species disappears. The loss of any one specie can lead to the collapse of an ecosystem - or it may not. Given the millions of species of flora and fauna on the planet it is impossible to know which species are keystone species” (Atkins and Macpherson, 2019: 2).

Fig 8: Extinction Governance Model (Atkins and Macpherson, 2019)

The Extinction Accounting Framework for Disclosure on Species Protection and Extinction Prevention

Stages	
1	Record a list of plant and animal species, identified as endangered by the IUCN Red List, whose habitats are affected by the company's activities Report where, geographically, the company's activities pose a threat to endangered plant and animal species, as identified by the IUCN Red List and assess habitat status Report potential risks/impacts on these specific species arising from the company's operations (equivalent to the existing GRI principles to this point) Incorporate images (photos or drawings, for example) of threatened species which are affected by the company's operations and which the company needs to protect and explain how these have been integrated into the company's internal control system, business model, business strategy and operational plans Report full details (narrative as well as financial figures) relating to any fines or ongoing claims relating to endangered species legislation including the names of species and a summary of losses suffered with causes identified Report corporate expressions of moral, ethical and/or emotional motivations for preserving species and preventing extinction with a consideration of ecosystem level effects, including normative reflective self-accounts of the company's impact on threatened and endangered species
2	Report actions/initiatives taken by the company to avoid harm to, and to prevent extinction of, endangered plant and animal species
3	Report partnerships between wildlife/nature/conservation organizations and the company which aim to address corporate impacts on endangered species and report the outcome/impact of engagement/partnerships on endangered species as well as the outcome of engagement with the responsible investment community (respecting investor confidentiality where appropriate)
4	Report assessment and reflection on outcome/impact of engagement/partnerships and decisions taken about necessary changes to policy/initiatives going forward
5	Report regular assessments (audit) of species populations in areas affected by corporate operations
6	Report assessment of whether or not corporate initiatives/actions are assisting in prevention of species extinction
7	Report strategy for the future development and improvement of actions/initiatives: an iterative process Ensure that the whole process of 'extinction accounting' is integrated into corporate strategy and is incorporated into the company's integrated report, not resigned to separate sustainability reports or websites, including species specific information. Report potential liabilities relating to future possible legal fines/claims relating to endangered species impacts. Include a discussion of ways in which the company is working to prevent future liabilities related to harming endangered species. Provide pictorial representation of success in conservation

Table 2: The Extinction Accounting Framework for Disclosure on Species Protection and Extinction Prevention (Atkins and Macpherson, 2019)

The extinction accounting and species protection plan (see table 2) were developed on the foundation of material financial risks linked to biodiversity loss and species extinction (Atkins *et al.*, 2020). The case for the protection of bees as major and fundamental contributors to pollination and, as a result, play a vital role in food production has been made (Atkins and Atkins, 2016). Therefore, the bees' financial contribution to many industries is of material importance. Importantly, Maroun and Atkins (Maroun and Atkins, 2018; Atkins and Maroun, 2018) ground their approach within deep ecology (Naess, 1989) and state that the value of nature and living beings cannot only be of anthropocentric financial value. Naess' ecological philosophy, borne out of the ecology movement in the 1970s represents a systems thinking that combines systemic studies of ecological systems and the intricate, co-dependent relationships between its parts. Naess' conceptualisation of nature addresses the link between environmental destruction and the relationship between humans and nature (Heinberg, 2017a; b). Similarly, Maroun and Atkins (2018: 5) question the terminology and discourse that is used to refer to nature. Specifically, they point out that the term 'natural capital' "assumes that all flora and fauna are simply in existence for our use and abuse".

Maroun and Atkins (2018: 5) argue in their discussion of the protection of Africa's wildlife that "humanity is obligated to respect and protect these ecosystems", a position that although seeks to provide a moral ground for the protection of all lives, is nonetheless anthropocentric as it situates humanity as the Godly chosen protector who has a natural right over ecosystems (whether to protect or destroy them). Nonetheless, Maroun and Atkins' approach to reporting on species extinction is one that attempts to incorporate both an integrated approach which "is able to explain how the risk of extinction impacts key aspects of the value creation

process", and an approach which acknowledges that the value cannot be solely based on financial criteria (ibid: 10). In addition, the authors' reporting framework is based on the guidance provided by South Africa's *King IV Report on Corporate Governance* (IOD, 2016, in Maroun and Atkins, 2018: 10). This stresses the importance of reporting in a manner which "enables stakeholders to make informed assessments of the organisation's performance and its short-, medium- and long-term prospects" (IOD, 2016, Principle 5).

An important aspect of the examination of integrated and sustainability reports is the explicit detail and disclosure of specific species that must be met for an effective extinction accounting. Once threatened species are identified, named and noted, the extinction framework as a tool for preventing extinction can be applied effectively. Although, as Maroun and Atkins (2018) concede, extinction accounting could be seen as an impression management tool in the same vein as biodiversity reporting. The authors provide evidence of companies beginning to provide broad policy plans or objectives which, if honed accordingly, could be the basis for a meaningful and emancipatory step towards extinction prevention.

Other pivotal components of extinction accounting refer to reporting on actions, partnerships and stakeholder engagement. In addition, specific details on cost and partnerships with NGOs should be disclosed, including the responsibilities embodied by each part. Further elements of the reporting include a post-implementation review of how the company performed: "the reporting entity should provide a review of its extinction risks, the actions taken to reverse extinction and its successes and failures" (Maroun and Atkins, 2018). In this way, "extinction accounting and engagement are attempting to reveal the reality of these risks by

making the second reality visible through their frameworks and calls for emancipatory public and private reporting" (Atkins and Macpherson, 2019).

3.6.1 Problematisation of extinction accounting and private industry response

IR promotes the interrelation of six capitals: financial, intellectual, environmental, human, social, and relationship capitals and the value creation of any business should take account of these (see fig.5). However, extinction accounting critiques the equal placement of the capitals and argues that without 'natural capital', the other are rendered meaningless (Atkins and Macpherson, 2019).

Currently, reporting frameworks such as the GRI only deal with biodiversity loss to a limited extent, and are not considered to be emancipatory, transformational or radical (Atkins and Maroun, 2018). What results in these kinds of reportings is a record of species, habitats, etc. Therefore, the extinction accounting framework (Atkins and Maroun, 2018; Maroun and Atkins, 2018; Atkins *et al.*, 2018) and the Species Protection Plan (Atkins and Macpherson, 2019) promote an emancipatory perspective to the extinction accounting framework emphasising that "environmental, ecological or biodiversity reporting that simply underlines the status quo, and ensures business as usual is quite literally a waste of time in a situation of urgency given the rate and speed of species loss" (ibid: 7). Zhao and Atkins (2021) provide evidence that extinction accounting can be emancipatory in the Chinese context. Companies examined appear to be displaying transformative behaviours in relation to conservation efforts.

To conclude, extinction accounting presents a more developed and comprehensive framework for ensuring the protection of species and preventing extinction. It is envisaged that this framework, taking a step further from biodiversity

accounting, promotes an emancipatory, operational approach that draws from the GRI and contributes to the IR framework to produce a narrative that lists in detail the species affected by the company's activity, and provides information on the area in operation. Further guidelines for the report include the review of the strategies put in place to prevent extinction, together with any policies and their consequences, whether they proved effective or ineffective. Finally, Atkins, Maroun and Atkins (2019) explicate that while the suggestion to save species via the capitalist system may not cohere with a deep green approach, the urgency of the crisis means that there is no time for gradual, systematic and radical change. The authors' normative perspective is that the powers of corporations should be harnessed immediately to halt this catastrophe.

3.7 Counter, shadow, and external accounts

While we await for corporations to embrace extinction accounting, external organisations can hold corporations to account by producing their own reflections of the corporations' activities in the form of counter accounts (Solomon and Thomson, 2009). Gray (2013) notes that in seeking alterative accounts, the accounts seek to puncture the hyper-reality of business representation (Dey *et al.*, 2011). External accounts to business organisations have been produced as early as Victorian times, alerting to the environmental pollution of the river Wandle (Solomon and Thomson, 2009). Counter accounts are an example of more democratic accounting forms that facilitate "better conversations" (Brown, 2009) where plurality of voices and increasing visibility of stakeholders, including nature and nonhuman animals can take place. For example, to mitigate the 'reporting-performance portrayal gap'(Adams, 2004), alternative accounting attempts to locate alternative counter discourses and external accounts (Owen, 2008). Alternative accounts are defined as

representations of organizations produced by civic society groups in order to rectify a state of affairs that is considered harmful or otherwise undesirable (Thomson, Dey and Russell, 2015).

In an attempt to provide a counter-version to companies' disclosures, other alternative accounting endeavours have been developed (although as Dey and Gibbon (2014b) emphasise, this practice predates modern SER practices with organisations such as the Social Audit Ltd., and Counter Information Services) that engage with external organisations. As Solomon and Thomson (2009) note, there is a need for stakeholders, rather than businesses, to produce environmental accounts that document business' impact on species. Spence et al. (2010, in Parker, 2014: 89) argue for a direct link between politics and SEA. For them, engagement with activists and NGOs is the path for expanding SEA research. External organisations such as NGOs, marginalised groups, and groups representing what is thought of as 'other', e.g., animals and the natural environment, produce external accounts, counter accounts and shadow accounts, "accounting for the other, by the other" (Dey *et al*., 2011:1), their force lying in their ability to uncover erased factors or behaviours.

To define the various alternative accounting approaches, external accounting refers to criticism of organisations, not from within the organisations themselves, but by external groups that highlight the oppressive or destructive nature of companies' actions. While organisation-centred accounting focuses on improving the company's resources and power, external accounting looks to challenge these and disrupt the company's legitimacy, resources and power (Dey, Russell and Thomson, 2012). Moreover, external accounts "create alternative representations of organisational conduct, construct and communicate new visibilities and knowledge of existing situations and are part of social activism" (Thomson, Dey and Russell, 2015: 3).

Therefore, external accounts can be conceptualised as part of social and environmental movements that disrupt and challenge current hegemony. There is growing evidence demonstrating NGO engagement if not counter-accounts per se, influences corporate behaviour (e.g., Islam and van Staden, 2018).

However, it is important to note that not all external accounting has the same disruptive effect. Many corporations and stakeholders use external accounting to support their agenda, appropriating the oppositionality that may otherwise be achieved by external reports. Dey et al. (2012) reveal that external accounting attempts to create new stories, new representations of how organisations conduct their activities in the overall aim of enacting a social change. The authors point to a multiplicity of terms currently used in this field such as silent accounts, shadow accounts (Dey, Russell and Thomson, 2011), and explain that this is due to the fact the field of external accounting is under-theorised in the accounting literature (Dey, Russell and Thomson, 2012). Because external accounting can be prepared and done by many different organisations (both by companies themselves or companies hiring external accounting but those then adhere to what the company wants to see), there are struggles embedded within external accounting. For example, external stakeholders often perceive environmental or social reports produced by companies as ‘greenwash’. Much like integrated and annual reports, external accounts can be rendered in numerical or narrative form, representing the company's actions and consequences. Like any other accounting practice, external accounting is not neutral as it advocates a certain 'better' behaviour.

Dey, Russell and Thomson (2012) describe four external accounting types: systematic, partisan, contra-governing, and dialogic. Systematic approach’s objective is to challenge the corporation’s conduct (or one aspect of corporate behaviour). In

this approach, shadow and silent accounts work together with governing bodies by providing new information. Silent accounts as precursors to shadow accounts, obtain their information independently of the corporation, compiled of fragmented ‘bits’ of information from corporate press releases, annual reports, and marketing campaigns. These are termed silent because they are not officially published and therefore not recognised as SER. Following concern of the quality of the emerging SERs, shadow accounts represent a shift from an organisation-centred approach to a more stakeholder-centric approach. Their overall aim is to find discrepancies between what the company reports on and what it chooses to supress.

Type of External Account	Transformation sought	Entity to transform	Field of visibility	Examples
Systematic	Participation within and/or improved discharge of existing governing processes	Specific organisational conduct or intention	Provide new evidence / knowledge on target entity's conduct / intentions	Social Audit Ltd (1976) reports Plant closure audits (Geddes, 1992) Silent accounts (Gray, 1997) Shadow accounts (Gibson et al., 2001) Reporting-performance portrayal gap analysis (Adams, 2004) Early ASH accounts of BAT (2002a, b)
Partisan	De-legitimation and/or reform of specific government technology / institution within overall governing regime	Specific governing technology or institution	Provide new evidence / knowledge on inadequacies / loopholes of governing	Anti-reports (CIS, 1971) Social audits (Cooper et al., 2005) Counter accounts (Gallhofer et al., 2006) Later ASH reports on BAT (2005) Other NGO reports (FoE, 2003a,b; Oxfam, 2002)
Contra-governing	Overthrow existing governing system and replace with another dominant form of governing	Regime of government	Problematise the underlying nature / ideology of governing systems	Public health/inequality research (Collison et al., 2007, 2010; Wilkinson and Pickett, 2009)
Dialogic	Synthesizing different voices into a new form of emancipatory governing	Oppressed and silenced voices within existing regime of government	Exposing the inequalities and oppression within a governing regime	None – but see Macintosh and Baker (2002); Thomson and Bebbington (2005)

Table 3: A typology of external accounting approaches adapted from Dey et al. (2012: 6).

Partisan accounting seeks to transform or reform unacceptable governing regimes and seeks to cause reputation damage, taking a reformist, deliberate action-based approach. A pertinent example is of boycotting a company or products: CIS (Counter Information Services) compiled a report that featured the employees' own voices, creating a strong image for the audience. This technique was used to highlight poor working conditions.

Another form of external accounting is emancipatory dialogue engagement or contra-governing (Dey and Gibbon, 2014). This approach does not look to replace one system with another but rather to synthesise a new system of governing. This is exemplified in the case study discussed by Thomson, Dey and Russell (2015) concerning Action on Smoking and Health's (ASH) campaign against smoking. The approach taken was beyond 'mobilisation' (civil disobedience, boycotting) in that a counter external social report was produced, in the same language and format as the tobacco companies' report but with an extended scope of the reporting. ASH used a combination of external accounting, activism and media. The authors conclude that in order for external accounting to be successful at creating change, dialogue has to develop on all fronts: engage with social movements, media, while also developing communication between stakeholders (viewed pluralistically) and companies.

3.7.1 Counter accounts

Counter accounts are another emancipatory accounting tool that aims to provide a counter discourse to hegemonic discourses (Vinnari and Laine, 2017; Gallhofer *et al*., 2006). Particularly relevant is Vinnari and Laine's (2017) examination of the moral aspects of counter accounts. Using Critical Discourse Analysis (CDA) and media studies as the conceptual lens of analysis, Vinnari and Laine examine counter accounts of animal-derived 'products', produced by social

movement groups in Finland. Vinnari and Laine provide a pertinent example of the extension of the definition of oppressed groups to include nonhuman animals, opening up a discussion of intersectionality in which various depiction of social oppression are linked. Vinnari and Laine's aim is to investigate how counter accounts can help shape public perceptions of suffering and thus effectuate change. Focusing on animal rights activists campaigning against the meat and dairy industries, the multimodal analysis includes undercover video footage from facilities where animals are slaughtered and imprisoned. By using CDA to analyse counter discourse, animals and human relationships are placed at the centre of the investigation and in this way, stimulate public action.

Justification for counter accounts as part of accounting and not just alternative representation as part of cultural studies, Vinnari and Laine (2017: 12) suggest that, "counter accounts can be said to problematize the conventional notions of accounting, which revolve around providing investors and creditors with quantitative, predominantly financial information about economic entities for the purposes of decision-making and assessing management's accountability". In this way counter accounts may well comprise financial and other quantitative information about distinct economic entities, but also qualitative and non-financial information concerning entire industries or governance regimes. Counter accounts' understanding of the users of such information encompasses not only investors but also a wide range of stakeholders. However, counter accounts, because they take on powerful corporations create a situation in which the Goliath tends to appropriate, undermine and limit David's reach in achieving change (Gallhofer *et al.*, 2006).

To conclude, counter and external accounts have an emancipatory potential to transform corporate destructive and undesirable behaviour because external accounts

create new knowledge and amplified visibilities of corporate past and present actions. External accounts have been argued in this section to have an important emancipatory and transformative potential (Dey and Gibbon, 2014). However, whether partisan accounts are perceived as more confrontation-orientated while systematic approaches are more based on cooperation or are simply reformist, and therefore limited in the change they can effect, as Dey and Gibbon suggest, remains to be seen.

3.8 Utopian methods of Accounting

An emerging field of inquiry that has a significant emancipatory potential for promoting a sustainable future is the exploration and power of utopian accounts that critique current practices in environmental reporting and provide a narrative vision for the telling of new stories to live by (Atkins and Maroun, forthcoming; Atkins *et al.*, 2015).

There has been an increasing trend in environmental accounting to explore new stories to live by, supported by an epistemology that views nature as possessing intrinsic value (Atkins *et al.*, 2015; Atkins and Atkins, 2016; Maroun and Atkins, 2018). Through the characters *Thought Woman* and *Green Owl*, Dillard and Reynolds (2011) and Dillard and Reynolds (2008) call for an emergent integration of both what the authors term ‘the masculine rational’ and the ‘emotional/spiritual feminine’. They argue for a more inclusive, emancipatory "path towards wholeness and unity, being shaped through becoming, recognizing the *interrelated* way of life wherein humankind can flourish" (ibid.: 492, my emphasis). Dillard and Reynolds’ purpose is to create a space for social change and new stories. They argue for a need to change the Newtonian perspectives that create a hierarchical value set for living

beings, and thus further entrench an anthropocentric dominant ideology. In addition, there is a need to reimagine new stories and ways to view the world through "integrated systemic perspectives". Dillard and Reynolds (2011: 495) view the social accounting project as a way to ensure the continuation of all beings on Earth, emphasising the importance of acknowledging the systemic problem and the need to "explicitly recognise the interdependence and interconnectedness of the social and natural systems".

Language that tells these new stories is capable of transcending the reality of everyday life altogether. It can refer to “experiences pertaining to finite provinces of meaning, and it can span discrete spheres of reality” (Berger and Luckmann, 1966: 54). An analysis of governance mechanisms and technologies therefore attempts to remove the taken-for-granted character of how things are done and reveal the possibility of doing things differently. Beck (2015) views the unseen emancipatory side effects of global risk, which already have altered our being in the world, as an emancipatory process of seeing the world and imagining and doing politics differently. While global risk is a dystopian vision, it has a significant power of mobilization because it is about the survival of all living beings. As discussed earlier, global risk has unintended side effects beyond ideologies and political programmes. The key to the ideas of global risk, as Beck (2015) argues, is that negative and destructive behaviour eventually produce normative horizons of common good. However, it could be argued that the ‘common good’ solution arises out of a lack of option, a last resort.

3.9 Wildlife, Covid-19 and corporate governance

Ulrich Beck was concerned with the question of whether a catastrophe could play a positive, constructive and even emancipatory role in social change, stressing that

“all catastrophes force us to think, to invent new paths, find perspectives for new rights and new rationales of emancipation” (Wieviorka, 2016).

Beck (2015) makes an interesting and important distinction between social change and social metamorphosis. While social change is a turning point in a certain common direction, it is not a radical, deeper change encapsulated by the notion he coined in social metamorphosis, “Metamorphosis is not revolution, which is imposed through the likes of doctrine, ideology, military and violence. It is happening through everyday practices on all levels; and it is affecting everyone everywhere differently” (Beck, 2015: 77).

The crisis borne out of the Covid-19 pandemic has highlighted the problems inherent in animal agriculture, the destruction of the ecosystem and the interrelated fragile web of all living beings depending on each other’s survival. The zoonotic aspect of the Covid-19 virus point to several problematic human-animal intersections: the human consumption of potentially infected wild animals; the illegal wildlife trade; and the crowded conditions in which humans and animals interact within live animal markets, on the one hand, and industrialized animal agriculture on the other. Hassan et al. (2021) note that in financial and non-financial reports, the nonhuman animals and humans are treated separately, resulting in a skewed reporting accountability to stakeholders that could generate more pandemics in the future (IPBES, 2020).

Specht and Dutkiewicz (2020) urge "the most pragmatic way to start building a resilient food value chain in the wake of the pandemic is to leverage the strengths of the existing system while building alternatives to the most vulnerable and highest-risk elements. There is a very strong economic case to be made that this should start with phasing out animals from the food system. Such a transition will be much easier

if the government and incumbent companies lead the change. They now face a critical choice: exacerbate our current problems and risk disruptions from future crises, including other pandemics and climate change, or be a participant in their own disruption". This echoes what Beck (2015) sees as the power of risk in mobilizing change as unavoidable. And indeed facing this risk, agriculture and animal consumption may be changing as well. For example, changes in farming and live animal markets are taking place in China where the government is offering farmers farming exotic animals for food financial assistance to change their farming model (AFP, 2020).

Atkins et al. (2020) highlight that there is a growing evidence of links between biodiversity loss, species extinction and Covid-19. The pandemic may expose even further the risk of biodiversity loss and alert investors to the need to protect species. As Paulin (2020) notes "industrial farming and intense animal density in small and restricted spaces, the destruction of habitats and of ecosystems, [and] a general increase in the consumption of meat in many industrialized countries since the 19th century" all shape relationships between humans, animals, and disease. Importantly, Covid-19 and other zoonoses are not limited to wild animals, even "your average chicken or pig farm is perfectly capable of starting a deadly outbreak. While the wet markets in China might be particularly risky due to the wide variety of animals in close contact with each other, any situation in which a large number of animals are kept in cramped quarters with frequent human contact poses a threat" (Rogers, 2020).

Following the global Covid-19 crisis, Atkins and Macpherson (2020) predict a strong interest in biodiversity from investors, demanding more concrete, detailed disclosures. As one of the investor interviewees in the study suggests:

> "In theory yes - there's no doubt that investor interest in biodiversity and related areas will have surged as a result of the pandemic and that this will have sparked a demand from investors for greater corporate disclosure on biodiversity-related impacts and dependencies" (R8-10).

Finally, the Covid-19 pandemic has given nonhuman animals the opportunity to stop and re-imagine new ways of being, consuming and living. During this enforced break we might examine our more destructive relationships with animals and redefine them in new, less harmful, more considerate and compassionate ways. "The pandemic has shown the fragility of our systems and the folly of our practices. It is now urgent that we think about the kinds of changes in our relations with other animals that we want—need—to enact post-pandemic" (Taylor and Fraser, 2020).

3.10 Conclusion

This chapter traced the development of SEA from its inception in the early 1970s. Sustainability reporting and later integrated reporting are now tools that could advance emancipatory accounting.

Embracing the notion of emancipatory accounting, extinction accounting takes the next necessary step towards remediating the crisis of extinction, drawing together both a financial, anthropocentric component and a holistic, deep ecology approach to create a pragmatic approach to integrated reporting. Following Hopwood (2007: 1370-1), "for knowledge to be a source of illumination rather than dogma, it must have a dynamic of change. Seen from such a perspective, accounting, as a practice, can be and indeed should be constantly examined, re-examined, interrogated, and criticized within the world of *constructed* knowledge. Rather than being a discipline in its own right, accounting needs to draw on a variety of sources

of illumination and understanding. It has been and must continue to be a site for interdisciplinary inquiry."

Finally, as Jones and Solomon (2013: 683) aptly write, "accounting provides a link between humanity and nature. Unless this link is used to improve both corporate accountability and the state of biodiversity, the future does not look bright". Gallhofer and Haslam's (2019) perspective offers an opportunity for betterment through the advancement of a pluralistic, new pragmatic approach to emancipatory accounting.

From a policy perspective, should environmental disclosures and biodiversity reporting be made statutory? There has been debate in the academic accounting literature for many years around whether environmental reporting should be mandatory (see Solomon, 2013, for a summary). Although there has been a shift towards mandatory environmental disclosures, especially in relation to climate change and greenhouse gas emissions, perhaps Covid-19 is the catalyst required to force mandatory extinction and biodiversity accounting, an urgent recommendation voiced by Hassan et al. (2021) as well. There were also suggestions that governments needed to take a lead to engender greater attention to accounting in these areas as one interviewee in Atkins et al. (2020) note:

> "Finally, I do not see how individual companies reporting on their biodiversity policies and action will have any impact on the cause or containment of this or future pandemics without government policy changes to provide the climate and environment with adequate protection" (R12). (Atkins *et al.*,2020: 23).

Chapter 4: Pesticides

"The damage was not caused by the enemy; the people had done it themselves" (Rachel Carson, Silent Spring, 1962)

4.1 Introduction

Wild animals are rapidly vanishing from Earth and the impact of humans on the environment is highlighted in many alarming reports (Rockström *et al.*, 2009; World Wide Fund For Nature (WWF), 2018; IPBES, 2019). However, researchers have been warning against this for decades. Sainsbury et al. (1995) investigate the harm caused by human activities on wild animals in Europe. The authors define harm as the pain, stress and fear caused to animals through atrocities such as shooting, injuries caused by car collisions, use of anticoagulant rodenticides, contamination of sea birds with oil and more.

Pesticides defined as chemicals which are used to kill or control living organisms, seen as 'pests' economically, or to health (Mesnage *et al.*, 2019), can affect mammals directly or indirectly. Direct effects occur through exposure, through physical contact via inhalation, touch, ingestion, or via secondary exposure through consuming contaminating prey or carcass (Harrington and Macdonald, 2002).

Almost half of the land in Britain is enclosed farming and pesticides (fungicides, insecticides, herbicides, rodenticides or a mixture of all of those) are applied over a significant portion of the area. In addition, pesticides are used in public areas such as parks, golf courses, road verges, private gardens, schools and public institutions. The relationship between agriculture, green spaces and the use of pesticides is therefore crucial if we are to understand the impact their application has on hedgehogs and other wildlife. As Carson (1962) already pointed out, spraying road verges is nonsensical and achieves the opposite effect. It perpetuates roadside

vegetation, because a blanket spraying, as opposed to selective spraying means that spraying has to re-occur each year. The best solution for the control of vegetation are not agrochemicals, but other plants.

Application of pesticides often results in drift and run off in almost all methods of application, either by hand on the ground, in drip systems or by aerial spraying with up to 75% of the chemical missing the target when applied by aircraft, 10-35% when applied on the ground, with the remainder dispersing in the air water and soil, contaminating the environment far and wide (Gillam, 2017). Although Bayer (AG, 2015) developed Drift Reduction Technologist (DRT) such as Dropleg, where pesticides are applied below the blossoms especially in rapeseed oil crops, it is adjuvants applied to the formulation that increase pesticide efficacy, and may pose a significant risk to the environment, animals and humans (Mesnage and Antoniou, 2018).

Intensive farming and the conversion of natural habitat to farmland are two of the biggest drivers for biodiversity loss as "very little can survive in a modern crop fields aside from the crop itself. Species are currently disappearing from our planet at a rate of between 1,000 and 10,000 per year (the latter equating to about one per hour, and the rate is accelerating fast" (Goulson, 2019: 226).

It is only towards the end of the 20th century that agricultural practices began to use pesticides. For example DDT, challenged by Rachel Carson's Silent Spring, an early environmental voluntary 'account', (Carson, 1962), was heralded after WWII as a 'war hero', a 'magic' insecticide that cured Polio and rid the world of the insect problem. Partially as a result of Carson's work, the US Congress banned the use of DDT in the United States Commercial.. Globally, about 3 million tons of pesticides are applied annually, with a market value of $40 billion (Silva *et al.*,

2019). “Despite relative benefits of pesticide use on crop yields, industrial intensive farming is wiping out wildlife” (Goulson, 2019: 228). The intensive, prophylactic, widespread and under-monitored use presents a serious and growing concern for the health of the environment, soils, insect, bird and mammals and human health (Goulson, 2019; Pesticide Action Network UK (PAN), 2020).

Industrial farming has developed as a result of policies and subsidies characterised by short-term goals, with the agrochemical industry playing an important part in sustaining intensive farming (Goulson, 2019). Agrochemical companies not only hold lobby power, but dominate research and development of the agriculture industry and employ many of the agronomists whose advice and services farmers use on their land, despite the fact that agronomists are supposed to be objective (Lucas, 2019).

Pesticide use in the UK has risen in the past three decades by more than 63% with the UK’s Pesticide Action Network (PAN) reporting increases in toxicity, areas of land and crops treated (PAN, 2018; Pesticide Action Network UK (PAN), 2019a, 2018). The areas to which pesticides are applied have increased by almost two-thirds between 1990 and 2016, and while the overall weight of pesticides has decreased as pesticides become more concentrated, their overall toxicity increased (ibid). Additionally, the frequency of application increased as well. For example, in 1990 only 21% of oilseed rape and 30% of cereals were treated with pesticides more than four times in the growing season. By 2016, 80% increase in oilseed rape applications, and 55% for cereals.

The global market for pesticides is valued at around $65 billion per year and growing (Gillam, 2017; BBC Research, 2012). The UK has an area of approximately 174 million hectares of agricultural land. The reliance on pesticides and their

ubiquity in agricultural practices has led farmers to rely on their use, and abandon traditionally honed methods to a point where "many farmers know no other way" (Gillam, 2017: 237).

Public concerns over chemical pollutants' adverse effect on the environment have gained traction since the publication of Silent Spring in 1962 which publicly highlighted the grave effects and risks of DDT and its metabolites (Carson, 1962). DDT was banned in the UK only in 1984 (Hayhow *et al.*, 2019). An increasing amount of evidence has mounted a recognition that biodiversity dramatically declined in agricultural lands in last decades, and the extensive and prophylactic use of pesticides is now linked to "the reduction of biodiversity in terrestrial and aquatic ecosystems" (Liess *et al.*, 2019: 2).

To assess the impact of insecticides, herbicides, fungicides, and rodenticides on hedgehogs and mammals, a literature search was undertaken using Scopus, Web of Science, and Google Scholar. Search terms were [product] [pesticide], where product was either neonicotinoid, imidacloprid, glyphosate, but also Roundup, adjuvants, surfactants, formulation, fipronil, clothianidin, thiacloprid, metaldehyde, anticoagulant rodenticides, second generation anticoagulant rodenticides, SGARs and [taxon] was either *vertebrate, mammal*, hedgehog* and followed up by references cited in the publications. I also draw heavily on the recent research by Mesnage (Mesnage *et al.*, 2018; Mesnage and Antoniou, 2018) on the toxicity of adjuvants.

While industry studies are reviewed by regulators rather than by peer-reviewed literature and may receive critical reviews, I focus here on published reports in the primary academic literature.

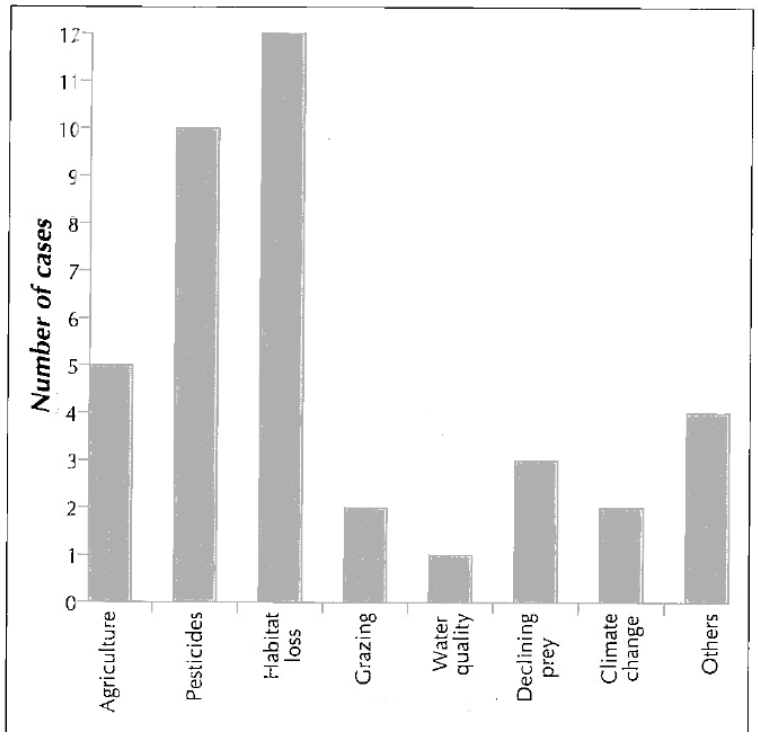


Fig 9: Possible threats to mammals that are declining (Harrington and Macdonald, 2002: 2)

The threat to wildlife by pesticides has long been identified and discussed. Harrington and Macdonald (2002) summarise the perceived threats to species, where habitat loss is considered one of the most important factors in species extinction, closely followed by pesticides and other intensive agricultural practices (Fig. 9). The authors emphasise that their findings are not conclusive and do not show a direct or indirect correlation between the increased pesticide use and the decline of hedgehogs. The impact of agriculture on the environment and wildlife, particularly the changes to agricultural practices, are not limited to pesticides use, which has developed hand-in-hand with changing practices. However, it is difficult to separate the changes in agricultural practices from the use of pesticides. Agricultural

intensification and its ailments such as increasing field size and the loss of hedgerows and loss of habitat are likely to negatively impact mammals and these are also considered when evaluating the decline of hedgehogs in the UK.

This chapter will therefore go beyond the effect of pesticides on pollinators and discuss the adverse effect on wildlife and mammals in particular. Starting with the adjuvant problem in relation to two leading pesticides: insecticides and herbicides, the section will explain their toxicity and effect on mammals. This will be followed by discussing each individual types of pesticides and their harm: insecticides, herbicides, molluscicides, and rodenticides. However, the harm continues, as these chemicals are seldom applied alone which gives rise to the Cocktail Effect, which will be discussed in section 3.4. The cocktail effect is directly linked to policy, discussed in the following section. The negative effects on wildlife, humans, the natural environment and climate change will be summarised in section 4.6 with some alternatives to pesticides in 4.7, followed by a conclusion.

4.2 The Adjuvant Problem

Applications of modern pesticides represent a cocktail of chemistries, often including an 'active' ingredient and formulants considered 'inert'. Proprietary spray adjuvants, also called co-formulants, are designed to increase the efficacy of the 'active' ingredient in a pesticide, by increasing the adhesion or absorption, or increase the half-life of 'active' ingredients in the soil (Mesnage and Antoniou, 2018). Adjuvants are estimated at a market value of $2.51 billion in 2015, aimed to increase by 5.8% to reach $3.18 billion by 2019 (Mesnage and Antoniou, 2018) and $4.7 billion by 2026 (Markets and Markets, 2018). Adjuvants are defined by the HSE Under Article 2 Scope (3d) of 1107/2009 (HSE, 2011) as:

> "Substances or preparations which consist of co-formulants or preparations containing one or more co-formulants, in the form in which they are supplied to the user and placed on the market to be mixed by the user with a plant protection product and which enhance its effectiveness or other pesticidal properties, referred to as 'adjuvants'".

Adjuvant products are formulated combinations of surfactants, penetrant enhancers, activators, spreaders, stickers, co-solvents, wetting agents, pH modifiers, defoaming agents, drift retardants, nutrients (Witt, 2012). Usually adjuvants are less expensive than the active ingredient and their use can help reduce cost, as it allows make the active ingredient last longer, by using less of it (Mullin *et al*., 2016).

Agrochemical risk assessment does not account for spray adjuvants, and only tests the 'active' ingredients. Currently, evaluation of toxicity effects detrimental to non-target species are not undertaken due to the "lack of disclosure of adjuvant and formulation ingredients coupled with a lack of adequate analytical methods constrains the assessment of total chemical load on beneficial organisms and the environment" (Mullin *et al.*, 2016: 1). Additionally, most adjuvants and 'inert' ingredients are currently exempt from human safety risk assessments, and are generally recognized as safe (Mesnage *et al*., 2019). Therefore, under this classification, no environmental monitoring is required (ibid.). According to the UK's Health and Safety Executive (HSE, 2011), "there is no direct control over the content of product labels, other literature or the containers in which the product is marketed". Only their reactions in relation to possible risk for eyes and skin are needed for current adjuvant assessment.

Final pesticide products are made up of various chemical mixtures that for authorisation purposes are referred to as either 'inert' or 'active' ingredients. Defarge

et al. (2018: 161) demonstrate that the distinction made between inert and active ingredients is a regulatory one which is not based on toxicology. "The difference between 'active ingredient' and 'inert compound' is a regulatory assertion with no demonstrated toxicological basis".

The adjuvants are not listed on the final product and their chemical component cannot be revealed due to intellectual property (CBI). For example, the ubiquitous and widely used herbicide glyphosate is never used alone, but mixed with formulants or adjuvants that stabilize glyphosate and allow its penetration into plants. "However, the fact that their composition is considered confidential business information does not allow scientists to describe their mechanism of action either on non-target organisms or even on plants. They are declared as inert by manufacturers because they are not considered to be directly responsible for the herbicidal activity" (Defarge *et al*., 2018: 161). Nonetheless, adjuvants can be toxic in their own right (Mesnage and Antoniou, 2018). Despite their known toxicity, their toxic effect is ignored by regulators.

4.2.1 Glyphosate-based formulations

Mullin et al. (2016) find that without tallow amine and other adjuvants, glyphosate has weak ecotoxicity and systemic movement. This finding is reinforced by Defarge et al. (2018: 158) who find that the toxicity of the GBH[3] formulations examined were, in the short term, due to the formulant family alone, called POEAs, now banned in the UK (HSE, 2017). The first generation GBH in the 1970s and 1980s contained POEAs derived from animal fat and the toxic properties began to emerge in the late 1970s. They are the most common surfactant in GBH

[3] Glyphosate is directly linked to the development of genetically modified plants, that were engineered to withstand and resist glyphosate and thus this herbicide is the most used on edible GMO plants (Gillam, 2017). However, the complex discussion about GMOs is beyond the remit of this thesis.

formulations, and have been used for the last 40 years, and are not a single molecule, but a class of surfactants. Defarge et al. (2018) note that the POEA surfactant examined in the GBH formulation "acted as the real toxic ingredient of the herbicide […] glyphosate did not appear to be the main active substance of the herbicide, but rather the formulants". Mesnage *et al*. (2019: 137) examine surfactants in GBH formulations and compare their acute toxic effects to find POEAs as "markedly more toxic than glyphosate". Mesnage et al. (2019: 140) note that the surfactant used in MON 0818 (Monsanto GBH formulation) is "5-50 times more toxic than glyphosate to mammalian species or aquatic organisms[4]".

Importantly, glyphosate has been headlining debates regarding its safety, and agencies such as the International Agency for Research on Cancer (IARC) of the World Health Organisation, and the European Food Safety Agency (EFSA). While the IARC classified glyphosate as a human carcinogen, EFSA did not (Defarge *et al*., 2018; European Commission Directorate-General for Health and Food Safety, 2017). This discrepancy is thought to be due to different toxicity profiles between full formulations that include adjuvants, and glyphosate alone. EFSA only examined the 'active' ingredient, glyphosate, as per the dossier presented by the manufacturers, while the IARC based their classification based on epidemiological studies on full formulations, glyphosate on its own, and animal testing.

Another important finding concerns spray tanks, where pesticides are mixed. Adjuvants can be sold separately and added in the preparation of pesticide mixtures for application in agriculture (Mesnage and Antoniou, 2018). Spray tank adjuvants by themselves harm non-target organisms from all taxa studied. Aquatic organisms

[4] Mesnage et al. (2019) also discuss MON 2139, the original formulation of roundup, that was more toxic than glyphosate to fish species by 10-40 times, and 10-50 times more toxic to frogs and crustaceans.

are particularly vulnerable to the general ecotoxicity of adjuvant surfactants but "terrestrial insects have been shown to be susceptible to insecticide synergisms associated with spray adjuvants […] Formulations are generally more toxic than active ingredients, particularly fungicides by up to 26,000-fold" (Mullin *et al.*, 2016: 2). Thus, adjuvants are toxic: "all pesticides in their formulations and their formulants, even glyphosate, acted as cellular endocrine disruptors" (Defarge *et al*., 2018: 159). Formulants are described as causing membrane disruption, apoptosis (cell death), mitochondrial respiration inhibition and DNA damage: "There is no instance in which glyphosate reaches the toxicity of any formulant, either in the formulation or alone" (Defarge *et al*., 2018: 161). The authors find that the adjuvants kill human embryonic cells and can bioaccumulate[5], while glyphosate alone does not exhibit the same cytotoxic levels (see more on human health effects in section 3.6). In addition, adjuvants were found to act as endocrine disruptors at lower levels than those tested for cytotoxicity (Mesnage and Antoniou, 2018).

Mesnage et al. (2019: 138) point out that the extant literature on pesticides suffers confusion over test substances, making comparisons between toxicity studies ever more complex: "many authors refer to 'glyphosate' in published papers, when they actually tested a formulated product". Given the fact that over the years there have been over 150 different GBH formulations, and over 2000 registered in Europe, this distinction is crucial. Different formulations of Roundup for example can contain different adjuvants depending on which country it is sold in. The secrecy shrouding the ingredients due to CBI makes researchers' accuracy and replicability nearly

[5] Bioaccumulation is a relationship between how much of the chemical is taken and how it metabolises, while biomagnification, is a process that is seen most in species at the top of the food chain, carnivores. Because they eat species that have accumulated pesticides, their intake is much higher (Daniele *et al*., 2018).

impossible, resulting in mixed information on which regulators rely. Mesnage et al. (2013) conduct the most extensive study on the toxicity of adjuvants in GBHs and find that the toxicity of two different formulations of the same active ingredient can be 100 times more toxic.

In addition to adjuvants, other toxic substances have been found alongside 'active' ingredients. Defarge et al. (2018) have surprisingly also found the presence of several toxic heavy metals in the pesticide formulations: arsenic (As), cobalt (Co), chromium (Cr), nickel (Ni), and lead (Pb) and report on this for the first time. They assert that this phenomenon appears to be widely distributed in the world. Heavy metals are thought to originate either from contamination of formulations due to their manufacturing process for example for petroleum or from industrial waste. "They may also be added intentionally as nanoparticles in pesticides or as chemicals", as arsenic has been used as a pesticides for decades (e.g, Carson, 1962) but banned due to its contamination of groundwater (Stein, 2012).

Finally, Defarge et al. (2018: 162) conclude that glyphosate being tested alone in chronic regulatory experiments is insufficient to establish a safe level of allowed daily intake (ADI), taking into account the synergistic toxic effects that "undoubtedly occur, and therefore ADI calculations and other regulatory experiments should be performed with the full formulations and all components".

4.2.2 Neonicotinoid insecticide formulations and their adjuvants

Other toxic adjuvants find their way into the environment through pesticide mixtures and everyday products. Neonicotinoids are synthetic insecticides that target the central nervous system via nicotinic acetycholine receptors of insects. However, their widespread use in agriculture has been having a detrimental effect on non-target species, such as bees (Mesnage and Antoniou, 2018).

Mullin et al. (2016) examine organosilicone surfactants present in shampoos, medicines and personal care products, and veterinary products (Mesnage and Antoniou, 2018). They are used to modify the surface tension of plant cells to increase the penetration of the pesticide active ingredients and can amount to 2% of the tank mix (Mesnage and Antoniou, 2018). They are toxic to bees and their use has increased particularly during bloom, when two thirds of bees are out collecting pollen. "The mixture-derived toxicity could account for the knowledge gap in the cause of bee colony collapse syndrome" (ibid: 4) This observation is reinforced by Defarge *et al*. (2018) who report that honey, pollen and wax were sampled and found to be contaminated with high levels of nonylphenol polyethoxylates (NPEOs), another family of adjuvants used in pesticides. Additionally, Mesnage and Antoniou (2018: 5) note that adjuvants, such as the ones found in Confidor, called N-methyl-2-pyrrolidone, can persist on pollen up to 7 days and "has the potential to negatively affect the well-being of wild bee populations". This substance also has adverse effects on mammals and is a developmental toxicant (Mesnage and Antoniou, 2018).

To conclude, the classification of a chemical compound as 'inert' or 'active' has serious consequences on the registration and authorization of a pesticide. It determines the safety and toxicity tests an agrochemical will have to perform and whether these toxic substances will be released into the environment. Mesnage *et al*.'s (2019) examination of surfactants in GBH highlights the need to reveal the information, specifically test substances and doses, on the specific formulation compositions in order to allow for experiment reproducibility and transparency.

4.3 Individual pesticides and their negative effects

4.3.1 Insecticides

Most insecticides are nerve poisons such as dichlorodiphenyltrichloroethane (DDT) and various polychlorocycloalkanes (PCCAs) introduced in the 1940s, followed by organophosphates (OPs) in the 1950s, methylcarbamates (MCs) in the 1960s, pyrethroids in the 1970s, and neonicotinoids in the 1990s (Casida and Durkin, 2013).

Almost all insecticides used between 1940s and the 1980s were neurotoxicants, but between 1997 and 2010, there was a shift from OPs and MCs to neonicotinoids (Casida and Durkin, 2013).

Insecticides, as their name suggests, kill insects indiscriminately. This means that earwigs, for example, great beneficial biocontrol agents that love snacking on apple-loving aphids, would be killed alongside them. It has been suggested that earwigs can eat "as many aphids each year in apple orchards as can be killed by three rounds of spraying with insecticides", making earwigs worth approximately £2.6 million to the economy per year (Goulson, 2019: 40). However, insecticides are not able to distinguish between target and non-target species, and as the following section will illustrate, damage and disrupt the delicate ecosystems, and present a great risk to all species along the food chain.

4.3.2 Neonicotinoids (Neonics)

Neonics were developed in the 1980s and imidacloprid was the first commercially available neonicotinoid insecticide in the 1990s (Goulson, 2013). Neonicotinoids work by interfering with the neural transmission of nicotinic acetylcholine by binding to its receptors and acting as false neurotransmitters (Van Der Sluijs *et al.*, 2015). However, negative effects of the 'miracle' insecticide were not late to arrive. In July soon after its licensing in Europe in 1994, beekeepers in

France began to notice over the course of a few days, just after the sunflowers had bloomed, “a substantial number of their hives would collapse, as the worker bees flew off and never returned, leaving the queen and immature workers to die. The French beekeepers soon believed they knew the reason; a brand-new insecticide called Gaucho® with imidacloprid as active ingredient was being applied to sunflowers for the first time” (Mason *et al*., 2013).

Currently, neonics are banned for oilseed rape, spring cereals and sprays for winter cereals, but they can be used to treat sugar beet and as seed treatments for winter cereals, with a ban on outdoor use that came into force in 2018 (DEFRA, 2018a). However, this partial restriction does not diminish the risk to all living beings. For example, Goulson (2013: 978) reports that in the UK “seed dressings accounted for 91% of all neonics use in farming in 2011”. Part of the attraction of the use of neonics is their ease and flexibility of application: they can be sprayed, seeds can be bought ready-dressed, and bait formulations can be fed to cockroaches and ants, and in amenity grassland neonics come in granular formulations to kill insects. For an even farther reach, they can be applied in irrigation water or injected into wood to kill termites, and finally, they are found in pet flea treatments (Atkins *et al.*, forthcoming; Goulson, 2013).

4.3.1.2 In the beginning: Bees

In 2015 the Global Taskforce on Systemic Pesticides (TFSP, 2015: 153) published their conclusions on the impact, effects and risks of neonics on bees, wildlife, soil and water. The report concludes that, “the existing literature clearly shows that present-day levels of pollution with neonicotinoids and fipronil caused by authorized uses (i.e. following label rates and applying compounds as intended) frequently exceed the lowest observed adverse effect concentrations for a wide range

of non-target species and are thus likely to have a wide range of negative biological and ecological impacts. The combination of prophylactic use, persistence, mobility, systemic properties and chronic toxicity is predicted to result in substantial impacts on biodiversity and ecosystem functioning" (TFSP, 2015: 153). Relevant for hedgehog survival, the report found that the species group most negatively affected were terrestrial invertebrates, namely earthworms, with insects such as bees and other insects important for pollinations coming a close second (The Bee Coalition, 2014). As Cielemęcka and Daigle (2019: 69) summarise, "when earthworms die due to the use of herbicides and insecticides, birds who feed on them become poisoned and, as a result of the diminished quality of soil, other species lose their home as well" and our hedgehogs suffer.

The effect of pesticides and neonicotinoids in particular on bees has been widely debated, with a plethora of voices arguing for and against a ban on neonics. Clappison and Solomon (2016) report that Ontario's bee population has been decimated since 2007. The debate creates two camps: the environmental groups and the pesticide companies, with some farmers arguing against a ban on pesticides, while smaller bee keepers support it. Some large farmers and larger bee keepers blame small bee keepers, or "hobby beekeepers" for not managing their hives well, causing bee death.

In parts of south-western China, farmers now resort to hand pollination of apples and pears due to the overuse of pesticides that have now nearly exterminated all bee species (Goulson, 2019). In the UK, farmers growing Gala and Cox apples are losing about £6 million in potential income because of unsuccessful and problematic pollination, the bee decline is so severe (ibid.). Thus, the loss of bees is having a significant financial impact on the food industry (Atkins and Atkins, 2016, 2019).

As mentioned in section 3.2, it is important to consider adjuvants and other chemicals burdens, as "most studies documenting pesticide effects on honey bees are performed without the formulation or other relevant spray adjuvant components used when applying the active ingredient, most often due to lack of such required tests for product registration" (Mullin *et al*., 2016: 2). Mullin et al. (2016: 6) acknowledge that chemical stressors alone are not the only factor responsible for the decline of pollinators and other non-target species, the true impact of chemical toxic exposure is "impossible to determine given our lack of understanding of the total chemical burden, a burden that clearly includes unknown and unevaluated materials". Importantly, the authors note that the elevated occurrence of the varroa mite and malnutrition of bees in tandem with exposure to pesticides may be linked in the decline of honey bee colonies.

4.3.1.3 Not only bees: vertebrates

Despite the claimed lower toxicity to vertebrates than invertebrates (Gibbons, Morrissey and Mineau, 2015), toxic effects to vertebrates are evidenced, and the risk of indirect, chronic and sub lethal effects are now emerging. Van Der Sluijs et al. (2015: 103) review the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife and find that "all three insecticides exert sub-lethal effects, ranging from genotoxic and cytotoxic effects, and impaired immune function, to reduced growth and reproductive success, often at concentrations well below those associated with mortality." This finding supports Mason et al.'s (2013) assertion that neonicotinoids suppress the immune system of vertebrates and invertebrates rendering them more susceptible to diseases and parasites. This finding is supported by Gu et al. (2013) who assert that neonicotinoids impair mammalian reproductive

systems by affecting sperm quality, motility and DNA in male fertility, and embryonic development.

The endocrine disruptive properties of imidacloprid have been confirmed (Baines *et al.*, 2017; Mikolić and Karačonji, 2018). Mesnage et al. (2018) are the first to investigate cellular responses to cell proliferation and lipid accumulation resulting from exposure to seven different neonicotinoids, and the way in which they mimic hormonal function. The authors find that imidacloprid could be an obesogen, causing obesity. Nevertheless, imidacloprid use accounts for 41.5% of neonics use, classified as Group E carcinogen meaning it is not considered a human carcinogen (Mikolić and Karačonji, 2018).

Goulson (2013) points out that economically, while neonics do provide effective control against pests, it is unclear whether their use increases yield. Yield has increased over the decades due to many factors including use of fertilizers, agricultural technologies, and use of pesticides but Goulson reports that the pace of yield has decreased. For example the yields of oilseed rape were the same pre 1994 when no neonics were around. An example of an economic loss to the farmer is given by Seagraves and Lundgren (2012) who compare the yield of imidacloprid and thiamethoxam seed dressings on soya with untreated, integrated pest management (IPM) methods and found not only that there was no difference in yield but that beneficial insect populations were decimated. In this study, it is evident that the farmer is not making a return for the cost of pesticides estimated at around $30 per hectare. This finding is also supported by the The Bee Coalition (2014) and the TFSP (2015) who conclude that the increase in yield does not compensate for the cost of the pesticides.

While imidacloprid has been banned for use on flowering crops, it still makes its way into the environment via veterinary treatment, and through ornamental plants (see section 4.4.1). A common route of exposure for animals to neonics is through pet flea treatment (Atkins *et al.*, forthcoming). The authors examine Bayer's disclosures on websites and in published annual/ integrated reports dealing with the safety of one of their most profitable products, the Seresto® flea collar. These accounts are contrasted with personal accounts of consumers relating negative experiences with the collars. The flea treatment can be applied to the companion animal via a spot-on drip or through an infused collar. The active ingredient is often imidacloprid, or imidacloprid with a second active ingredient acaricideflumethrin (Atkins *et al*., forthcoming), or as I have noticed on the spot-on treatments for my cats – fipronil. Toxicity is dose, size and weight dependent. The dose advised by a vet to drip onto a medium sized dog is about 250mg a month; the collar version dose is 20 times higher, at 4.5g. Goulson (2019) estimates that a 250mg of imidacloprid a month is enough to kill 60 million bees or 60 partridges. Since the flea treatments are water soluble, and pass through urine, they wash off the pet and while there are no current scientific studies on imidacloprid, Gibbons et al., (2015) found that while neonicotinoids work by interfering with the neural transmission of nicotinic acetylcholine by binding to its receptors and acting as false neurotransmitters, fipronil works similarly but instead binds to the gamma-aminobutyric acid (GABA) receptors which results in the same disruption to neural transmission.

Furthermore, Atkins et al. (forthcoming: 4) note that safety testing of the collars focus on "the efficiency and 'kill speed' of the collar when compared to other similar products, rather than on the collar's safety for animals, humans and the environment". The authors report that Bayer's account of its flea collar emphasises

its functionality, and at the same time reassuring stakeholders that the collar is safe for use.

However, Bayer does warn consumers on the product packet to dispose of the collars safely (Atkins *et al.,* forthcoming: 19) "The fact sheet for Bayer New Zealand and Australia warn that the product contains hazardous substances. As a result, the collar should only be disposed of in an approved manner. For example:

> "Do not let this product enter the environment. Do not dispose of in waterways or sewers. Dispose of this material and its container as hazardous waste, via a licensed facility. See local council for disposal/recycling information" (Bayer, New Zealand, in Atkins *et al*., fourthcoming).

Goulson (2019) similarly asks: where do the neonics go once they have been applied to the pet? Once the product has been absorbed into the skin, and spread on the fur, what are possible consequences for family members ruffling the cat or dog's fur? The treatment is advisable for lactating dogs with pups, so do the pups ingest the pesticide? And if so, then it must also end up in urine, or at least some of its residue. Teerlink et al. (2017) examine fipronil and fipronil degradates after reporting of higher concentrations than allowed by the USEPA Aquatic Life Benchmarks have been found (USEPA, 2016). The authors analysed the water of baths volunteers gave to their dogs who were treated with fipronil spot-on treatment. Dogs were washed either 2, 7, or 28 days after product application, totalling in 34 baths. The authors found that fipronil was found in up to 86% while fiproles (degradates of fipronil) were detected in 100% of the samples. Teerlink et al. conclude that their "results confirm a direct pathway of pesticides to municipal wastewater through the use of spot-on products on dogs and subsequent bathing by either professional groomers or by pet owners in the home" (Teerlink *et al*., 2017: 960). Additionally, the authors

warn that the spot-on flea and tick treatments may also be directly transferred to surface water in locations where treated pets swim, and that in the absence of directions on the packaging for users to use protective gear, children, pet groomers, vets, and owners may be coming into contact with fipronil regularly.

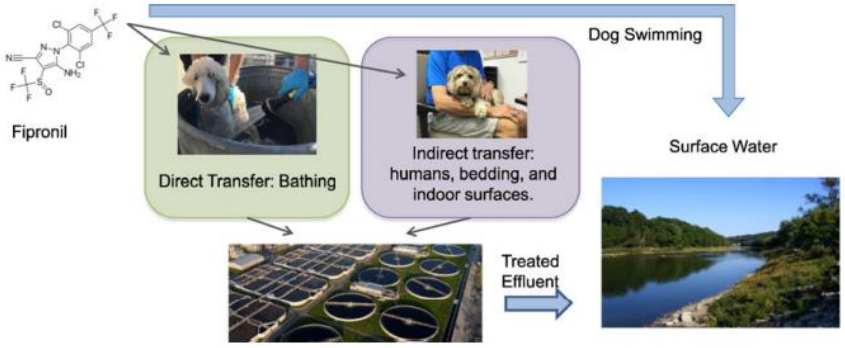


Fig. 10: Fipronil pathway into the environment from its starting point as a spot-on flea treatment (Teerlink et al., 2017: 960).

Goulson (2019: 133) finds that neonics make their way routinely into the foliage of field margins and hedgerow plants, shrubs and trees so insects eating the leaves are "likely to be receiving a chronic dose of potent neurotoxin", a claim that is reinforced by Humann-Guilleminot et al. (2019). Humann-Guilleminot et al. (2019) note that the link between the use of neonics and farming practices in terms of soil contamination remains unclear. The authors examine the concentration of five neonicotinoids in 702 soil and plant samples in Switzerland. They report that neonics were detected in 93% of organic soils and crops, and in 14 out of 16 seed samples. The authors conclude that these finding suggest that the use of neonics can harm a large percentage of non-target beneficial insect species, as well as harming

biodiversity in refuge field margins. Additionally, Goulson (2013: 981) reports that neonicotinoids "readily leach so that significant levels might be predicted in groundwater and run-off immediately after application". Whilst neonics accumulate in soil, they are not monitored in aquatic pollution, and there is a gap in knowledge with regard to how the plants in margins take them up.

Finally, as Köhler and Triebskorn (2013: 762) summarise, "despite all efforts to increase the specificity of insecticides, there is yet no compound that both targets insect pests and leaves non-target insects unaffected".

4.3.3 Organophosphates

Three major neonicotinoids have been partially banned from use in the EU and the UK since 2016 (DEFRA, 2018b). But what do farmers resort to? Farmers have substituted neonics with an increased use of pyrethroids and organophosphates, or use newly created pesticides such as cyantraniliprole, sulfoxaflor, and flupyradifurone, all of which are systemic neurotoxins, and are now available on the market (Goulson, 2019). Importantly, Goulson (2019) posits that the difficult and long names of the pesticides are a strategy to discourage discussion about them. This observation will be explored more fully in chapter 7.

4.3.3.1 Acelepryn

Replacing the three-banned neonicotinoid insecticides imidacloprid, thiamethoxam and clothianidin is Acelepryn, also known as chlorantraniliprole now used on amenity green spaces to kill beetle grubs, weevils and caterpillars. Syngenta, its manufacturer, claims it has "no known adverse effects on beneficial and non-target organisms including earthworms and honeybees" (GreenCase Syngenta, 2019; Goulson, 2019). However, as Goulson points out, it is not possible that an insecticide will only kill the pests and leave the beneficial insects unharmed. In addition,

acelepryn has a half-life of 924 days and can accumulate in soils if used every year, and it is highly toxic to aquatic life. Indeed, the new extension to the neonics ban in April 2018 to include all outdoor use of imidacloprid, clothianidin and thiamethoxam in the EU reflects the concerns about persistence in soil (Center for Ecology and Hydrology, 2018; Goulson, 2013; Castle *et al*., 2017; Roy *et al*., 2019). However, while the CEH does advise the use of pesticides as a last resort, it promotes the application of biologics, which have not been tested or extensively studied, and the CEH was funded by Bayer and Syngenta in 2015-2016. This may raise concerns regarding the impartiality of its recommendations.

In conclusion, neonics, fipronil and acelepryn are all systemic insecticides that impact wildlife, non-target species directly and indirectly, through their toxicity or through damaging the food chain. These insecticides pose a risk to birds, aquatic species, amphibians and mammals. While research has proven difficult in establishing a clear causation (a notion that will be discussed in section 3.5.4), indirect effects have been demonstrated to be more important that direct toxic effects on vertebrates (Gibbons *et al*., 2015). As Stein (2012) notes, our body contains many toxic chemical burdens. In 2005 the Centres of Disease Control found 148 toxic chemicals in the blood and urine of Americans of all ages. It is not possible to study the synergistic effects of these toxic chemicals because there are no populations free from toxic exposures that can serve as a control group. In view of these challenges, Steingraber (in Stein, 2012: 88) urges that "we use the Precautionary Principle in environmental decision-making: 'Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'".

Neonicotinoids not only have adverse effects on bees and other insects, but have negative harmful effects during early development in mammals (Burke *et al*., 2018). The authors assess the effects of imidacloprid (although it is not clear whether the authors used a full formulation or imidacloprid alone) and found that the maternal exposure can be transferred to offspring in the prenatal and early postnatal period and cause long-lasting effects into adulthood.

4.3.4 Herbicides

Plants support all animal life on earth, and provide shelter as well as nourishment. "Although modern man seldom remembers the fact, he could not exist without the plants that harness the sun's energy and manufacture the basic foodstuffs he depends upon for life" (Carson, 1962: 69). The delicate balance created by the interaction of plants, insects, and other animals creates an intricate web. While plants are pretty adept at protecting themselves with an array of natural defences such as spines, bristles, tough leaves and natural chemical defences (Goulson, 2019), the anthropocentric desire to kill unwanted plants, labelled 'weeds' the equivalent to 'pest', has given rise to herbicides (Carson, 1962: 47). For Carson, the notion that herbicides are only poisonous to plants and are not a threat to animals is a 'legend'. This section will discuss glyphosate-based herbicides (GBHs) and their inherent toxicity not only to plants but to all living beings.

4.3.4.1 Glyphosate-Based Herbicides (GBHs)

It was in 1974 that John Franz first synthesised glyphosate and issued its patent (Gillam, 2017). Gillam (2017) traces Monsanto's dubious history of developing herbicides and reveals a dangerous pattern in which a herbicide or insecticide is developed and heralded as the next safest, cure-all solution. Beginning with DDT, Monsanto was one of several businesses manufacturing the insecticide

DDT, and in 1960 became the infamous supplier to the U.S government of the defoliant known as Agent Orange (named thus due to the orange striped barrels in which it was delivered) used during the Vietnam War to destroy the vegetation under which the enemy took cover. The herbicide was a mixture of 2,4-D and 2,4,5-T and was asserted as a safe chemical for humans and animals. However, Agent Orange was found to contain a highly toxic contaminant called dioxin that causes cancers, disrupts endocrine processes and affects reproductions and development (Gillam, 2017). Köhler and Triebskorn (2013) note that while DDT has been banned in most developed countries, it is still used in many developing countries. Gillam (2017: 19) writes that many scientists and environmentalist believe that the trajectory and development of glyphosate "mirrors that of DDT". Like DDT, glyphosate is used in agriculture, residential areas, political warfare (e.g., against the Colombian drug trade (Gillam, 2017)), and importantly, like DDT which was heralded for decades as a 'war hero' (Carson, 1962; Stein, 2012), fell out of use following its devastating effects. The dangers of DDT took decades to emerge and influence policy and, like glyphosate, had run alarm bells for many. By 1972, DDT was labelled by the WHO as a probable carcinogen to humans and banned for most uses.

While neonics are the most commonly found insecticides in food samples, glyphosate is thought to be the herbicide most consumed. In fact, the major pesticides of the world are glyphosate-based herbicides (GBHs), consisting of a mixture of water, 10-20% chemical formulants, and 36-48% glyphosate as the 'active' ingredient (Defarge *et al*., 2018). Glyphosate is a non-selective systemic herbicide used by farmers and home gardeners alike, and first appeared in Roundup formulation (Cortinovis *et al*., 2015). Glyphosate acts on plants by shutting down the production of essential amino acids and there are currently 750 different formulations

of GBHs worldwide (Mesnage and Antoniou, 2018; Mesnage, Benbrook and Antoniou, 2019).

While glyphosate is deemed safe by agrochemicals, marketed as having no adverse effects in animals due to its modus operandi unique to plant (Zimmer, 2018), glyphosate was declared by the World Health Organisation (WHO) as a carcinogen (Goulson, 2019). Counterarguments posit that higher doses are required to cause cancer than the current exposure rate (Williams, Kroes and Munro, 2000). However, those are difficult to track and estimate but "what is undoubtedly true is that we are all consuming glyphosate all of the time" (Goulson, 2019: 85). As discussed in section 3.2, animal experiments confirm that the toxicity of GBH formulations is due to the adjuvants contained within them, and it is the most common herbicide involved in animal poisonings, with 1323 enquiries about dogs and cats received by the London Veterinary Poisons Information Service (Mesnage and Antoniou, 2018; Cortinovis *et al*., 2015). Cortinovis et al. (2015) carry out a retrospective analysis of all the enquiries related to animal exposure to GBHs between 2006 and 2012 in the Poison Control Centre of Milan. Severe signs developed in one dog, and four dogs and one cat died. Exposure occurred through inhalation, consumption of contaminated items and through eyes. While acute poisoning is a concern, cumulative and chronic exposures should be the main objective for increasing the relevance of risk assessments as "[Glyphosate] doesn't create a completely poor functioning brain, or have major effects on brain development […] The effects are going to be subtle and accumulative over years of exposure. And it's going to be tricky to convince regulatory bodies that there's a problem, if that's the case" (Zimmer, 2018). The slow disappearance of species could become irreversible, as the insidious nature of extinction of relatively common species slowly reduces

populations through deficient reproduction, and chronic illnesses. “As the herbicides rain down on forest and field, on marsh and rangeland, they are bringing about marked changes and even permanent destruction of wildlife habitat. To destroy the homes and the food of wildlife is perhaps worse in the long run than direct killing” (Carson, 1962: 78).

Pesticide Action Network International (2016) report that “exposure to glyphosate-based herbicides, even at very low doses, may result in reproductive problems including miscarriages, pre-term deliveries, low birth weights, and birth defect […] very low levels of glyphosate, Roundup and the metabolite AMPA all kill human umbilical, embryonic, and placental cells. Roundup can kill testicular cells, reduce sperm numbers, increase abnormal sperm, retard skeletal development, and cause deformities in amphibian embryos”.

The latest report for the active substance glyphosate finalised in the Standing Committee on Plants, Animals, Food and Feed at its meeting on 9 November 2017 in view of the renewal of the approval of glyphosate as active substance in accordance with Regulation (EC) No 1107/20091 says that Member States shall ensure that plant protection products containing glyphosate do not contain the co-formulant POE-tallowamine (CAS No 61791-26-2) (European Commission Directorate-General for Health and Food Safety, 2017):

> “Member States shall ensure that the genotoxic potential of formulations containing glyphosate is addressed before granting authorisations for plant protection products containing glyphosate”.

However, Member States adapt the EC’s regulation in their respective jurisdictions and can invoke the Emergency Authorisation to put into use a pesticide that has been banned by EU.

The European Parliament passed a resolution in 2016 suggesting that glyphosate not be approved for longer than 7 years and that it is not to be used at all in public spaces. In addition, the European Parliament said that spraying glyphosate to ripen crops before harvest "is unacceptable because it increases human exposure" (Gillam, 2017: 170). MEPs urged the European Commission to invoke the precautionary principle originating in the 1980s. The precautionary principle was included in the Rio de Janeiro UN General Assembly, albeit grounded in anthropocentrism, emphasises the importance of careful study and delayed release of dangerous and woefully under-researched chemicals and their potential deleterious effect: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature". The precautionary principle holds that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (Assembly United Nations General, 1992). The European Parliament and the European Commission, the two legislative branches would continue to take opposing political stances of the use of glyphosate.

GBHs have been found to harbour other toxic chemicals in addition to adjuvants. Gillam (2017) reinforces Defarge et al.'s (2018) findings of heavy metals in pesticide formulations (section 3.2). Glyphosate was shown to be binding to heavy metals and residues have been detected in bread samples in the UK for years. Government figures show its use in UK farming has increased by a shocking 400% in the last 20 years. In the UK, monocultures of crops are sown in huge fields. Wheat, for example is the single biggest crop, stretching across about 2 million hectares, with barley and oilseed rape in second place, covering 600,000 hectares

(Goulson, 2019). Between 2014 and 2016 the area treated with glyphosate increased by 24%, and the amount applied rose by 26%. Tests by the Defra Committee on Pesticide Residues in Food (PRiF) found that almost two thirds of wholemeal bread sampled contained glyphosate (Soil Association, 2019). “Seldom is the question asked, what is the relation between the weed and the soil? Perhaps, even from our narrow standpoint of direct self-interest, the relation is a useful one. As we have seen, soil and the living things in and upon it exist in a relation of interdependence and mutual benefit” (Carson, 1962: 82). Importantly, weeds serve to indicate the condition of the soil, a limited, non-renewable resource.

The overuse of GBHs causes weed resistance and pest resurgence and as a result, an increase in yearly use (Cortinovis et al., 2015), as pest insects recover quickly while earwigs, beetles, lacewings, hoverflies and the like take a long time to recover. This means the farmer has to keep spraying numerous times, whereas the natural enemies would have sorted out the pests for him (Goulson, 2019).

4.3.5 Summary of Molluscicides and Second Generation Anticoagulant Rodenticides

Molluscicides and their active substances include metaldehyde, methiocarb, and thiodicarb. Some are systemic, such as methiocarb, and most are available as granules, applied to land as baited-pellets, intended for consumption by slugs and snails (Berny, 2007). Metaldehyde is increasingly considered a pollutant as it is detected in water bodies in the UK and ends up in drinking water in quantities larger than the EU statutory limit, and presents a problem for water supply companies (Castle et al., 2017). Due to its chemical structure, metaldehyde easily runs off from fields, entering water bodies, and surface water. It is classified as a ‘moderately hazardous’ pesticides (class II) (The World Health Organisation, 2009).

Metaldehyde causes molluscs to produce excess mucus which dehydrates them and causes them to die. In mammals, metaldehyde is an irritant to the skin, eyes, mucous membranes, throat and respiratory tract" (Castle et al., 2017: 416). Its half-life can vary between 3.13-223 days, therefore it can linger, depending on weather conditions, albeit once it reaches water, its degradation slows.

Metaldehyde use in the UK between 2010 and 2016 was extensive with nearly 1000 tonnes applied mostly during autumn and winter when molluscs come out in the moist environment (FERA, 2020). This is also a crucial time for hedgehogs and autumn juveniles hurrying to put on weight in preparation for hibernation. The fight to ban metaldehyde in slug pellets to protect wildlife has been heard by UK government when a ban on outdoor use was to be introduced from spring 2020 (Department for Environment, 2018). However, the decision made by Michael Gove at the time was deemed unlawful and challenged at the High Court (NFU, 2019). Arguments against the ban cite £100 million a year in lost produce to slugs, if they are not controlled.

Methiocarb is a carbamate pesticide is a culprit that crops up regularly in the wildlife pesticides poisoning investigation reports (see section 4.5.5 and Appendix B). It is stronger than metaldehyde by approximately 10 times, but less water soluble. However, due to concerns of its toxicity to granivorous birds, mammals and bees, it has been banned in the EU in 2014 (University of Hertfordshire, 2020). Nevertheless, methiocarb can still be used as seed dressing.

4.3.6 Second Generation Anticoagulant Rodenticides (SGARs)

Other chemicals that cause mollusc death are rodenticides. Anticoagulant rodenticides are used worldwide for vertebrate pest control in urban and agriculture settings. These chemicals operate by blocking the vitamin K cycle

and impede blood clotting, so that the victim dies of haemorrhage (Rattner et al., 2014). Due to genetic resistance developed through exposure to first-generation anticoagulants, second-generation anticoagulants (SGARs) e.g., brodifacoum, difethialone, bromadiolone, difenacoum, flocoumafen are now currently authorised in the UK to be used in and around buildings as well as in open areas (Shore et al., 2017). This reflects a change in authorisation, where previously, use and distribution has been more restricted in order to mitigate secondary exposure to non-target animals.

Booth et al. (2001: 7) summarise literature of the acute toxicity of brodifacoum and report that it caused death in two species of molluscs, snails and earthworms – hedgehogs' favourite snack. Additionally, the authors emphasise that "smaller animals […] may be at more risk [of secondary poisoning] from consuming insects that have fed on brodifacoum bait". This observation is reinforced by Brakes and Smith (2005: 118) who assert that "predators and scavengers of poisoned rats are at most risk of secondary poisoning". Sainsbury et al. (1995) identify second generation anticoagulant rodenticides, the most commonly used chemicals against rodents in the UK, as being a major factor on wildlife declines in terms of scale and severity of effects and the number of animals affected with animals between 10-100 million affected annually, with predators accumulating anticoagulant rodenticides following repeated exposures (Elmeros et al., 2019). One pertinent example is anticoagulants appearing in 67% of hedgehogs in England (Dowding et al., 2010).

SGARs have been developed as a result of increased resistance to first generation anticoagulants. Harrington and Macdonald (2002) note that rodenticides used in agricultural settings pose a direct threat to non-target species, especially since these are applied in winter. Non-target species such as hedgehogs, do not hibernate

continuously throughout winter and the application in winter increases the risk to non-target species that feed around farm buildings at a time when food sources are low. And the toll on wildlife is a heavy one. Finally, Brakes and Smith (2005) demonstrate that routine and prophylactic rat control reduces local populations of small, non-target mammals, as well as increases the exposure of predators and scavengers to rodenticides through secondary poisoning.

The changes in authorisation for the principle five SGARs brought about the creation of an industry-led stewardship scheme established in 2016 under the name Think Wildlife, implemented by the Campaign for Responsible Rodenticide Use (CRUU), whose members include Bayer, Syngenta, Rentokil and other leading companies (Shore et al., 2017; Buckle et al., 2020). The aim of the scheme is to promote best practice, train users, and monitor outcomes of use of SGARs. The CRRU is overseen by the Government Oversight Group (GOG), chaired by the HSE and comprises HSE NI, DEFRA, Public Health England, Natural England, the Welsh and Scottish Governments and an independent scientific adviser (RSGOG, 2020) and specifically provides (Buckle et al., 2020: 4):

(i) Evidence that the industry has put in place what it said it would

(ii) Evidence/indicators of industry's response/ changes of behaviour

(iii) Evidence/indicators of impact

Compliance with CRRU guidance is now a condition of product authorisation that is written into product labels, therefore carrying regulatory weight (Buckle et al., 2020).

The Centre for Ecology and Hydrology (CEH) provide CRRU with reports on SGARs effects on barn owls as evidence and indicator of impact. Shore et al. (2018)

find that “among the barn owls examined 87% carried residues of one or more second generation anticoagulant rodenticide” (Buckle et al., 2020). The data collected by WIIS is not currently considered by CRRU/GOG despite that “all first and second-generation anti-coagulant rodenticides fail the environmental risk assessment for use outdoors, but Government recognises that this use is sometimes necessary to control pests and the threat they can present, including to public health”(RSGOG, 2020: 2).

4.4 The Cocktail Effect

The European Union (EU) has been promoting reduced pesticide use and increased adoption of Integrated Pest Management (IPM) practices (see section 3.7.2 for discussion) (Handford, Elliott and Campbell, 2015). Notably, the EU introduced a partial ban on neonics in 2013 on flowering crops, intended to reduce risks to bees. Use of these chemicals elsewhere in the world is much less restricted, and we could presume that the EU and the UK will continue to uphold the measures put in place pre-Brexit. However, the use of multiple pesticides poses risks to the environment that are not captured by regulatory tests “which largely focus on short-term studies in which test organisms are exposed to a single chemical” (Goulson, Thompson and Croombs, 2018: 2).

To keep huge monocrop fields ‘healthy’, they are treated with “a barrage of pesticides” (Goulson, 2019: 225). Examining the Cox apple orchard, Goulson reports that data for the number and types of pesticide-spraying iteration includes “thirteen fungicide sprays, five plant growth regulator sprays (plant hormones for fruit growth and speeding up ripening), five sprays of insecticides, two herbicide sprays, and one spray with urea. Many of these sprays involved applying mixtures of different pesticides, forty-two different chemicals were used in all” (Goulson, 2019: 43).

Goulson notes that the main insecticide used was chlorpyrifos, a chemical that belongs to organophsphates, nerve agents that were developed by the Nazis and is more toxic via contact than through consumption, unlike neonics (Lentola *et al.*, 2017). Chlorpyrifos is banned in the United States since 2000 because of its toxicity (Gillam, 2017). However, this chemical has been banned in the UK since 2016, and the only allowed application is on brassica seedling via drench treatment applied via a sprayer (HSE, 2016).

Pesticides are registered individually. Each 'active' ingredient, as mentioned in section 3.2, needs to be authorized for the product to be put on the market. However, practical applications of pesticides in fields result in multiple applications simultaneously of insecticides, herbicides, and fungicides which can combine to an even more toxic and harmful concoction to result in 'the cocktail effect' (Pesticide Action Network UK (PAN), 2019b). These mixtures occur in food, water and soil and can have a negative effect on human and wildlife. Pesticide Action Network UK (PAN) (2019b) examine the cocktail effect in the UK and the extent to which it negatively impacts the environment and human health. For example, the report finds that "one sample of raspberries contained one 'known carcinogen', one 'probable carcinogen', two possible carcinogens and two endocrine disruptors, one developmental toxin which can have adverse effects on sexual function and fertility and one neurotoxin that can negatively affect the nervous system" (ibid.: 3). Not only found in fruit and vegetables, pesticide cocktails were found in more than half of rice and a quarter of bread that were tested by the government in 2017. Grapes, for example have been found to contain more than nineteen (!) different pesticides.

There is no current monitoring of the environment and non-target wildlife with regard to cocktail mixtures. Academic studies on bumblebees found that 43%

had detectable levels of more than one pesticide, with traces of seven pesticide in one single individual (Pesticide Action Network UK (PAN), 2019b). Research on birds and mammals has focused on a single pesticide and there are no UK studies that have investigated the impact of pesticide mixtures on mammals (PAN, 2019). Goulson et al. (2018) examine the changing patterns of pesticide use in arable and horticultural crops in Great Britain from 1990 to 2015, and find that more than 400 different pesticides are authorised for use in the UK, and farmers are prescribed use of combinations of pesticides, in order to slow pest resistance that arises from using the same product over time. For agrochemical companies, one might think that they would have an interest in avoiding the development of pest resistance. However, the registration for the particular pesticide and exclusive right to manufacture it expires after fifteen years during which time the company aims to make considerable returns on R&D investment (Goulson, 2019).

The soil and its dwellers do not remain unaffected. Daniele et al. (2018) found 10 pesticides in a small sample of earthworms, with as many as five different pesticides in one earthworm. Silva et al. (2019) examined soils of 11 EU countries, finding the UK to have the second highest level of pesticide mixtures residues in the soil. The authors find that 67% of the UK samples had multiple residues, with 25% having more than six. Notably, Silva et al. (ibid) found glyphosate and its metabolite AMPA as well as DDT residues, and broad spectrum fungicides. While the authors disclose that some chemical compounds were below the toxic level endpoints for in-soil organisms, the study does reveal "that the presence of mixtures of pesticide residues in soils are the rule rather than the exception, indicating that environmental risk assessments should be adapted accordingly to minimize related risks to soil life and beyond" (Silva *et al.*, 2019: 1532). In fact, pollution from agrochemicals is a

major threat for soil health and needs to be addressed as it affects several SDGs related to soil health (Keesstra et al., 2016; Payá Pérez and Rodríguez Eugenio, 2018). Soil contamination raises concerns for soil functions, biodiversity and food safety. It is the source of prey for many mammals and birds. Soil contamination is also a source of water contamination through leaching and run-off, as well as wind (Payá Pérez and Rodríguez Eugenio, 2018). Waterways in the UK have been found to be contaminated: 66% of the samples were found with more than ten pesticides (Pesticide Action Network UK (PAN), 2019b: 3). Additionally, Silva et al. (2019) describe pesticide residues in dust, formed by contaminated small soil fraction that can be inhaled by humans and nonhumans. Despite these concerns, soil monitoring in the EU is not required, and concerns of new bills presented in the UK post-Brexit that further degrade environmental protection in agriculture have been raised (see section 4.5).

4.4.1 Pesticides mixtures on ornamental plants and in urban spaces

Exposure of hedgehogs and other non-target wildlife is not limited to the agricultural setting. Lentola et al. (2017) find that plants sold as 'bee-friendly' have been grown in greenhouses that heavily rely on pesticides. Pollen, nectar, and leaves were extracted from the plants bought in nurseries and big chain retailers such as Aldi, B&Q and Homebase. Most of the plants contained a cocktail of pesticides, commonly fungicides and insecticides. Only two of the 29 plants that were examined were found to be pesticide-free. 76 percent contained at least one pesticide, and 38 percent contained two or more insecticides. 70 percent of the plants under investigation contained neonicotinoids. Other insecticides found were pyrethroids and chlorpyrifos on 10% and 7% of plants, both more toxic via contact than consumption. The concentrations of neonics found harmful to bees are one to ten

parts per billion (ppb). Although a small amount, it is not negligible, as exposure to such levels has been found to impair bee navigation, reproduction and supress their immune system (Goulson, 2019). The study found neonics concentrations of imidacloprid at up to a maximum of 29 ppb, clothianidin at 13 ppb, and thiamethoxam at 119 ppb (Lentola *et al*., 2017). Also a widely used neonicotinoid insecticide, Di Prisco et al., (2017) assess clothianidin's effect on the immune system of vertebrates and find that clothianidin poses a risk of immunotoxicity. Fungicides have also been found to be toxic to bees, blocking their detoxification pathways, increasing the toxicity up to 1000 times. Additionally, Wang et al. (2020) evaluate the potential synergy of toxicity of pesticides on pollinators. Examining chlorpyrifos, acephate, tetraconazole, with nine pyrethroid insecticides to honey bees, the authors find that the exposure of bees to the mixture "might lead to severe injury to crop pollinators" (Wang, Zhu and Li, 2020: 6971).

While it may be possible to avoid buying and planting flowers dowsed with pesticides, it is harder for humans and wildlife to avoid exposure to pesticides in green spaces. Local authorities across the UK spray "huge amounts of herbicides (mainly glyphosate) to keep pavements tidy" and stop weeds covering paths (Goulson, 2019: 90) as well as fungicides[6], insecticides and rodenticides in playgrounds, road verges, cemeteries, pavements and around council houses, university campuses, car parks, hospitals, private housing developments, shopping centres and schools (Pesticide Action Network UK (PAN), 2017). The exact amount is nondisclosed and unrecorded but an estimate for a global, yearly use of glyphosate for non-agricultural use come to about 80,000 tonnes. In the UK there are campaigns

[6] Wang et al. (2020) note that synergistic interactions between fungicides and insecticides may increase risk to pollinators, especially when farmers routinely use tank mixing of the fungicide with other insecticides on crops to reduce spraying cost.

to make cities pesticide-free (including one here in Sheffield!), led by the NGO Pesticide Action Network (2017). With hedgehogs and other wildlife increasingly turned out of their natural habitat and deprived of food sources, they migrate to towns and cities, thus coming into contact with pesticides in areas where they forage for food.

4.5 Policy and its current challenges

As discussed in section 4.2, there is an urgent need to consider adjuvant toxicity in the authorization process. As Defarge et al. (2018: 156) emphasise, the safety and toxicity measures currently "are insufficient to ensure safety". This section will consider and discuss the policy challenges and shortcomings and will attempt to provide alternative suggestions to current legislation and authorisation processes.

Until 1986, the United Kingdom had no statutory regulations for the approval and registration of pesticides. Instead, a voluntary scheme known as the Pesticides Safety Precautions Scheme (PSPS) operated between government, manufacturers, and suppliers (Rothstein *et al.*, 1999: 244). Pesticide production is under the authority of the Food and Environmental Protection Act 1985 and the Control of Pesticides Regulation 1986 (COPR) in the UK. Part III of The Food and Environment Protection Act 1985 (FEPA) aims to protect the health of human beings, creatures and plants; safeguard the environment; secure safe, effective and humane methods of controlling pests; and make pesticide information available to the public. This is implemented by the Control of Pesticides Regulations (1986) (COPR), as amended by the Control of Pesticides (Amendment) Regulation 1997, and by the various Maximum Residue Level Regulations. The Control of Pesticides Regulation (1986) (as amended) (COPR) states that all pesticides must gain approval

before their sale, supply, storage, advertisement or use are permitted in GB. It is an offence to use non-approved pesticides.

In the EU pesticides are under the directive 91/414 (Authorization Directive) which provides a community-wide framework for the regulation of pesticides. The Pesticides (Maximum Levels in Crops, Food and Feeding stuffs) (England and Wales) Regulations 1999; The Pesticides (Maximum Levels in Crops, Food and Feeding stuffs) (Scotland) Regulations 2000 all define the maximum concentration of pesticide residue likely to occur on or in food. These are not safety limits and exceedance does not necessarily imply a health risk.

The Control of Substances Hazardous to Health Regulations 1994 (COSHH) requires that exposure to substances hazardous to health is either prevented or where this is not reasonably practical, adequately controlled. Anyone wishing to use a pesticide should determine (1) whether its use is necessary, (2) which product poses less risk but is still effective (3) assess which measures can be used to minimise exposure to the pesticide. Codes of good practice have been issued by DEFRA to assist farmers to meet their legal obligations. Some have statutory status. However, failure to comply is not an offence.

Many debates centring on the toxicity and thresholds of pesticides have taken place amongst scientists and regulators. As PAN (2019b) suggest, our regulatory system is ill equipped to protect the natural environment from pesticide cocktails and does not assess or monitor the residues to which humans and wildlife are exposed to. As mentioned above, pesticide mixtures are not monitored in soil (Silva *et al*., 2019; Payá Pérez and Rodríguez Eugenio, 2018) which is further compounded by the scarcity of studies conducted on soil contamination of pesticide residues. Those that do, concentrate on one pesticide alone.

4.5.1 Toxicity measures and indicator organisms

Current pesticide risk assessment relies on the comparison of toxicity exposure rations (TERs) and trigger values which are set according to ecotoxicological concentrations tested on indicator organisms such as earthworms, mites and nitrogen transformation microorganisms (Silva *et al*., 2019: 1533). This is usually achieved by a mortality threshold designated at LC50 - a toxic concentration is deemed toxic when 50% of the indicator organisms die when exposed to the substance. This is only recorded at acute or short term toxicity, or chronic/reproductive toxicity. The doses are given at twenty-four and forty-eight hours, and seeing how many of the organisms are dead. Straub et al. (2020: 1) plead that the current ecotoxicological risk assessments (ERA) are misleading because they measure survival, rather than long-term harm brought on through sub-lethal effects that are "far more common and likely having severe consequences".

However, the sensitivity of indicator organisms may not be as reliable as the sensitivity of other species from the same taxonomic group, which may result in underestimating pesticide toxicity (Ockleford *et al.*, 2017 in Silva *et al.*, 2019). Another aspect of pesticide toxicity that is not taken into account by policy registration relates to community shifts (Silva *et al*., 2019). Community shifts relate to the way in which pesticides may affect the equilibrium of organisms, both beneficials and pathogens. These can be easily disturbed by pesticide residues. Liess et al. (2019: 2) note that the application of the ecological risk assessment framework (ERA) "did not prevent adverse effect of pesticides on non-target organisms".

At the EU level, there are no ecotoxicological endpoints required for testing for mixtures by EFSA (European Commission Directorate-General for Health and Food Safety, 2017). Therefore, "urgent attention is required to address the toxicity of the mixtures of residues present in soil" (Silva *et al*., 2019: 1542).

Mesnage et al. (2019) recommend that laws must be enacted to disclose the chemical composition of pesticide products, a change that needs to be considered also in determining the authorised maximum residue levels (MRLs) that are supposed to ensure the safety of food and feed. However, livestock feed also ignores mixtures and studies are only performed on the active ingredients (Mesnage and Antoniou, 2018).

4.5.2 Doses and testing

One of the key arguments for safety needed to satisfy pesticide registration regards doses. However, this argument is based on the testing that is done to estimate the acute toxicity. As mentioned above, safety tests examine only one 'active' ingredient at a time. Based on short-term toxicity tests, conducted over 24 and 48 hours, or a longer chronic exposure test typically lasting 90 days. The results from rat testing are extrapolated to assume safety for humans.

Following PAN (2019b), key recommendations for policy would be to propose a new agricultural bill that not only significantly reduce overall use of pesticide in agriculture and urban settings, but also start assessing combined toxic loads, and move away from only testing and focusing on one element. There are no adequate soil protection policies in place to compare and reverse the hidden threat.

Hayes et al. (2006) who examine the cocktail effect of insecticides, fungicides and herbicides on frogs demonstrate that the requirement for authorisation to test a single pesticide mixture and a single 'active' ingredient is insufficient to address and assess the sub lethal, developmental and long-term effects of pesticides on amphibians.

It is clear that pesticide cocktails are poorly understood and studied. Therefore, given their widespread occurrence, it is vital that regulatory frameworks

reflect the negative and deleterious effect these have on human, nonhuman health and the environment.

Mesnage et al. (2019: 143) urge that policy makers produce a consensus for product labelling for the full ingredients of a formulation: "the toxicity of co-formulants should be fully acknowledged and misleading terms such as 'inerts' should be avoided". In addition, the authors recommend that given the toxicity of co-formulants, farm animals and human populations should be monitored for their daily intake of adjuvants in food in order to determine health implications that arise from exposure to these chemicals.

4.5.3 Policy weakening following Brexit

In April 2018 the EU voted on a near-total ban on neonics following a devastating review of bee population decline (CEH, 2018). However, following Brexit, researchers uncovered a significant weakening of the pesticide approval process as part of the changes under the European Union (Withdrawal) Act 2019, and a risk that the role of scientific evidence in pesticide regulation could be watered down (Lucas, 2019).

EU exit will see the UK negotiate its own Free Trade Agreements (FTAs) for the first time in four decades. The UK has some of the world's most stringent safetly limits in the world when it comes to the approval of pesticides (PAN UK and Sustain, 2020). Following Brexit, this places considerable pressure for the UK in future trade negotiations. For example, American grapes, for example, are allowed to contain 1,000 times the amount of the insecticide propargite, a pesticide linked to cancer and classified as a 'developmental or reproductive toxin', than their UK equivalents.

Any weakening of UK pesticide standards via trade deals poses risks not just to human health but also to the environment. These risks also pose an economic threat to the future of UK agriculture. If UK food starts to contain higher levels of more toxic pesticides then British farmers will struggle to meet EU standards, thereby losing their primary export destination which currently accounts for 60% of UK agricultural exports.

4.5.4 Agrochemicals and their lobby power

Agrochemical corporations are influential in the development of policy on pesticide use and regulation. Their argument against bans on neonicotinoid pesticides is that there is scientific uncertainty about the harm caused by this class of pesticides, and no direct causative relationship. They claim that the science is too complex and incomplete and therefore should not be acted upon. The agrochemical industry conducts, funds, and otherwise supports scientific research that aims to find that elusive, and impossible-to-find causation (Ellis, 2019).

In relation to harm to bees, Ellis (2019: 105) argues that in the Ontario bee debate about neonics (Clappison and Solomon, 2016), agrochemical corporations intervened in multiple ways, potentially weakening the legislation and that "the partial ban on neonicotinoids in Ontario does not go far enough to address the pollinator crisis, partly due to the role of agrochemical corporations such as Bayer CropScience and Syngenta, manufacturers of neonicotinoids, in the development of the policy". Ellis (2019) as well as PAN (2018) views the partial ban as a 'win' for the agrochemical companies because its effectiveness in keeping insects and animals safe is limited, due to the persistent nature of neonics. Corporate manipulations of public policy-making over the banning of neonicotinoids is just one example of the power and influence of agrochemical corporations. In the case of the so-called

Monsanto Papers, “Monsanto’s internal documents declassified by the US courts in 2017, seem to show that since 1999, Monsanto was aware of the carcinogenic effect of glyphosate and tried to impede the work of competent scientific bodies by disguising the data proving the danger of this product”. According to these documents, Monsanto financed experts to carry out scientific research to defend the non-carcinogenic nature of glyphosate (Donati, 2020). Regulatory science then emerges as a problematic meeting ground between the institutional practices and professional expectations of science and of policy making (Rothstein *et al*., 1999).

Some solutions to the policy issues presented above include switching to a different metric to measure pesticide use, as weight no longer indicates toxicity. PAN UK is calling for the UK to adopt two new metrics: treatment frequency index (TFI) and number of doses (NODU). Using these new metrics would indicate to what extent UK citizens and the natural environment are exposed to the harmful impacts of pesticides. It would also assist in developing a reliable indicator for the UK’s post-Brexit agricultural subsidy payment scheme. Adopting meaningful metrics for measuring pesticide use will be vital to underpin such a system (Pesticide Action Network UK (PAN), 2018). Another important factor in successful change in policy lies in the need to disrupt and complicate the agrochemical narrative (Confino, 2012; Ellis, 2019).

Finally, while pesticides are an important last-resort tool in a larger toolkit available to farmers, they have an adverse effect on non-target wildlife. Regulators attempt to balance the negative impact of pesticides with the potential economic benefit and health risk to society. Mitigation requires a shift from relying solely on pesticides and rodenticides to an ecological paradigm, and improvements in site management.

4.5.5 Investigation schemes and reporting units for pesticide poisoning in the UK

While acute poisoning is tested in the registration process, toxicological monitoring systems of wildlife disease (such as cancer, changes in reproduction), is only reported in a limited way in incidences of poisoning, and with chronic poisoning of wildlife rarely described.

Very few countries have launched a wildlife surveillance programme tracking wildlife exposure to pesticides. Among direct exposure cases are accidental poisoning resulting from intended (licensed) use, as well as illegal poisoning (Berny, 2007). Reviewing the wildlife poisoning investigation systems and their effects regarding wildlife exposure in Britain and France, Berny (2007) considers that poisoning can occur even if the product has been used according to the product label. For example, avian mortality has been documented by Mineau (2002, in Berny, 2007) after 'regular' use of pesticides in agricultural fields.

There are no post-registration schemes to monitor exposure of wild mammals to pesticides (Vijver *et al.*, 2017). However, in the UK The Wildlife Incident Investigation Scheme (WIIS) (Scottish Agricultural Science Agency (SASA) in Scotland on behalf of the Environment and Rural Affairs Department of the Scottish Executive (SEERAD) is a unit devoted to the post-marketing surveillance of pesticide poisoning in wildlife, and acts as a post-registration surveillance in a fashion, albeit the data collated by the WIIS are not currently taken up by the GOG (Berny, 2007; Taylor and Giela, 2006). Pesticide poisoning surveillance falls under the competence of DEFRA who delegates this duty to the HSE who delegate this to CRD and to Natural England under the WIIS.

However, the chemical analyses of the pesticide residues are conducted by the Wildlife Incident Unit (WIU) at Fera Science. In 2015, 75% of Fera Science was

privatised and sold to Capita, with DEFRA retaining 25%. As Fera also conduct tests for private industry, there may be a conflict of interests, and there is a danger that commercial consideration will skew Fera's priorities. Fera made a profit of £1.6m last year as a government entity, on sales about £40m (Bawden, 2015).

At the WIU, assessments are made to determine which residues are present in the animal's tissues and whether the cause of death can be established as a result of exposure. This causal link is only made, however, when there is information on baits and local use of pesticides, usually organophosphates, as they are fast-acting compounds and cause death quickly. However, for compounds that are acting slowly and sub-lethal exposure occurs where the victim dies over a period of hours or days and becomes easily predated upon, it is more difficult to establish the cause of death and link it to pesticide poisoning (Berny, 2007; Köhler and Triebskorn, 2013). Post mortems and chemical analyses of specific body tissues are carried out but the scheme is not adequate for monitoring the extent of pesticide poisoning because finding sick or dead animals are rarely reported or found. Therefore there is a clear bias in the WIIS data towards more visible species or those of public interest (Berny, 2007).

The WIIS records and investigates together with the police's wildlife unit any pesticides poisoning that is reported on. The wildlife poisoning surveillance systems only check for acute poisoning as the cause of death, and do not take into account or consider indirect effects. However, the latter may have even more hazardous, long-term consequences for wildlife (Berny, 2007: Mason *et al.*, 2013).

4.5.5.1 Analysis of the WIIS 2019 Report and Excel Spreadsheet

All of the pesticides discussed thus far are involved in acute poisoning of wildlife. The most commonly reported are insecticides such as organophosphates and

carbamates, rodenticides SGARs and strychnine, and molluscicides such as metaldehyde and methiocarb. The WIIS 2018 (WIIS, 2019) excel spreadsheet analysis indicates the cause of death was determined in 204 incidents. 138 incidents (30.07% of all 459 incidents accepted into the WIIS) tested positive for pesticides and other chemicals. 54 of these incidents were attributed to pesticide poisoning. Interestingly, starvation has been noted in 36 cases as the cause of death and as Holmstrup et al. (2010) indicate, this may be the cause of death that was instigated by poisoning.

However, the WIIS report has several shortcomings, especially if it is to be considered a post-registration monitoring scheme. Firstly, a full written narrative report has not been available since 2006. Only the excel spreadsheet and the quarterly summaries are available, which would make any results and conclusions not readily available to influence policy. The Scottish WIIS carried on making the reports until 2011. In addition, while the animals are listed in the excel spreadsheet, the exact zoological specie is not named, nor does the conservation status. For example, both terms are used: sea eagle and white tailed eagle but there are other eagles in the family of Accipitridae, so there is no way of knowing if the same species is referred to so I kept the entries separate. As my analysis, in which I crossed checked the names of poisoned animals with conservation databases, demonstrates 11 species are classified as Amber, 12 are Red, and 16 are Green. This emphasises the need for the WIIS to produce more detailed reports. Omitting this information means that there is no way of keeping track of vulnerable species affected by pesticides and biocides.

Berny (2007) notes that the final decision to carry out toxicological examinations heavily relies on the financial burden incurred. Finally, rethinking of

our current approaches toward risk assessment is urgently required (Vijver *et al*., 2017). The authors argue that the registration and re-registration applications should be an iterative process whereby the assessment relies on data collected from post-registration monitoring of wildlife exposed to pesticides "and/or cross-ecosystem calculations and discuss how such monitoring can be incorporated as an essential safety lock in environmental risk assessment and management to curtail the ongoing impairment of ecosystems, including their biodiversity, their functioning, and the services they provide" (ibid.: 860).

4.6 Pesticides effect on wildlife, humans and climate change

4.6.1 Humans

The negative health effects of pesticides on human health, and in particular farmers has been devastating (Gillam, 2017). Mesnage et al. (2019: 140) report that between 1981 and 1985 the major two illnesses related to pesticide incidents were eye (50%) and skin (35%) injuries, with glyphosate ranking "third among all pesticides causing occupational illness in California". However, biomonitoring of neonics in human population is very limited (Mesnage *et al.*, 2018). Testing for authorization purposes are performed by an external company, not the agrochemical company, and on the active chemical only. However, this kind of testing does not represent the toxicological properties of a commercial pesticide mixture, used both in agricultural and urban, private or amenities settings (Mesnage and Antoniou, 2018).

Mesnage et al. (2019: 2) note that the domestic use of insecticides, fungicides (for example, as furniture treatment), or herbicides used in gardening "could be a major source of human exposure" to pesticides. Chronic exposure and effects on mammals are never tested (Mesnage and Antoniou, 2018). For hibernating mammals, pesticides that promote lipid accumulation may present a threat. Mesnage and

Antoniou (2018) report that POEA-based adjuvants can promote lipid accumulation, which cannot be achieved with glyphosate alone.

Adjuvants are found in groundwater (Mesnage and Antoniou, 2018). For example, the authors report that Nonylphenol is of particular concern, as it has found its way into UK rivers and as a result of its endocrine disruption properties, is feminizing wild fish. Little is known about the contamination of the environment by adjuvants in pesticides.

4.6.2 Wildlife vertebrates and mammals

"Although vertebrates are the intended target of only 2% of pesticides on the market, the unintentional impacts of pesticides on vertebrate populations have been marked and are well documented" (Gibbons *et al.*, 2015: 103). Gibbons et al. (2015) review 150 studies on neonicotinoids effects on vertebrate wildlife, both direct and indirect (through the food chain) effects. They focus on two neonics: imidacloprid and clothianidin, and a third insecticide – fipronil, also a systemic insecticide. They find that all three substances exert sub-lethal effects, including impairing the immune system, reduce growth and reproductive success.

Imidacloprid (neonicotinoid) and chlorpyrifos (organophosphate) have been found to damage songbirds' ability to migrate as they are exposed to treated seeds, sprays, sprayed soils, and prey in agricultural land (Eng, Stutchbury and Morrissey, 2017; Leahy, 2019). Examining the effects of these two insecticides on the white-crowned sparrow, the authors found that the control group maintained body mass, a very important element for successful migration and energy storage required for the feat, and they were also able to find north throughout the experiment. However, the dosed birds with imidacloprid "exhibited significant declines in fat stores and body mass, and failed to orient correctly", and the birds dosed with chlorpyrifos also failed

to orient north (Eng *et al.*, 2017:1). These findings have negative implications on wild bird population levels, because unsuccessful migration means less breeding opportunities, and of course, higher mortality.

Hayes et al. (2006) examine the cocktail effect of nine pesticides (herbicides, fungicides and three insecticides) used on cornfield in the US on frogs. The authors find that pesticides acted as immunosuppressant (to what degree it is difficult to determine) and acted as an endocrine disruptor. Köhler and Triebskorn (2013) similarly report the same immunosuppression in oysters, in seals, amphibians, and plankton, thus revealing that pesticides affect all levels of the ecosystem, causing increased susceptibility to infections, parasites and disease.

In the field of ecotoxicology there is an over-reliance on laboratory direct toxicity (acute) work which limits the ability to understand how pesticides impact the field in reality, under real environmental conditions. The most commonly studied mammals are rats, *Rattus norvegicus*, and the mouse, *Mus musculus*. Standard toxicity tests for pesticides on terrestrial vertebrates is through acute study. They are fed an estimated dose of pesticides associated with the death of half of the victims and recorded as LD50 – lethal dose. Sub-lethal or reproductive effects are not included in the classification of toxicity. Given the highly limited range of species tested, and the limited assessment of what is termed end point, it is easy to see the importance of the wide-reaching effect of pesticides on the natural world, and particularly on hedgehogs. Another failing of risk assessment as Gibbons et al. (2015) highlight is "the underestimation of interspecies variation in insecticide susceptibility […] too few species are typically tested" which impacts the thresholds set for 'hazard doses' (HD5).

Sub-lethal effects by neonicotinoids and fipronil manifest through reproductive problems such as reduced sperm production, fertilization process, reduced rates of pregnancy, higher rate of embryo death, problems with birth such as stillbirth, premature birth, and reduced weight of offspring.

For mammals, in addition to adverse effects on reproduction, neonicotinoids and fipronil also affect "genotoxicity and cytotoxicity, neuro-behavioural disorders, lesions of the thyroid, retinal atrophy, reduced movement, and increased measures of anxiety and fear. Even doses as low as 0.21 and 2.0 mg a day of imidacloprid have been shown to have immunotoxic effects and reduce sperm production in rats (Gibbons et al., 2015: 110). One of the questions posed by Goulson (2013) is whether levels of exposure can impact populations of vertebrates. Risks in mammals include "reduced reproduction, premature deliveries and deformities in foetuses (Gu *et al*., 2013).

The concentrations hedgehogs and other vertebrates may be exposed to may vary dramatically, based on their habitat and movement between contaminated or uncontaminated areas. Peveling et al. (2003) is the only study demonstrating the importance of the health and balance of the ecosystem that has documented the impact of fipronil on the food chain. The authors demonstrate how the use of fipronil to control locusts in Madagascar have caused a decline in the native hedgehog population, *Echinops telfairi*, the lesser hedgehog tenrec (see chapter 5). Food chain breakdown caused by pesticides has been documented in partridge chicks feeding on insects contaminated with herbicides, eaten off of the plants insects feed on, resulting in chicks dying after herbicides were sprayed. The insects disappear and the partridge chicks eventually starve (Berny, 2007).

4.6.3 Climate change

Climate change influences pesticide use directly and indirectly (Delcour, Spanoghe and Uyttendaele, 2015). Pesticide efficacy is strongly associated with environmental conditions, in tandem with changes in pests. In the long-term (2030–2050), mean temperatures are expected to increase by more than 5 ∘C in several regions of the world with climate change. These two factors, increasing CO2 levels, and temperature fluctuation are considered to have the most significant effect on future agricultural production (Matzrafi, 2019). Holmstrup et al. (Holmstrup et al., 2010) provide a review of over 150 studies examining the relationship and interactions between chemical pollutants and environmental stressors such as heat, cold, desiccation, oxygen depletion, pathogens and immunity factors. The authors find that more than 50% of studies synergistic interaction were reported, with 70% of the interactions found to be compromising human immune systems.

Fossil fuels are used in the production and transportation of pesticides their use supports unsustainable agriculture and pesticides affect the soil's ability to sequester carbon.

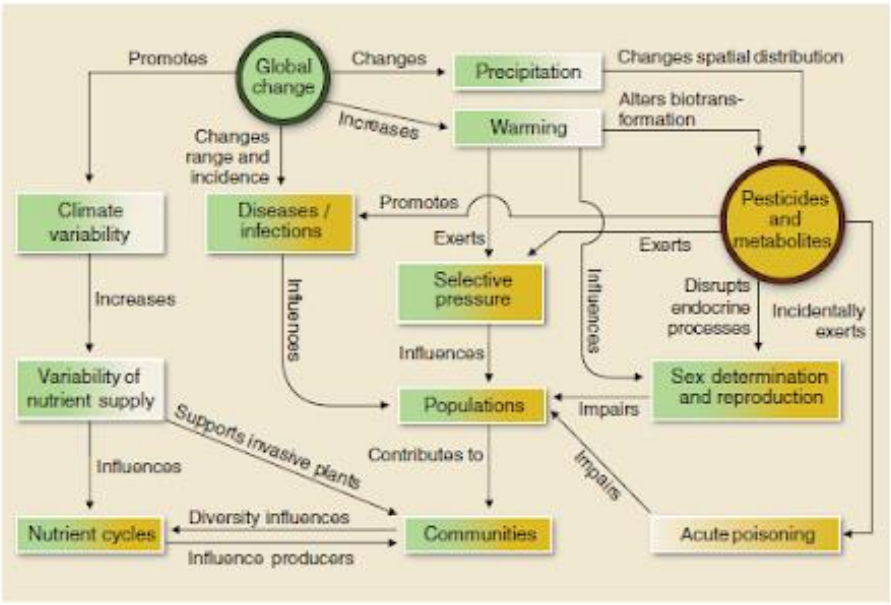


Fig 11: Anticipated interactions between climate change and pesticide effect on the physiology and ecology of wildlife (Köhler and Triebskorn, 2013: 763).

As climate change progresses, the increased level of CO2 in the atmosphere will increase the tolerance of invasive grass species to glyphosate (Pesticide Action Network UK (PAN), 2018).

Legislation, economy, technology, crops, pests and pesticides themselves are influenced.

Köhler and Triebskorn (2013) conclude with a future warning: climate change will definitely interact with the spatial distribution of pesticides. Although the scale of the interaction is difficult to ascertain, it is possible to speculate that elevated

water temperatures may affect the way in which pesticides are broken and metabolised. For example, changes in precipitation may affect the rate of evaporation and deposition. The authors assert that "global warming is decisively expected to affect the ecotoxicological potency of pesticides". Finally, Delcour et al. (2015) predict that in the future, more frequent pesticide applications are expected. A shift to other management systems and a different pesticide scope is expected, where complex interactions and climate variability will decide on the risks to agriculture.

As climate change progresses, the increased level of CO2 in the atmosphere will increase the tolerance of invasive[7] grass species to glyphosate (Pesticide Action Network International, 2016).

4.7 Alternatives to chemical pesticides

4.7.1 Biopesticides or Biologicals

One of the solutions currently pursued by agrochemicals as an alternative to pesticides are biologics or biopesticides defined by the EPA as "products derived from natural materials such as animals, plants bacteria and certain minerals" that generally are targeted, affecting only the pest and closely related organisms.

[7] The issue of invasive, non-native species has long been debated. In Silent Spring, Carson tells of the Gypsy moths, a non-native species brought to the U.S by a scientist in Medford Massachusetts who hoped to breed them with silkworms to develop an American silk industry (Carson, 1962). His plan failed, and some of the moths escaped and reproduced. Foresters feared that the dramatically increased population of the moths would decimate the oak trees and believed the spraying was necessary. A similar problem to save elm trees from the Dutch elm diseases through spraying against the bark beetles started in the East and Midwest. Carson was worried because there hasn't been sufficient research about the dangers. Following the spraying, people started noticing dead songbirds in the city and suburban areas where the trees were sprayed and in 1957 a group of concerned citizens filed a lawsuit to the federal court seeking injunction against DDT spraying. The spraying of the Dutch Elm disease didn't only kill the bark beetles that carried the fungus from tree to tree, but also killed robins and other birds that ate insects, earthworms and leaves. The birds were controlling the insect population were now killed, with no one left to control the insect population (Carson, 1962).

Biopesticides or biologicals as an alternative to chemical pesticides are outside the scope of this project. However, this issue is discussed by some interviewees and merits a short consideration.

Goulson (2019) gives the example of Swiss growers who use a virus as a biopesticide to infect caterpillars in apple trees, suggesting that using a biological is more favourable as it is harmless to most insects and to humans.

However, much like 'miracle' pesticides introduced thus far, Köhler and Triebskorn (2013: 763) caution against biologicals and exemplify the risk inherent in a biological pesticide spinosad that had sub-lethal effects on natural enemies of pests and "drastically affect demographic traits in parasitoids and predators". In other words, while this alternative to conventional pesticides did not kill natural pest enemies out right, it did cause secondary negative effects via poisoned prey.

4.7.2 IPM

The widespread adoption of neonics moved farmers and agricultural practices away from true IPM. The prophylactic use of pesticides goes against the long-term strategy of Integrated Pest Management (IPM) (Goulson, 2013). IPM is an approach to pest management that prioritises pest monitoring, making the most of using biological controls and creating an ecosystem to control pests, leaving broad-spectrum pesticides as last resort (Goulson, 2013; Pesticide Action Network UK (PAN), 2019b).

While IPM is more labour intensive, there are many working hands to be had. The intensification of farming and the reliance on technology meant that less people are employed on farms, collapsing rural communities throughout the developed

world. Employing a true IPM-based agriculture could provide many with employment (Goulson, 2019).

In England alone, farmers were paid £400 million per year in 2009 to employ more environmental agricultural practices (Goulson, 2013). Despite this, biodiversity indices show a significant decline, the reasons for this are multifactorial, yet pesticide remain a significant one. While agrochemicals claim most UK farmers are already employing IPM, most conventional farming continues to rely on pesticides prophylactically and as their main tool.

4.8 Conclusion

Over the last 20 years the use and application of pesticides shifted from reactive to prophylactic. Now many fungicides, pesticides and herbicides are applied to the seeds before sowing, with farmers 'stuck' on a pesticide treadmill (Mason *et al*., 2013; Gillam, 2017). "The chemical companies are 'like the drug cartel warlords that get their people addicted to their drugs'" (Gillam, 2017: 236). Resistance of plants and target species incurs larger and larger doses of applications. Neonicotinoids working systemically through plants, reach target and non-target species, negatively affecting them directly and sub-lethally. Insects die en masse, not only acutely but chronically. Sub-lethal effects weaken the immune system of nearly all living beings and has been demonstrated in bees, fish, amphibians, birds and mammals (Mason *et al.*, 2013; Hayes *et al.*, 2006).

The segmentation of responsibility and accountability chain is evident in the process of formulating, registering, discharging and applying pesticides. Starting with the production of adjuvants or co-formulants, these involve the manufacturing of chemical components that are specifically added to increase the efficacy of the

active ingredient, and are “inert” only with respect to the pesticide's mode of action targeting a given class of pests. The classification of a compound as ‘inert’ or ‘active’ has serious consequences for pesticide manufacturers and users. It determines the set of tests that have to be performed to assess the toxicity of pesticide ingredients (Mesnage, Benbrook and Antoniou, 2019). In most parts of the world, pesticide toxicity tests for regulatory purposes follow a common set of guidelines and standards set by the Organisation for Economic Co-operation and Development (OECD), in the hope of facilitating cost-effective pesticide regulation, international trade, and limiting the number of animals studied. The identity and concentration of the co-formulants in end-use pesticide products is proffered as confidential business information (CBI) by industry and accepted as such by regulators, and hence is rarely disclosed on product labels or via any publicly accessible source. “Little information beyond the concentration of the active ingredient is routinely available on end-use pesticide labels. As a consequence, scientists rarely have access to compositional information, nor descriptions of the structural characteristics of, for example, different POEA surfactants, and how such differences impact toxicity” (Mesnage *et al.* 2019: 138). Because adjuvants can degrade, their breakdown residues also needs to be considered.

This chapter has reviewed extant literature discussing the negative effects of intensive farming, and the pesticides they enchain, as is now practiced in most western countries, and in the UK in particular. Despite the move away from organochlorines, adverse effects are still experienced by mammals exposed to new pesticides. To summarise, indirect effects of pesticides on mammals include:

1. Insecticides reduce the abundance of insects – food for insectivores such as hedgehogs

2. Rodenticides reduce the abundance of small mammals – hedgehogs themselves, and can cause secondary poisoning in hedgehogs

3. Herbicides decrease plant abundance, which in turn decreases invertebrates that depend on them – decrease food for herbivores. This in turn decreases food availability for insectivores.

4. Herbicides decrease plant abundance, health and diversity which leads to a loss in habitat for small mammals. E.g., hedges for hedgehogs (Graham *et al*., 2018).

Are there alternative systems of agriculture? Goulson (2019) urges that we turn to several. One of them is adopting a broader and more accessible system of allotments. In 1887, after decades of riots and protests by the peasants and the dispossessed, fighting against land-grabbing, the Allotment Act made it compulsory for councils to provide allotments, and have become an important resource during WWI and II. Allotments can produce "between four and eleven times the wright of produce that one might get from an intensively farmed arable field" (Goulson, 2019: 237). The reason for this, as suggested by Goulson, is due to the variety of crops that can be fit into a single small space of an allotment, resulting in fewer pests as the biodiversity and ecosystem of an allotment is maintained where no pesticides are used, mimicking a natural ecosystem. Allotments are also a wonderful way to keep fit, gardening aids in mental health, and helps produce healthy food.

Managing pests without the interference of pesticides requires a good understanding of biology and the intricacies of ecological balance. The only way to ensure the protection of people and the environment is to greatly decrease the use of pesticides and cease to use them prophylactically, and adopt a true form of IPM.

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Chapter 5: Hedgehogs: The canary in the ecological coal mine

5.1 Introduction

Some animals, such as the megafauna, are charismatic and thus receive most of the public attention. Rhinos, elephants, tigers and pandas are made highly visible by international wildlife organisations. Warwick (2008: 268) urges us to put aside those 'poster-children', those magnificent unattainable 'supermodels' as he calls them, and focus on finding true love: 'because this is what we need. Love and compassion for nature are the best ways to ensure we all, humans and animals, continue to survive on our one and only planet". Hedgehogs, an icon for Britain's wildlife, is an animal we can all meet, relate to and fall in love with. Hedgehogs can be our link to a disappearing natural world that can reignite that lost contact, "like the girl or boy next door, the hedgehog is what true love is all about" (ibid.).

The UK's poor hedgehogs are fast disappearing (Goulson, 2019). While there are no accurate estimates of population size, extant evidence suggests they have undergone a colossal decline in the last 30 years, with their population currently below 1 million. Some estimated figures suggest hedgehogs have declined by 50% in the last 15 years with factors attributed to loss of food sources: a dramatic decline of insects and slugs in intensive farmland, poisoning by slug pellets, road accidents and predation by badgers (Hallmann *et al.*, 2017; Goulson, 2019).

This chapter will tell the story of the hedgehog, an ancient creature that has long-lived amongst humans as a contributing member of some of the oldest societies. Their particular and important yet under-researched ecology and contribution to the health of the ecosystem will be outlined, and how their imminent disappearance is a

sign of worse things yet to come, making them a true canary in the minefield of a degrading ecosystem.

5.2 Hedgehogs: ancient friends

Hedgehogs (Erinaceus sp.) are an ancient species, as written accounts dating 2,300 years confirm (Morris, 2018). Mentioned as early as in the first century CE were, in Pliny the Elder's writing (Morris, 2018) who describes hedgehogs gathering grapes on their spines, although fruit has never been confirmed in hedgehog faeces or stomachs.

The earliest documented encounters between hedgehogs and people were found in household objects and wall carvings from ancient Egypt. One of the most famous wall carving depicts a hedgehog eating a big locust (see fig. 12 below), pests that have been plaguing Egypt and destroying crops. In fact, the hedgehog is mentioned in the Bible in Zephaniah 2:14: *Flocks will lie down in her midst, All beasts which range in herds; Both the pelican and the hedgehog Will lodge in the tops of her pillars;*

רֲבָצוּ בְתוֹכָהּ עֲדָרִים כָּל־חַיְתוֹ־גּוֹי

בְּכַפְתֹּרֶיהָ יָלִינוּ קוֹל יְשׁוֹרֵר בַּחַלּוֹן חֹרֵב בַּסַּף כִּי אַרְזָהּ עֵרָה גַּם־קָאַת גַּם־קִפֹּד .יד

Being natural pest-controllers, hedgehogs may have won a place of importance on the wall, alongside humans and larger animals (Morris, 2018). Not only were hedgehogs recognised as useful for pest control in ancient Egypt, Egyptians also recognized the link between soil fertility and earthworms, illustrated in Cleopatra's somewhat extreme decree that anyone who takes earthworms out of Egypt was to be killed (Goulson, 2019).

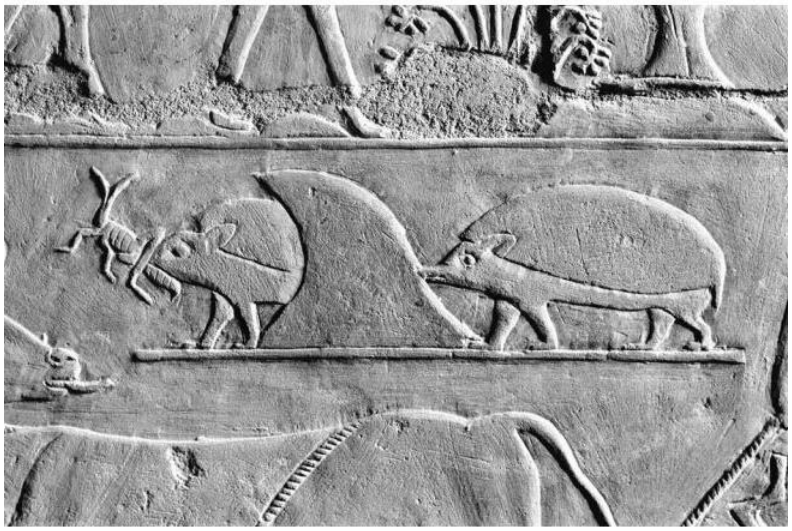

Fig. 12: Hedgehogs depicted on a wall carving eating a locust (Morris, 2018: 339).

In the nineteenth century, hedgehogs were used as natural pest control around kitchens and houses. They were bought and released to kill cockroaches, crickets and other unwanted creatures. Gilbert White (White, 1883; Morris, 2018) in his writings of *The Natural History and Antiquities of Selborne* recorded that a Mr. Davy, "has had forty hedgehogs at a time, he sold them to shopkeepers to sell again; the price, wholesale, was from eight shillings to twelve shillings we dozen". Selling hedgehogs by dozens suggest that they were a popular 'commodity', and their high price suggests their services were valuable.

The name hedgehog originated from the old Anglo Saxon name 'il', a contraction echoing the German name for hedgehogs, *igel*. In the fifteenth century, Shakespeare referred to them as hedgehogs, hedgepigs and urchins (Morris, 2018). Hedgehogs were not only regarded as a useful species in terms of pest control, they were also eaten. Gypsies were known to bake hedgehogs by encasing them in clay,

roasting them on a fire, after which the clay can be broken off together with the spines (Morris, 2018).

5.3 Hedgehog ecology

The European hedgehog, *Erinaceus europaeus*, is widely distributed in Western Europe (Hof and Bright, 2012). In Great Britain and Ireland, hedgehogs are widely found but are absent from some of the Scottish islands. In rural areas, hedgehogs live along woodland edges and hedgerows in meadowland and rough pasture, but are scarce or absent in marshy or upland habitats (such as moorland) and in coniferous woodland (Wilson and Wembridge, 2018).

Hedgehogs are 'generalists', feeding on a range of foods—mostly on soil invertebrates such as beetles, caterpillars, earthworms - a favourite hedgehog snack, and slugs, but also on carrion and birds' eggs. In urban areas, they will make use of gardens and amenity grassland, as well as other green spaces. Villages and towns can act as a refuge from pressures in the wider countryside. Hedgehogs tend to ignore arable fields, and recent research (e.g., Williams *et al.*, 2018) has suggested that some will actively make their way to villages. Gibbons et al. (2015: 113) note that food abundance and availability is widely accepted as affecting habitat selection, which may support the reason hedgehogs are moving to urban settings, with the intensification of agriculture, the increased use of pesticides. Indeed, across Europe and North America dramatic and widespread declines of birds associated with farmland have been observed and Tennekes (2010, in Gibbons, 2015) hypothesizes that neonicotinoids were acting indirectly on bird populations in farmlands by reducing the availability of their insect prey.

Between November and the end of March, when food is scarce, hedgehogs hibernate to conserve energy, remaining largely inactive. During the rest of the year,

they are mostly nocturnal, moving over areas of 1-2km in a single night. The minimum area of habitat necessary to support a population is about 1 kilometre (BHPS and PTES, 2015).

5.4 Hedgehogs: a culturally significant species in the UK

Hedgehogs carry a cultural importance in the UK, so much so that there is a 'National Hedgehog Day' designated to take place on 2nd February, borrowed from American tradition related to Groundhog Day, and a national Hedgehog Awareness Week running from 5th to 11th May.

Hedgehogs have been immortalised in literary works. For example, hedgehogs are mentioned in Shakespeare's Midsummer Night's Dream: 'Thorny hedgehogs be not seen; Newts and blind worms do no wrong'.

In more contemporary works, Beatrix Potter (Potter, 1905) has brought to life Mrs Tiggy-Winkle, a hedgehog-washer lady operating a laundrette in the Lake District, modelled after her very own pet hedgehog also named Mrs. Tiggy Winkle, with whom she travelled between London and the Lake District.

Fig 13. Beatrix Potter's Mrs Tiggy-Winkle (Potter, 1905)

The Tale of Mrs Tiggy-Winkle (Potter, 1905) has been so popular, it has remained in print ever since its publication in 1905, complete with paraphernalia of plushies, mugs, figurines, and postage stamps, and the practice of keeping hedgehogs as pets is still current. While it is not illegal to sell hedgehogs, the Erinaceus europaeus species, as opposed to the African Pygmy hedgehog who is smaller, does not make a tame and cuddly pet. Considering they are active at night, in unsociable hours, they tend to travel over 2 kilometres a night so being confined in a cage or even roam around an average household is not enough to maintain their wellbeing.

Hedgehogs are ubiquitous in cultural activities and events in the UK. For example, a hedgehog joke won in the Edinburgh Fringe Festival in 2009 (BBC, 2009; Morris, 2018). The joke was a one-liner: *"Hedgehogs. Why can't they just share the hedge?".* Additionally, hedgehogs feature in cartoons, and in science there is even a chromosome named the 'hedgehog chromosome' due to its structure.

Hedgehogs are regarded as Britain's iconic wild mammal, winning Britain's National Species, at 42% of the vote (Magazine, 2013), Three years later, hedgehogs won the title of Britain's No.1 favourite mammal (Royal Society of Biology, 2016).

5.5 Legal protection

However, hedgehogs are not so well received by some. In fact, it was Queen Elizabeth I who designated hedgehogs as vermin and decreed they should be destroyed, as they were considered to be harming ground nesting bird eggs. Despite being quite innocent, church wardens were authorised to pay for the killing of hedgehogs in 1566, two pence per hedgehog snout (Morris, 2018). It is estimated that the Vermin Acts in 1532 and 1566 led to the killing of half a million hedgehogs (ibid.).

The persecution of hedgehogs did not end with Queen Elizabeth I. The Uist hedgehog cull in which hundreds were killed, was directly influenced by the EU Birds Directive and fuelled by the fear of being imposed with a fine by the European Court of Justice (Warwick, 2008). On South Uist in the Outer Hebrides, an island about 80 km west of Scotland, a significant decline of ground-nesting wader birds was detected. A few hedgehogs were released on the island in 1974, as a way to control garden pests. The conditions on the island, plentiful food sources and a relative lack of predators meant that hedgehogs proliferated to reach about 5000. Large declines of dunlin and redshanks were recorded on the south part of the island, despite being regarded as low in natural predators. However, apart from hedgehogs, the birds, dogs, cats, gulls, crows, and introduced mink may have had a negative effect on their population. However, incriminating evidence pointed the blame at hedgehogs. Detective work found eggshells in 13% of 64 hedgehog droppings that were examined during the birds' breeding season (Warwick, 2008; Morris, 2018).

The Scottish Natural Heritage (SNH) was responsible for keeping an eye on these bird populations and fear of heavy fines may have fuelled the crusade against hedgehogs. The SNH formulated a policy by which hedgehogs were caught and killed in order to deal with the perceived impact on birds. Capturing and translocating the hedgehogs to the mainland of Scotland was deemed wrongful and that the hedgehogs would suffer, and it is in their best welfare to be euthanized. This led to a massacre of more than 700 hedgehogs which halted in 2007 after the reconsideration of other possible drivers affecting the birds (Moss, 2013). Warwick's (2008) extensive research of hedgehog conservation challenges confirms the multiplicity in the social construction of hedgehogs' categories, as a pest, pet and national emblem. Britain's most endearing and best-loved wild mammal, hedgehogs' struggle for survival and fast-dwindling numbers are an indication of climate change. With recent research pointing to changes in hedgehog hibernation patterns and ensuing reproduction outside the spring and summer months, thus confirming a link with climate change, presents risk to young who do not gain enough weight prior to winter months.

Further afield, hedgehogs are also a persona non grata brought to New Zealand, where they are regarded as a threat to nature reserves and ground-nesting birds (Morris, 2018). Hedgehog species in New Zealand are derived from the British hedgehog. The first hedgehogs recorded were brought to Canterbury in 1870, with a subsequent shipment from Scotland. Further translocations of hedgehogs continued over the next 20 years, and were motivated "by sentiment", but the hedgehog's role as pest controller was soon established and further releases were made on the island. Hedgehogs, much like in Britain and the Uist saga, are considered a threat to the native kiwi bird (Apteryx sp.) as they compete for food. Hedgehogs are now given

pest status in areas where native species are prioritised, and are killed by kill traps (The Depatment of Conservation, 2020).

In addition to being a scapegoat in bird conservation issues, hedgehogs face abuse as their natural defences make them vulnerable, as they do not bite or run away. For example, reports on hedgehogs being kicked to death (BBC News, 2019), thrown from a roof of a house for amusement (Way, 2019), set on fire (Giordano, 2019), and pounded to death (Naylor, 2020) are only a few examples.

These issues have led to the formulation of statutory protection for hedgehogs. Queen Elizabeth II granted hedgehogs their first legal protection in 1863 (Morris, 2018). Hedgehogs are now protected by the Wildlife and Countryside Act 1981, but only under Schedule 6, which guarantees only partial protection. It stipulates that it is illegal to catch hedgehogs with particular implements such as snares, use hedgehogs as a decoy or put out poison to kill hedgehogs. Hedgehogs cannot be shot or caught by using gas, dazzling light or mirror, explosives or crossbow, nor is it legal to chase them with a vehicle. However, Morris (2018) argues these protections were intended for other species and are irrelevant to hedgehogs as these do not protect them from other more detrimental threats such as poisons, agricultural intensification, and habitat fragmentation and loss. Reclus notes that "the devouring of the surrounding land by large estates is hardly less disastrous than fire and other devastations since it produces the same end result, which is the ruin not only of populations but also frequently of the land itself" (Clark and Martin, 2013: 83).

In 2016 a campaign spearheaded by Oliver Colville attempted to upgrade hedgehog protection to Schedule 5 as a fully protected species. Morris (2018) argues that even this would not protect hedgehogs from loss of hedgerows, diminishing prey

in arable land, habitat fragmentation, rodenticides and road killings and changing the legal protection would not address the root causes of the decline. Until 1996, cruelty to wild animals, including hedgehogs, was not prosecutable. This was amended by the Wild Mammals Protection Act of 1996, followed by the Protection of Wild mammals Scotland Act 2002, and the Welfare of Animals Act Northern Ireland 2011.

Another beneficial legislation for hedgehogs is the Hunting Act of 2004 which makes it illegal to use dogs in hunting wild mammals. Dogs in hunting, and in general, disturb and destroy nests, and cause injuries to hedgehogs, biting their hind legs. Finally, not a binding document but a statement of concern, the UK BAP (Biodiversity Action Plan) (DEFRA, 2018c; JNCC, 2010) lists hedgehogs as a priority species. The BAP was developed following the Convention on Biodiversity's conservation strategies cascading to national and local levels actions. In this way, local councils play a pivotal role in the protection of the environment and biodiversity as they are expected to develop strategies for conservation (Gaia and Jones, 2017). LBAPs are non-statutory plans whose development is voluntarily. They are considered as a means for local authorities to discharge "biodiversity duty" which they are subjected to, in accordance to the HM Government. LBAPs are typically produced via local partnerships whose main role is to identify local priorities and determine the contributions that they can make to achieve the national targets (Gaia and Jones, 2017). While the BAP process was abandoned, a revised list of vulnerable species was produced, with hedgehogs listed in Section 41 of the natural Environment and Communities Act of 2006 as a species of 'principal importance for the purpose of conserving biodiversity in England'. What this means in practice is

for public bodies to consider hedgehogs in planning and development, although how this is carried out in practice is hard to enforce.

Because the hedgehog is not a protected species at the EU level, Brexit poses no changes to their status in the UK. However, withdrawal from EU agreements in respect of agricultural practices could significantly affect hedgehogs (see section 4.5.3).

5.5.1 Organisations dedicated to helping hedgehogs

Despite a lack of official public support for the practical protection of hedgehogs, many individuals and organisations have enlisted to protect the spiny creature. Hedgehog carers and wildlife hospitals engage with the injured or poorly hedgehogs that are brought to them by concerned individuals. Morris (2018) points out that while rescue centres have the potential to collate a lot of information about hedgehogs that has not yet been fulfilled. The British Hedgehog Preservation Society (BHPS) lists no fewer than 800 carers, although this is not an official endorsement by the organisation. The BHPS, one of the leading NGOs in the UK on hedgehog conservation, was founded by Major Adrian Coles in 1982. One of the organisation's first campaigns was to get hedgehogs escape ramps over cattle grids. Other campaigns include raising awareness every 5th November to check bonfires where hedgehogs could be hibernating. The BHPS also led a successful campaign to have McDonalds remove or change their McFlurry ice cream styrofoam packaging onto which hedgehogs would back themselves and would be unable to move or feed themselves. The BHPS also issue periodic warnings about the need to keep dogs on leashes, and their presence in private gardens is considered to be a deterrent for hedgehogs, although hedgehog carers report many dog injuries to the hedgehogs that

are brought in. The BHPS was among the leading NGOs to campaign for the Uist hedgehogs, to create a policy that supported translocation rather than killing by lethal injection.

The BHPS raises funds for hedgehog research and works in partnership with the People's Trust for Endangered Species (PTES) (Morris, 2018).

In 2016, an annual Christmas Appeal on hedgehogs resulted in a donation of over £62,000 (Morris, 2018) that created the first full-time position of a Hedgehog Officer based in Wildlife Trusts, promoting the species locally to raise awareness.

5.6 Do hedgehogs need saving?

Although the IUCN Red List currently classifies Erinaceus Europaeus as *Least Concern* and *Stable* globally, regionally, a dramatic decline has been recently reported across the UK (Carrington, 2017) that led to hedgehogs being added to the UK's Priority Species List and classified as *Vulnerable* (Mathews *et al.*, 2018). Estimated at 30 million in the 1950s, numbers have plummeted to fewer than one million today with a third of this loss thought to have taken place in the past decade (Roos *et al.*, 2012). In 2020, hedgehogs have undergone an assessment which officially locates them on the UK's Red List of Endangered Species, as under "imminent risk of extinction" (Carrington, 2020b).

Following a severe decline in abundance in 2007, hedgehogs have been added to the UK government's priority species list (Roos *et al.*, 2012). The State of Britain's Hedgehogs 2011 was the first attempt to comprehensively review the status of hedgehogs nationally (BHPS and PTES, 2015). Since 2000, rural populations have declined by at least a half and urban populations by up to a third in the same period (ibid.).The dramatic decline of the European Hedgehog by a third in

the last quarter of the century in the UK is attributed to a host of threats: a lack of food availability due to a decline in invertebrates, habitat fragmentation, the conversion to agricultural land and the introduction of intensive farming that abandons the use of hedges so vital for hedgehogs, as their name suggests (BHPS and PTES, 2015). Graham et al. (2018) examine the relationship between hedges and hedgehog conservation on agricultural land and find that intensive farming practices ignore species interdependence. The authors particularly highlight the importance of heterogeneity in hedgerows, meaning that there is no one-type-fits all.

Hedgehogs are considered a bioindicator species of the health of ecosystems, indicative of soil health and the presence of insects (BHPS and PTES, 2015). As hibernating species, hedgehogs are likely to be sensitive to climate and temperature changes. Facing long summers and drought, warming trends negatively impact hedgehog populations by disturbing hibernation and reproduction patterns, and food availability.

As well as being an iconic, popular and native mammal, hedgehogs "are a flagship species: what's good for hedgehogs is good for many other species too. Like the miner's canary, its demise is a warning of a failing environment" (ibid: 1). Furthermore, a study on hedgehogs' mortality causes conducted in Finland found that of the carcasses obtained for the study, 75% died of human-related causes *(*Rautio *et al.,* 2016).

In the UK, hedgehog numbers are declining, but with more severe declines in rural than urban areas (Pettett *et al.,* 2017). "Even within rural areas, hedgehogs favour rural villages rather than open farmland and arable land is particularly under-selected" (Pettett *et al.,* 2017: 54). The European hedgehog is increasingly associated with gardens and villages and less so with arable farmland. This is in line with the

summary presented by Mathews et al. (2018: 563) who report a population size decline in hedgehogs. Specifically, the authors emphasise that hedgehogs in arable land have declined by 8.3%, the steepest decline in all other areas where they are found between 1990-2007, with soil invertebrates and other aspects of soil health likely to decline "as a result of continuing changes in agricultural practices" (ibid: 564). Drivers for these changes are multifactorial and include decreased food sources in arable land, a greater range of day nest sites and a decreased risk of predation by badgers (Meles meles) (Pettett *et al.*, 2017; Hof and Bright, 2010; Hof and Bright, 2012). Hof and Bright (2012: 80) emphasise that "the hedgehog's decline might imply general deterioration of the agricultural landscape in Britain", while Hof and Bright (2010) also cite a negative impact from pesticide use further reducing food sources, including in private gardens.

Data on hedgehogs has been gathered over varying numbers of years through national surveys coordinated by organisations including the People's Trust for Endangered Species (PTES), the British Hedgehog Preservation Society (BHPS), the Game and Wildlife Conservation Trust (GWCT), the British Trust for Ornithology (BTO) and the Royal Society for the Protection of Birds (RSPB). Roos et al. (2012: 37) report that the database suggests the presence of hedgehogs has declined over the past 3 to 13 years (10% and 50% over 10-25 years are the common time period used for assessing population status for listing species in red lists). However, no data was collected from regional hedgehog rescuers. Considering that the authors' conclusion is that "a larger decline can be detected with a smaller number of sites", and that "overall decline is easier to detect over longer periods" (Roos *et al.*, 2012: 56), it is surprising that hedgehog rescuers in particular areas were not consulted and their data was not solicited. Differences in the way data are collected means that trends are

not directly comparable, but together they give a good indication of the direction of change and an idea of its size (Wilson and Wembridge, 2018). Furthermore, Hof and Bright (2012) explain that thus far, the main focus of conservation efforts have been on rare species at risk of local extinction. However, given the recent mass extinction crisis, there is an increasing awareness of "the significance of studying more common species [...] since proportionally, relatively small declines in the numbers of common species can mean large absolute losses, which might disrupt ecosystems" (ibid: 79).

Estimating the population of hedgehogs has been subject to critique and uncertainty. Mathews et al. (2018) note that there have been very few population density estimates that lead to a difficulty in estimating population sizes. Changes to population density through time have relied on Harris et al.'s (1995) seminal hedgehog estimate of 1,555,000 hedgehogs in Britain. Carey et al. (2008) have generated a figure of 423,000 hedgehogs between the years 1990 - 2007 based on Countryside Surveys, representing a horrific 73% decrease. While there is methodological variability between the different surveys used to estimate hedgehog population trends, Mathews et al. (2018) report that there is consistency in the overall trend and that the direction of the effect is an annual decline between 1.8% to 10.7% which could be translated into a decline in relative abundance of 40% in 10 years.

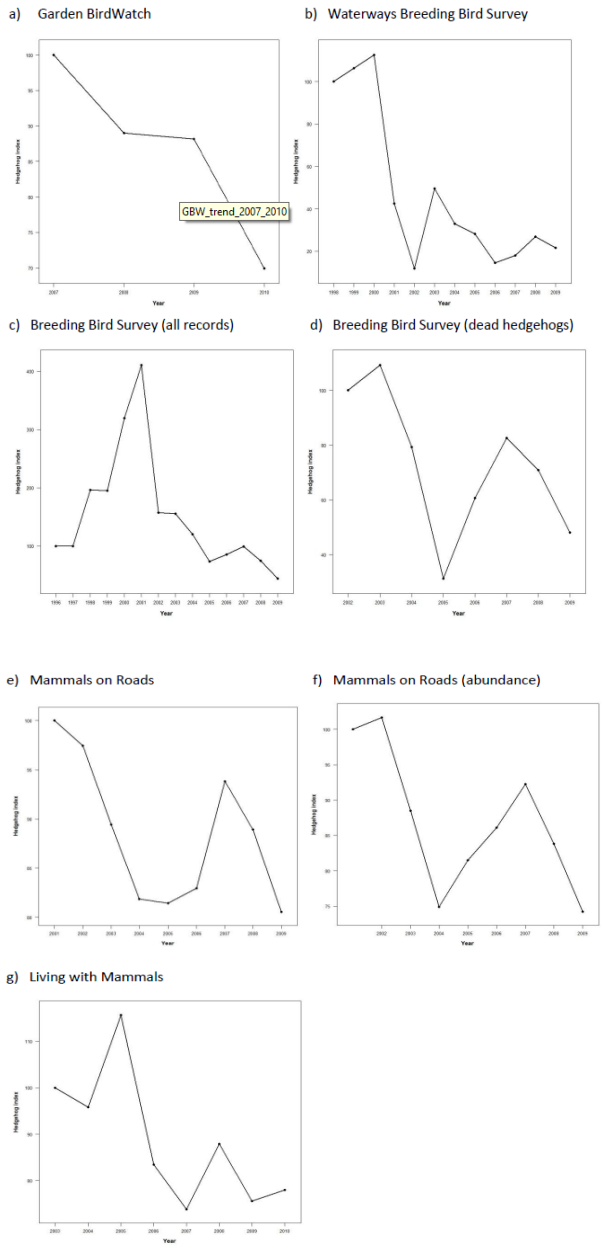

Fig. 14: Hedgehog population trends based on the 7 leading hedgehog surveys (Roos *et. al*., 2012)

In the surveys Roos et al. (2012) examined representatives of the countryside (b,c,d,e,f above) all show a marked decline between the years 2002-2009. Survey (g) *Living with Mammals* represents a slight increase in hedgehog occupancy. However, the authors note that in surveys such as this where participants can choose which sites to survey, a bias is likely to form. Such a bias may lead to less marked declines, as participants mark presence rather than absence.

5.6.1 Rural populations

Two of the surveys, BTO's *Breeding Bird Survey* and PTES' *Mammals on Roads* survey (Roos *et al.*, 2012; BHPS and PTES, 2015) cover primarily rural areas. Population trends in Figure 13 show substantial declines of over a half since 2000.

Williams et al. (2018) conducted the first national survey of rural hedgehog populations in England and Wales. In the UK, agricultural landscapes have changed significantly since the early 1900s, leading to a negative effect on wildlife. The authors note that much of the blame for hedgehog decline in the UK has named badgers, a competitor and hedgehog predator as the main culprit in the decline. However, the authors argue that while their findings support the negative relationship between the two species, i.e., where there are badger setts hedgehog seem to avoid them, rates of hedgehog occupancy were low even in the absence of badgers. Collectively, this suggests that intensive management of rural areas is negatively impacting both species. Hedgehog ecological research presents a gap in this domain, which this thesis hopes to address.

5.6.2 Urban populations

Some species that have declined in farmland areas, such as the song thrush and common frog, are abundant in urban habitats, particularly in domestic gardens, and such areas may also be a refuge for hedgehogs. Records of hedgehogs from

urban sites (mostly private gardens) show a mixed picture. The BTO's *Garden BirdWatch* has an upward trend, while PTES' *Living with Mammals* shows a decline. The trend in the former, however, is due largely to the high value of a single point (the estimate for 2014), and the trend should be treated with some caution because of this. From 2008 to 2013, there was little change. Although hedgehogs have been described to prefer urban settings, Pettett et al. (2017) conclude that hedgehogs are also in decline in urban areas. All surveys analysed have sufficient power to indicate red-level declines over 25 years, equivalent to red-listing for birds.

As we have seen so far, studies in hedgehog ecology focus on mortality, diet and habitat (Rautio *et al*., 2016; Hof and Bright, 2010, 2012). However, there is a dearth of research investigating the direct and indirect effects of pesticides on hedgehogs. For example, indirect negative effects on hedgehog population have been hypothesised to be as a result of diminished invertebrates as prey source (Morris, 2018; Goulson, 2019). While some research has highlighted direct and indirect negative effects of biocides on hedgehog mortality (Dowding *et al*., 2010) none has examined the long-term effects of hedgehog (and other species) exposure to pesticide cocktails (Pesticide Action Network UK (PAN), 2019b) and the detrimental effect on their reproductive and endocrine systems, the general weakening of their immune system which may be a cause in the increase of hedgehog susceptibility to parasites (Rautio *et al*. 2016; Morris, 2018; Mason *et al*., 2013). Indeed, this has not changed since Reeve and Huijser (1999) who observed that hedgehog population and mortality studies have focused on traffic accidents rather than on other anthropocentric mortality causes.

Fig. 14 illustrates the importance of collecting data from hedgehog rescue centres. However, there is a need to methodically and systematically test natural

causes related deaths for presence of pesticides and biocides, as intoxication can weaken the individual rendering them more prone to traffic accidents, starvation and parasitic diseases. Importantly, Reeve and Huijser (1999: 18) note that many deaths go unrecorded as the individuals are never found such as "those affected by pesticides and pollution but with non-specific symptoms". Difficulty and expense of obtaining laboratory equipment to test for poisoning leads to cases not being tested and therefore, death from poisoning and pesticides remains under-represented (ibid: 19).

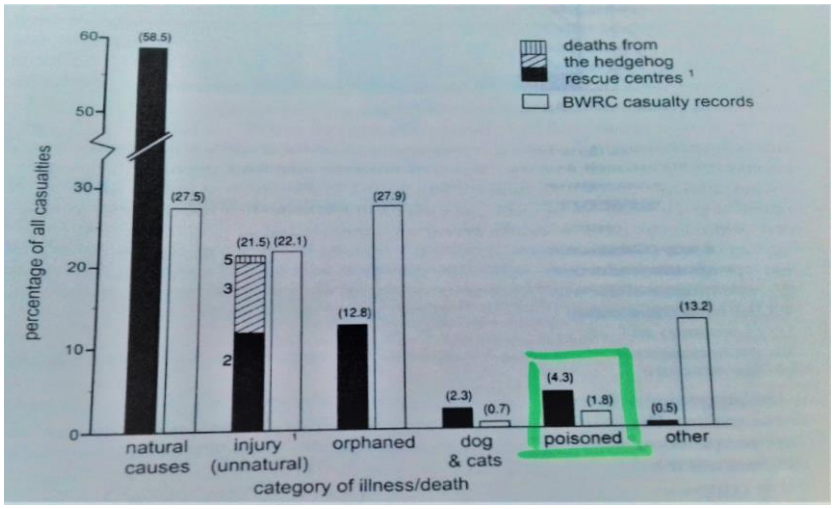

Fig. 15: Threats to wildlife (Reeve and Huijser, 1999: 14)

5.7 Pesticides and biocides as underlying contributors to hedgehog extinction

A major concern this project aims to tackle is largely unexplored in hedgehog ecological research, and is related to agrochemicals and their effect on hedgehogs and the larger natural environment. Technological control of nature is

essentially a social and political process often led and maintained by powerful groups (Kroma and Flora, 2003). There are many risks and negative consequences associated with their use as they have high leaching and runoff potential, and are highly toxic to all animals.

Reeve and Huijser (1999) indicate that although most hedgehog deaths in their study resulted from parasitic infestation, unnatural deaths could have a significant effect on hedgehog populations. For example, Dickmann (1988) finds 78% of his sample of 109 hedgehog corpses were road kills, while 2.8% died from eating slug pellets. Importantly, Reeve and Huijser (1999: 10) emphasise that although the data from wildlife rescues is biased (not random), they are "the only practical source of substantial data". The authors note that although 54% of the recorded wildlife casualties are hedgehogs, which may be associated with areas of human habitation and so indicative of a large and thriving hedgehog population, the fact that 41% of the deaths are connected to anthropogenic factors, is worrisome. The authors indicate that many deaths have gone unrecorded, and cite pesticides and pollution with non-specific symptoms as one factor. Hedgehogs are seen to take refuge in urban landscapes which provide them with more food choices. However, I argue that hedgehogs are excluded from their natural living habitats, their homes and food sources destroyed and they are not presented with many alternatives but to nomad into urban areas. They are "under considerable pressure from anthropogenic mortality factors" (Reeve and Huijser, 1999: 18).

Poisoning in Reeve and Huijser's (1999) study is classed as a minor cause of death, but the authors caution that this may be because death or injury from poisoning or pollution is under-reported. Laboratory confirmation of death by poison

is costly and difficult. In addition, the authors suggest that under-reporting can happen due to the invisibility of the poisoned animal. Dying animals may hide away.

Hedgehogs are omnivore, generalist feeders making them vulnerable to a wide range of poisons such as heavy metals and agricultural biocides that are designed to eliminate invertebrates (Morris, 2018).

Like the weevil, aphid and caterpillar killing DDT that was banned in 1986, contemporary biocides such as glyphosate, the ubiquitous herbicide worldwide and in the EU, are also considered to be bioaccumulators, meaning that mammalian predators such as hedgehogs consume contaminated prey, absorbing a sub-lethal amount of poison that build up in their bodies, until a toxic level has been reached. Morris (2018) discusses the phenomenon observed in hedgehogs running around in circles manically since the 1960s, possibly due to accumulated residues of DDT through ingesting contaminated small prey which, over time, cause disruption in normal behaviour, disorientation, sickness and sterility. Indeed, while little attempt has been made to research the effects on hedgehogs, either on the individual or at the level of populations, Morris (2018: 254) points out that "the use of agricultural pesticides cannot have been benign, if only because their purpose was to reduce or eliminate the very prey that hedgehogs rely on for most of their food".

According to the Wildlife and Countryside Act (1981), it is illegal to put out poison with the intention of killing hedgehogs. Intention or not, poisons are difficult to contain once they are unleashed and have many deleterious effects on non-target species.

5.7.1 Neonicotinoid Insecticides (Neonics)

The introduction of neonics, a synthetic compound in pesticides raised serious concerns regarding their effects on bees. A partial ban was introduced in the EU in October 2016 on the use of neonics-based pesticides directed at protecting bees visiting flowering plants but poisonous seed treatments are still allowed.

However, pesticides are not confined to their target host and their effects need to be understood holistically. Species tolerance limit is often the only criteria examined as relevant to species survival, ostensibly ignoring co-extinction, in which the loss of one species can make more species disappear, and can possibly bring a total ecosystem collapse as driving mass extinction. For example, Humann-Guilleminot et al. (2019: 2) carried out a large-scale survey on the house sparrow, also an omnivorous species. Their research "highlights how ubiquitous neonicotinoid insecticides have become in agricultural habitats, and reveals generalized exposure of house sparrows, and potentially other species inhabiting farmlands, to neonicotinoids". The authors also indicate how neonicotinoids, water soluble, targeting insects are prone to runoff and leaching which means they end up transported away from the field in which they were intended for. Not only are they a threat to pollinators, but also to birds. The authors indicate that house sparrows have the potential to be directly in contact with neonics through eating contaminated anthropods when pesticides are applied. If house sparrows can be contaminated this way, so can hedgehogs. The authors' results reveal that "house sparrows are seldom exposed to a single neonicotinoid insecticide, but, instead, are exposed to cocktails (see chapter 4 for discussion) of two or more compounds, at frequencies as high as 86% for thiacloprid in combination with any one other [neonics]" (Humann-Guilleminot, 2019: 14). Additionally, Morris (2018) reports on neonics that they

have a cumulative toxic effect. This means that multiple exposures to the pesticide amplify the toxicity in any species that eats the contaminated insects. At the time of writing, the ban on outdoor use of three neonicotinoids - Clothianidin, Imidacloprid and Thiamethoxam continues in the UK ((DEFRA, 2018a) but is only partial, and seed dressings are still allowed. “Pesticides that appear safe and irrelevant for hedgehogs are potentially implicated in declining hedgehog populations even if there are no direct effects on the individual animals as a result of eating contaminated prey” (Morris, 2018: 256).

Neonicotinoid insecticides and their effect on pollinators is found to be negatively affecting vertebrates as well as insects, despite the agrochemicals’ early claims that the modus operandi of neonicotinoids via the acetylcholine receptors does not exist in vertebrates and therefore would not present a negative impact on non-target species. Di Prisco et al. (2017) find that Clothianidine, a neonicotinoid insecticide, may adversely affect immunological signalling in vertebrates, as their study on human cell lines has demonstrated. As the authors report, acute lethal effects are rarely reported, and this is the only testing the agrochemicals are required to perform for the final formulation’s registration by regulators. However, sublethal effects on pollinators such as impaired learning or homing abilities, as well as an increased susceptibility to pathogens due to the immunosuppressive effect of neonics, which in turn lowers the barriers honeybees have against the Varroa destructor mites. Similarly in hedgehogs, there has been an increase in parasitic pathogens which could be as a result of immunosuppression exerted by neonics, albeit this is not currently researched.

Mesnage et al. (2018) investigate non-target effects of neonics on mammalian physiology and conclude that imidacloprid, the active ingredient of Confidor, causes

lipid accumulation and accumulates in adipocytes. While the research was not conducted on a particular species, this finding is important for hedgehogs. Because hedgehogs rely on their fatty reserves during hibernation, similarly to bees, hedgehogs are at risk of depending on a highly concentrated toxic fat reserve. This may be an important factor in the decline of the overall hedgehog population, especially taking into consideration the high mortality of hedgehogs during hibernation (Rautio *et al*., 2016).

The only study to date to demonstrate a population-level impact of a systemic insecticides on hedgehogs, was on the lesser hedgehog tenrec who are believed to be termite-specialized (Peveling *et al*., 2003). Between 1997 and 2000 Madagascar was plagued by migratory locusts and termites, enchaining a widespread application of insecticides. Madagascar, an island rich in biodiversity became threatened by the use of pesticides, negatively impacting wildlife. Peveling et al. (2003) examine and monitor the effects of insecticides fipronil and triflumuron, an insect growth regulator (IGR) on key non-target species that prey on the harvester termite *Coarctotermes clepsydra* and locusts. The authors found that fipronil caused high mortality of the locusts *Coarctotermes clepsydra* colonies to a point where the lesser hedgehog tenrec was not found in spots where fipronil was sprayed. The study provides strong evidence of food chain breakdown caused by pesticides. Additionally, the authors point out that while lack of food was the principal factor in the decline of hedgehogs, direct toxicity is also considered, albeit with low risk.

5.7.2 Herbicides

As one ecological villain is removed another takes its place, a phenomenon Pesticide Action Network refers to as '*the pesticide treadmill'* (also Goulson, 2019). In terms of herbicides, the same assumption can be made. Herbicides are designed to

kill weeds, so how could they be harmful to hedgehogs? As Goulson (2019: 65) sardonically puts it "no one has yet invented a pesticide that can tell the difference between pest insects we might wish to kill, such as pea aphids or Japanese beetles, and the large majority that we ought to avoid harming [...]. Whatever the manufacturers may claim, it is inconceivable that hosing a garden with a potent insecticide will kill only the pests and leave bees and other beneficial insects unharmed". Morris (2018) notes that glyphosate is known to cause liver damage in mammals at low doses. Endocrine disruptors and bioaccumulators are not toxic in the traditional 'poison' way of thinking, but affect populations, and not only an unlucky individual (Morris, 2018).

5.7.3 Molluscicides

Since 1937, metaldehyde has been heralded as an effective poison against molluscs and has been marketed in the form of small pellets mixed with bran. In 2000, over 350 tons of slug pellets were strewn across a million hectares (Morris, 2018). The slugs are dyed blue as it is considered a deterrent for birds, minimising the risk of them consuming the pellets. However, for hedgehogs this mitigation does not work, as they are colourblind, foraging at night they would not be able to distinguish colours. Metaldehyde has been found to kill dogs and can be found in drinking water (Morris, 2018). Metaldehyde-based slug pellets are the kind that are available for personal use in garden centres. Pellets containing methiocarb are used at a large scale for agricultural use. Unlike metaldehyde, methiocarb, banned in 2014, does not decompose into a harmless chemical and so their ingestion would be harmful to hedgehogs.

5.7.4 Rodenticides

Rodenticides are classified as biocides in the UK CRD chemical authority. Rodenticides are widely used on farms in rural Britain but are also commonly used throughout urban and suburban landscapes by both professional practitioners and the general public. However, "studies on exposure of non-targets to anticoagulant rodenticides have largely focussed on predatory birds and mammals and insectivores have rarely been studied" (Dowding *et al.*, 2010).

The density of baits and contaminated prey relative to population numbers of non-target species in rural and urban areas is completely unknown. Furthermore, it is possible that hedgehogs may be particularly susceptible to exposure in urban areas where untrained domestic users may be prone to unintentional misuse.

High proportions of dead hedgehogs are found to contain rodenticide residues (Morris, 2018). Sources of rat poison include grain baits, wax blocks and other presentations that hedgehogs would not normally be attracted to gnaw on. However, rodenticides are recently being placed outdoors in farms, towns and gardens in metal and plastic boxes, on a prophylactic basis (Morris, 2018).

Rat poisons known as SGARs (second generation anticoagulant rodenticides) have increasingly been placed in urban environments where rodent problems are most likely minimal. These poisons present a serious threat because they are anticoagulant, preventing minor wounds from clotting. The animals ingesting the poison die over 12 agonizing days and become a hazard for predators or scavengers. Contaminated animals can travel and spread the poison further, putting other larger animals at risk, a cycle referred to as secondary poisoning. For example, rodenticide residues have been found in up to 91 percent of barn owls (Dowding *et al.*, 2010). In addition, much like neonics, rodenticides remain active in faeces and dead bodies.

Decomposed by beetles and insects, these become contaminated. The very creatures hedgehogs depend on become a health hazard.

Dowding et al. (2010) investigate the exposure of 120 European hedgehogs throughout Britain to first- and second-generation anticoagulant rodenticides (FGARs and SGARs), demonstrating hedgehogs have been negatively affected by rodenticides as a result of eating carrion. FGARs were applied during the 1950s but their extensive use led to rats developing resistance which led to the development of SGARs, making them more persistent, binding, accumulating and toxic (Dowding *et al.,* 2010). Both FGARs and SGARs operate by preventing the formation of blood clots and are thus harmful to all vertebrates (ibid.). While users, both domestic and farmers must exercise caution to limit the negative effects on non-target species, the degree by which preventative measures are executed is unknown. Most studies investigating indirect exposure of non-target species to anticoagulant rodenticides have focused on the consumption of poisoned rodents by predatory birds and mammals (for example, Shore *et al.,* 1999). However, invertebrates, the prey of insectivores such as hedgehogs, can come into contact with rodenticides and thus contaminate hedgehogs via the consumption of rodent faeces, or eat carrion; ingestion of soil-bound residues by e.g. eating earthworms; and of course by directly eating poison baits.

While Dowding et al. (2010) acknowledge that invertebrates have different blood-clotting mechanisms to vertebrates, the authors point out that invertebrates can still access and consume rodenticides placed in bait stations, and retain the toxic chemicals for more than four weeks, rendering the "predation of contaminated invertebrates [...] likely to be a major pathway by which hedgehogs are exposed to anticoagulant rodenticides" (Dowding *et al.,* 2010: 165).

Importantly, the authors emphasise that "given that many ecological communities typically contain larger numbers of insectivorous vertebrates relative to predators, the contamination of invertebrates potentially poses the greater risk of non-target poisoning in terms of species and individuals" (Dowding *et al*., 2010: 162). The authors investigate the scale and severity of exposure of hedgehogs throughout Britain to some of the first-generation (warfarin, coumatetralyl) and all of the second-generation (difenacoum, bromadiolone, brodifacoum, flocoumafen) anticoagulant rodenticides that are licensed for use in Britain. Brodifacoum is restricted to indoor use only, although rats and mice could still venture out and be eaten outside. Only a few SGARs are intended for outdoor use, bromadiolone being a common one. However, there is no way to control secondary poisoning (Morris, 2018). The authors conclude that "contamination of hedgehogs with anticoagulant rodenticides is commonplace" and is similar to the risk at which non-target predatory birds and mammals were found, such as the tawny owl, barn owl and polecat (Dowding *et al.,* 2010: 165). This is of particular importance considering the residues found in most animals in the Natural England monitoring of pesticide poisoning of wild and domestic animals (Taylor and Giela, 2006) (see appendix B for detailed table).

SGARs represent risk that is not deemed acceptable: "All first and second-generation anti-coagulant rodenticides fail the environmental risk assessment for use outdoors" (RSGOG, 2020). This prompted the EU to issue a change in legislation that SGARs are only made available to farmers and professional pest controllers. However, a cursory look online finds the products readily available to buy, containing bromadiolone.

Morris (2018: 264) concludes that "rodenticides seem to be a likely contributor to recent declines in hedgehog numbers". Rodenticides pose a threat to any other species that may consume contaminated prey and enter the environment despite control measures.

5.8 MFFMs

Agri-environment schemes have been introduced in the UK (DEFRA, 2020) in order to mitigate biodiversity loss and the negative impacts of agricultural intensification. Agri-environment schemes are comprised of two main elements: the set-aside scheme that aims to promote an ecologically-focused areas such as hedgerows, ponds and meadows. The second element are in-production schemes that support environmentally friendly agricultural such as organic farming methods (Humann-Guilleminot *et al.,* 2019a). However, Hof and Bright (2010) note that while research into the effectiveness of the schemes has been carried out, little is known with regard to mammals. In fact, Humann-Guilleminot et al. (2019: 1503) note that the extent of contamination of agri-environment schemes by neonics is "largely unknown". In their study of 351 samples of 169 fields across Switzerland, the authors find that neonics are present in "nearly all soils and vegetation samples including organic fields" (ibid: 1511). The highest concentrations of neonics found belonged to imidacloprid, even though it was under a ban at the time. The authors explain the presence of neonics on organic farms through dust, lost during planting of coated seeds, run-off water, aerial contamination through spraying, the long half-lives of neonics explains their lingering presence in the soil. Finally, these findings point to a threat to invertebrates in these refuge areas. The authors emphasise that neonics have the potential to "disrupt the food chain at many levels: within the soil, interfering with plant-arthropod relationships, and at the predator level via a

reduction in the biomass of arthropods eaten by predators"(Hallmann *et al.*, 2017; Humann-Guilleminot, Binkowski, *et al.*, 2019: 1511).

Because hedgehogs are highly mobile, and eat a diversified diet, they should be less susceptible to habitat fragmentation. However, their inclusion on the UK's Biodiversity Action Plan (JNCC, 2019b) that was created as a response to the Convention on Biological Diversity (JNCC 2010) and Priority Species List is evidence that agricultural intensification does have a negative effect on hedgehogs. Hof and Bright (2010) analysed the effectiveness of agri-environment schemes for hedgehogs on arable farms and find that while field margins provide refuge and foraging opportunities, many of the hedgerows in the study were too open at the base to provide cover. Additionally, set-aside fields were not used by hedgehogs, possibly due to lower food sources (ibid: 471). The authors conclude while set-asides have been found under-utilised by hedgehogs, it is still, together with field margins, both able to provide more food than arable land.

While agrochemical companies boast their actions in promoting Multiple Function Field Margins (MFFMs) (e.g. Syngenta, 2018a; Hof and Bright (2010; 2012) find that although hedgehogs are frequently found along hedges and hedgerows in arable landscapes and thus positively associated with the presence of hedgerows, the authors did not find a strong benefit to hedgehogs, and conclude that "hedgerows only had a slight positive relation with hedgehog presence on farms" (Hof and Bright, 2012: 86). In addition, Graham et al. (2018) emphasise that when farmers consider hedgerow management, no fixed set of hedgerow characteristics were found in their study to benefit all taxa. This means that different species require different types of habitat offered by hedgerows.

As mentioned in chapter 3, Goulson (2019: 133) finds that neonics make their way routinely into the foliage of field margins and hedgerow plants, shrubs and trees so insects eating the leaves are "likely to be receiving a chronic dose of potent neurotoxin".

5.9 Conclusion

Hedgehogs have been living alongside humans as far back as ancient times of Egypt. They have been regarded as friends and given a prominent place in culture and regarded as a national iconic mammal of the UK, most loved wild animal, and yet, they still suffer from abuse, persecution and direct and indirect eviction and annihilation of their homeland. The fact that hedgehogs enjoy strong public support is important because it makes them an ideal flagship species for encouraging institutions, organisations and the public to change practices in urban and rural environments (Morris, 2018). Hedgehogs are a valuable bioindicator species, through which the state and health of the natural environment can be seen. "Their presence is indicative of sustainable populations of important invertebrates, especially earthworms and the many insects whose larvae and adults perform vital ecological functions. If hedgehogs are present and correct, then all is well. If they are declining or absent, something has gone wrong" (Morris, 2018: 378).

One of the things that have gone awry is the use of pesticides in both rural and arable land, amounts and toxicity of which are increasing. The prophylactic and cosmetic reliance on pesticides spells soil degradation, less food availability, reproductive and endocrine disruption which may directly affect hedgehog populations.

Results from Pettett et al. (2017) examining hedgehog distribution in the UK find hedgehogs to be observed most frequently in areas with a large proportion of arable land (e.g., on roads), but note that this is due to a high abundance of hedgehogs around the edges of fields in the east of England that is dominated by arable land, rather than hedgehogs' preference for arable land, which they avoid. The authors' recommendation for hedgehog conservation emphasise the need to improve arable land, chiefly in respect to cover from predation and connectivity between rural villages by increasing hedgerow length and quality will offer cover from badger predation, provide nests - recommendations that are, of course, relevant to many other species (Pettett *et al*., 2017; Hof and Bright, 2012). The effect of pesticides on hedgehogs are summarised thus:

Exposure pathway			Type of pesticide	Indirect/direct effect	Location
Exposure pathways to pesticides	Ingestion	• contaminated prey • residues in crops and soil • contaminated drinking water • nearby vegetation and ingested invertebrates • self-anointing/preening.	**Insecticides** neonicotinoids, water soluble, targeting insects are prone to runoff and leaching	• Indirect effect • cumulative toxic effect • acute lethal effects (Di Prisco et al., 2017) • sublethal effects immunological signalling in vertebrates • imidacloprid, the active ingredient of Confidor, causes lipid accumulation and accumulates in adipocytes (Mesnage et	In arable land and in gardens

			Rodenticides	al., 2018) - (Rautio *et al*., 2016). ● ingestion of soil-bound residues by e.g. eating earthworms; and of course by directly eating poison baits.	
	Dermal exposure	direct spray or treated surfaces self-anointing/preening.	**Herbicides** **Molluscicides** **Rodenticides**	● glyphosate is known to cause liver damage in mammals at low doses. ● Endocrine disruptors and bioaccumulators are not toxic in the traditional 'poison' way of thinking, but affect populations (Morris, 2018) Metaldehyde-based slug pellets High proportions of dead hedgehogs are found to contain rodenticide residues (Morris, 2018). hedgehogs have been negatively affected by rodenticides as a result	available for personal use in garden centres urban areas

				of eating carrion toxic (Dowding *et al.*, 2010)	
	Airway exposure	inhalation or self-anointing/preening.			

Finally, the prognosis for hedgehog populations recovery in the future remains grim. Mathews et al. (2018) predict a decline in their assessment of the future prospects for hedgehog population size and habitat quality.

Chapter 6: Methodology and Methods

"To sin by silence, when we should protest makes cowards out of men" – Ella Wheeler Wilcox

6.1 Introduction

Following on from the earlier discussion in chapter three of the centrality of language to the construction of reality this chapter further develops the argument that language is instrumental to how we conceive of, and thus interact with, the natural environment, at the level of an individual, family, community, society and of course, the corporation. As Haugen (1972; 2001: 58) notes, language is socially situated, it "[…] does not breathe, it has no life of its own apart from those who use it […]". Therefore, the social meaning of materiality and 'things' comes about from both interactional and contextual co-construction of meaning and identities, as well as from more fixed and stable discourses (Fairclough, 2003b). According to Whorf's conceptualisation of language as constructing reality emblematically, known as the Sapir-Whorf hypothesis[8], Halliday (2001: 65) follows with the view that "language does not passively *reflect* reality; language actively *creates* reality". Observing the linguistic features at work, Halliday notes that grammar and vocabulary indistinguishably shape experience and transform perceptions into meanings. Furthermore, Halliday takes a relativist approach to knowledge and meaning-making and claims that "the categories and concepts of our material existence are not 'given'

[8] Although not originally a 'hypothesis', Whorf actually used the expression linguistic relativity principle, referred to since as Whorf's Hypothesis. The first part of the Sapir-Whorf hypothesis is a relativity notion, that says that since signs take their meaning from other signs that are assigned meaning from other signs, no language can describe reality, only its own. The second part of the hypothesis is more deterministic and controversial. In its strong version the hypothesis claims that the limits of a language limit the world because we cannot comprehend and understand what is beyond the capabilities of our language to encode. Conversely, critics argue that language has a way of creating new meanings (Mooney and Evans, 2015).

to us prior to their expression in language. Rather, they are *construed* by language, at the intersection of the material with the symbolic" (emphasis in original). I understand Halliday's reference to the 'material existence' as a kind of relative-critical realism (Fairclough, 2005: 65): "Our 'reality' is not something readymade and waiting to be meant – it has to be actively construed; and that language evolved in the process of, and as the agency of, its construal. Language […] is a product of the conscious and the material impacting each on the other […]".

Language analysis, therefore, can help to reveal how the linguistic features of a text, together with its semiosis, influence and are influenced by the macro context in which it is written, the socio-economic and political contexts in which it is co-produced (Merkl-Davies and Koller, 2012). Various forms of discourse analysis have been used in social and environmental accounting research (see section 6.6.2), ranging from analysis of the journey metaphors (Milne *et al.,* 2006), Critical Discourse Analysis for examining legitimacy negotiation of management and stakeholders (Beelitz *et al.,* 2012) to genre analysis using CDA (Zappettini and Unerman, 2016). However, critical discourse analysis (CDA) has not explicitly made the link with ecological destruction. Therefore, following the theoretical (and practical) framework designed by Stibbe (2015), CDA is extended and geared towards focusing on the way the oppression of nature is embedded in the discourses and language we use, as Stibbe (2014: 120) puts it, "What is missing from […] many frameworks in CDA is a consideration of the ecological embedding and impact of cultures. Freedom and democracy do not automatically lead to sustainable levels of consumption, and peace in a society that exceeds environmental limits will be short lived". Additionally, Jones and Solomon (2013) note that there is a need for different

methodologies and different media such as corporate websites and reports, as well as different reporting enterprises such as NGOs and governments.

This chapter describes the design of the research project that was followed in order to achieve the aims and objectives stated in Chapter 1. The first section of this chapter discusses the aims of the research. The second section describes the methodology used, and the stages by which the methodology was implemented. The research design section describes the data and the participants in the study. The fifth section discusses how the data is analysed; finally, the last section discusses the ethical considerations of the research and its limitations, as well as considering the identity of the researcher and the way I position myself in this research.

6.2 Aim of the research and research questions

In light of the discussion in the above chapters outlining the negative impact of pesticides on human and non-human health, ecosystems and hedgehogs in particular, agrochemicals and business more broadly needs to heed this threat urgently, respond to it, and discharge accountability to stakeholders for species protection. This is my normative research position. As outlined in the theoretical framework, following Beck (1992), business must respond to the ecological and social risk and threat that modernism has developed. However, Beck (2015) also notes that technologies, as well as accounting, have the ability to reorient and reinvent themselves. Accounting as a communicative and social practice constructs a reality and in this way, has an emancipatory potential not only to identify and critique the stories it constructs and 'lives' by, but also create new stories that are more beneficial towards protecting the ecosystems on which all life depends, the fauna and flora (Gallhofer and Haslam, 2003; Stibbe, 2015).

The project concentrates on the biodiversity disclosures of leading international agrochemical corporations, and draws significantly on the above studies with the aim of broadening previous works on pesticides and species extinction disclosures in the UK, focusing on hedgehogs as an indicator species. Effectively, hedgehogs are a mammalian 'canary in the coal mine' where their absence is indicative of a colossal deterioration and degradation of the ecosystem.

6.3 Research Methodology

6.3.1 Research philosophy

Research philosophy, referring to the way in which knowledge is understood, shapes the belief system of the researcher that subsequently influences the research method used, data collection and analysis (see Fig. 16 below). Research philosophy and the assumption about human knowledge pertain to epistemology, and ontology, the creation of realities encountered in the research (Saunders, Thornhill and Lewis, 2019). Additionally, axiological assumptions, the researcher's personal value set and beliefs considerably influence the research. Those will be considered in section 6.3.1.1. Epistemology concerns what is acceptable and valid knowledge, and how this can be communicated to others (Burrell and Morgan, 2016).

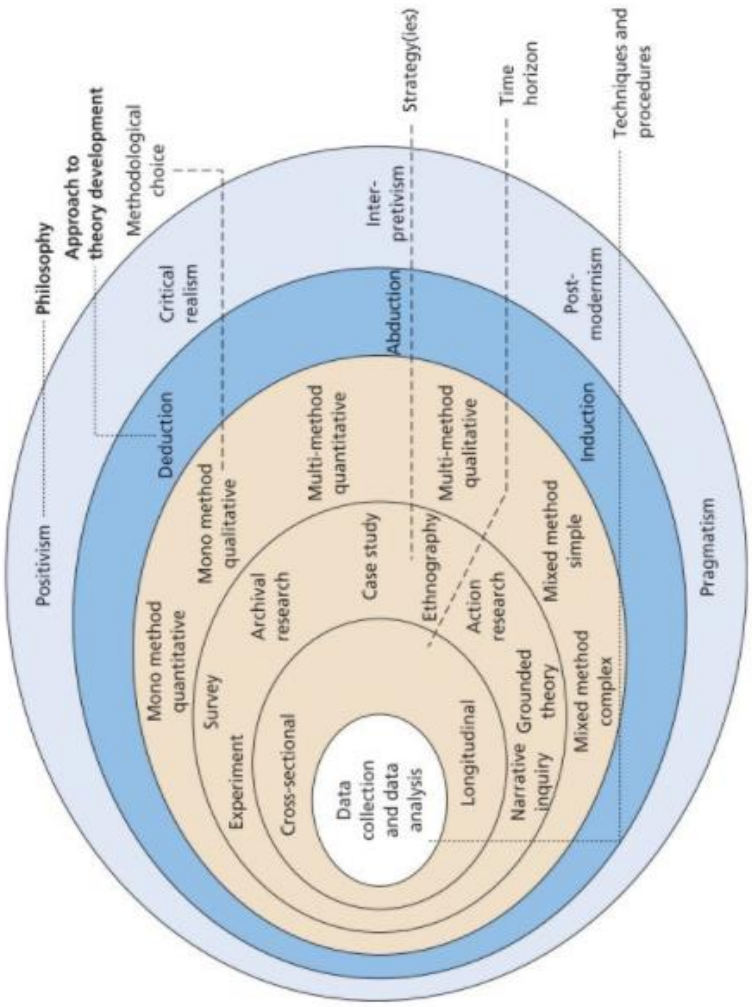

Fig. 16: The research paradigm (Saunders, Thornhill and Lewis, 2019: 124)

This research takes a subjectivist epistemological and ontological position. Subjectivism holds that social reality is not 'nature-given', but is constructed by social actors through acts such as language and other semiosis. In this way, reality is socially constructed. However, I do not take the more extreme position of nominalism or solipsism, where the underlying assumption is that there is no reality but the one made by actors, including the concepts of ontology and epistemology (Burrell and Morgan, 2016). Instead, social interaction, with its complex paradigms of power and ideology, shapes and is shaped by social actors (Saunders, Thornhill and Lewis, 2019). This approach entails a close examination and consideration of the situated context, the sociocultural, political and historical contexts as within these changes meaning is made and knowledge is encoded. Unlike an objectivist approach, social constructionism is interested in the way in which different narratives and discourses illuminate or construct a problem, and how these stories shape a particular experienced dominant reality.

In the same vein, a subjectivist epistemology follows an interpretivist paradigm[9], as opposed to an objective one where the assumption is that knowledge can be obtained from observation and contribute to universal, generalised laws. Interpretivism does not seek to make these generalisation, as the complex interaction of cultures, backgrounds, experiences etc. is considered to be lost in objectivist pursuits. By considering hermeneutics, symbolic interaction and phenomenology, I am able to construct a richer understanding of the participants in the project and their lived realities, and how these interact in the complex arena of hedgehog protection.

[9] Paradigm refers to a model or an example to be followed or to an established system or way of doing things. The concept was introduced into the philosophy of science by Thomas Kuhn (1970) in his discussion of the nature of scientific progress (Lewis-Beck, *et al.*, 2004).

Since the chosen methodology is a linguistic one, it could be argued that the research straddles both camps of interpretivism and postmodernism, as the latter emphasises language and power relations (Saunders, Thornhill and Lewis, 2019). In my research, I demonstrate what perspectives and realities are excluded by agrochemicals, what is silenced, and whose interests they serve: not only agrochemicals but also other organisations such as NGOs, local authorities, charities, academic and others. Additionally, in the interviews, I begin with the assumption that power relations between myself as the interviewer and the participants shape the interaction itself, a key consideration for postmodernists.

Another reason for situating the thesis in the realm of postmodernism is to take account of criticism of interpretivism as failing to acknowledge the role of institutional structures, particularly divisions of interest and relations of power (Lewis-Beck, *et al.*, 2004).

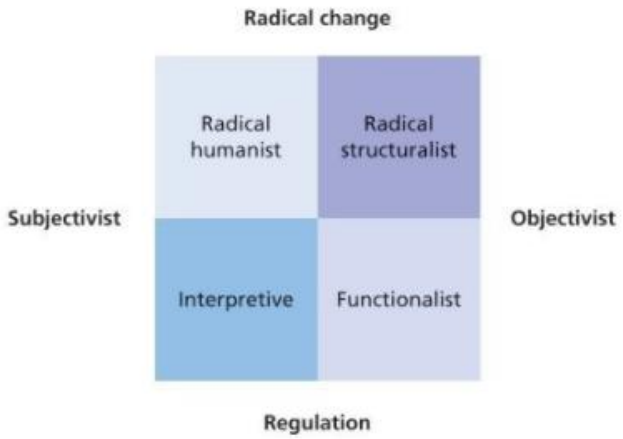

Fig. 17: Four paradigms of the analysis of social theory (Burrell and Morgan, 2016: 22)

The four paradigms in Fig.17 present the axis along which social science examines reality. Ways of encoding reality can be subjective or objective, and society is organised along either regulatory or radical lines. The four paradigms situated along these dimensions, and have their respective methodological implications in generating different type of organisational analysis.

The interpretivist paradigm has its roots in the work of early German theorist Immanuel Kant, and although many philosophies are embedded underneath its umbrella, the paradigm shares a common characteristic that attempts to understand and explain the social world through the social actor who is intrinsically involved in shaping the social world (Burrell and Morgan, 2016).

A unifying agreement in the interpretive paradigm is that social reality is an emergent process, where language is viewed as a key act through which reality is encoded. Therefore, taking a discursive approach to the data, my own methodology and methods are heavily data-driven, with a design developed from analysis of authentic discourse, both written and spoken. The overview of the methodological framework presented below is indicative of the eclectic methods in discourse analysis (de Beaugrande, 2006).

Not only does discourse analysis afford the understanding of lived realities, it can also serve as a position from which normative critique can be formulated, and bring about societal change. As Herzog (2016: 289) notes “discourse analysis can openly defend a normative stance that is ultimately anchored in the claim that human-made suffering should vanish. Immanent critique can provide theoretically informed research questions for discourse analysis, such as questions regarding the existence of (silent) suffering, the process of the social production of that suffering and the structural obstacles to ending such suffering”. Normativity entails the

researcher taking up a political, or at least a value-laden stance that is made explicit (see section 6.5.11). This position additionally ensues the objective-subjective dichotomy in social scientific research, and management or business studies which needs to be addressed in this section.

On the subject of subjectivity in qualitative, normative and interpretivist discourse analysis, this research follows the position of Berglund who states that every aspect of research, even science 'proper' that follows a seemingly objective agenda, entails a degree of subjectivity and agenda, as she puts it, "Political and economic interests must also be taken into account, even if those engaged in conflict phrase their agendas scientifically, as if they were devoid of political interest" (2001: 835). In other words, Berglund suggests that the constructionist approach reveals the artificial simplification and reduction necessary in objective, calculative disciplines that favour an objectivist approach: "What constructionist accounts demonstrate is that what are made to appear internally consistent systems or epistemological domains, such as quantum mechanics, ecosystems, economic regimes or administrative structures, are the result of ironing out inconsistencies deemed irrelevant, and sometimes even deliberately forcing results or funding or projected research towards quite interested (as opposed to disinterested) ends" (Berglund, 2001: 837). For example, Berglund discusses the socially constructed terms 'old-growth forests and 'biodiversity'. The construction of knowledge can also imply constructing nature. She gives the example of US forest fires, where the established scientific 'fact' was to fight forest fires at all costs, despite environmentalists' clamours. The understanding that the forests need fires was eventually taken up and accepted, but nevertheless demonstrates that "society [is still used] to explain the

mistakes of the natural sciences is still a frequently employed strategy and an acceptable intellectual move" (Berglund, 2001: 837).

To conclude, the epistemology of subjectivity operates on two levels. First, that social reality is a constructed one that is experienced through the subject. The latter points to a postmodernist position in that subjectivity, the condition of being a person of or 'subject' is perceived, represented and reinforced by the subject and society. Secondly, the need to re-imagine and search for better stories is a strong tenet of this project. The methodology chosen for the project highlights the deep subjectivity and involvement of the researcher, through the discussion of the ecosophy adopted by the researcher, to which I turn next.

6.3.1.1 Reflexivity: Positioning and identit(ies) of the researcher

In pursuing the interpretative, normative method of inquiry, I acknowledge that the interpretation of the texts are informed by my own epistemic and ontological lens of social constructionism, and by my own identity as a vegan, immigrant, and female researcher from an ethnic minority whose family has known aggression, violence, injustice and denial of citizenship (see section 6.5.11). I am unable (and unwilling) to detach myself from my values and openly reveal the way in which these influence and shape the research and positioning (Saunders, Thornhill and Lewis, 2019). The task of examining erasure, as Choudhury (1988) notes, requires me to be acutely aware of my own cognitive biases, reinforced by Taylor (2001) who signals the importance of acknowledging the researcher's identity as it influences the choice of topic as well as the interaction with the interviewees.

Herzog (2016) asks, "Should we strive for no normative viewpoint? Is it possible to argue without adopting a normative stance?" Herzog discusses the

difficulty of separating the normative stance taken by the author, from the influence this stance has on findings: "critical discourse analysts […] openly defend a particular normative standpoint. Although critical of hegemonic norms, such researchers defend particular norms that can also have (undesired) power effects. When adopting a normative viewpoint before performing discourse analysis, these researchers must assume a normative position outside of the criticized material" (Herzog, 2016: 280-1). Importantly, embedded in the notion of immanent critique is not only the critique of current society, but the forward-looking aspect of the critique that sees social change of a future society. Herzog argues that in critical discourse analysis there is little debate about making transparent the ground(s) of one's normative critique and the role of normative positioning in undertaking discourse research.

Shrader-Frechette (1994: 180) discusses the need for academics to take a normative stance because not only is "The ivory tower model of objectivity is clearly wrong", taking a stand on an environmentally practical issue and defending that stance as rational and ethical rather than summing up alternative positions in a 'balanced' way *is* advocacy. And this is precisely why an ecosophy is elaborated in relation to the researcher's axiology. Shrader-Frechette (1994: 184) emphasises that there is "no value-free inquiry" that is free from methodological values. By stating my values clearly I am promoting advocacy for the protection of non-human animals, as well as humans because "advocacy encourages counterarguments and public discussion".

Therefore, I believe it is important and appropriate to link the ontology and epistemology that underpin this research as discussed in the ecosophy section (6.5.11) with the researcher's stance through the process of reflexivity, as Mason

(2002: 149 in James, 2013: 564) notes: “a reflexive reading will locate you as part of the data that you have generated and will seek to explore your role and perspective in the process of generation and interpretation of data. You will probably see yourself as inevitably and inextricably implicated in the data generation and interpretation processes, and you will therefore seek a reading of data which captures or expresses those relationships”.

What we “require is the formulation of a new moral, social, and economic philosophy for business, something that has not as yet been attempted on a large enough scale, at least, by scholars in business schools or in ethics for that matter. It would require a new vision of Western economic society based on the idea of community and responsibility rather than individual rights related to the use of property. Otherwise, ‘‘the hope of committing business to the canons of responsible professional behavior is only a dream, a moralists vision without consequence in reality’’ (Levi, 1964: 28, in Buchholtz and Rosenthal, 2007: 205) .

What we’re up against is, in short, are the interlinked notions of objectivity, neutrality and nature that bind together to form a cluster of related ideas and ideals that have been highly valued in science, and have largely gone unquestioned, if not demanded, especially in management. This has implications on the micro-level that eventually inform the macro-.

2. Institutionalisation of the PhD journey and methodological considerations

My own PhD journey and notably the confirmation review leads me to think that university programmes fail to instil norms of ethical behaviour (Buchholtz and Rosenthal, 2007).

We need to question some of the assumptions that inform the methodological choices we make, in relation to the institutional and discipline constraints, as in publications too.

Methodology is essential for development of a scientific discipline, because it enables for progress of accumulated knowledge. However, methodology, defined as a logic and procedure of research (Landau 1972 in Waltz 1979/2010: 13), depends on knowledge which can be highly imperfect in terms of being partial, context dependent and biased, thus making methodology a political issue (Lovec, 2017). "It is precisely because methods and facts are valued-laden that it is so important to produce them based on our collective concerns rather than a dogmatic defense of value neutrality" (Zyphur and Pierides, 2020: 4).

The following reflection forms the basis of my approach and view of methodology, because seeking to change the world is not harmful to being a scientist of any kind. What kind of scientists do we, or I, want to be?

3. Personal axiology

Methodology is defined as a logic and procedure of research leaves out that very important component: axiology.

The Sheffield school, a part of which I am proud to be doing my PhD, has that very important heritage of values that were elemental of the community of practice and it is called a 'school' precisely because members shared academic and political values (Haslam, 2016). At its core, the Sheffield school, engaging in critical methodology, held an open choice and critical values. Tony Lowe, forming the Interdisciplinary and Critical Perspectives on Accounting (ICPA), Laughlin eschewing any notion of value neutrality, objectivity, reforming the privilege of science and rigour.

My methodology is also my axiology: I use an ecoloinguistic framework to examine multimodal texts, and spoken discourse. Ecolinguistics has its roots in critical discourse studies (CDS), where there is little theoretical discussion regarding the possibility of normative critique. It is seldom clear what the normative grounds and the normative scope of a critique are, because it is taken for granted that the researcher is operating from values such as equality, anti-racism, etc. Foucault was aware that even concepts such as liberty, autonomy, democracy and emancipation can become instruments of repression, power and/or governance. Foucault (2007: 44) understood critique as the 'art of not being governed or better, the art of not being governed like that' and as 'insubordination' or 'desubjugation'. In these formulations, there is something negative (e.g. being governed in a certain way or subjugation) from which Foucault wanted to distance himself because he was suspicious of all existing – and particularly hegemonic – norms and values.

Where ecolinguistic differs from Critical Discourse Analysis is in that it makes the researcher's axiology prominent and makes the researcher articulate their values in an ecosophy, or an ecological philosophy. Coined by Naess (1973: 99) he defines an ecosophy as "a philosophy of ecological harmony […] openly normative it contains norms, rules, postulates value priority announcements and hypotheses concerning the state of affairs […] The details of an ecosophy will show many variations due to significant differences concerning not only the 'facts' of pollution, resources, population, etc. but also value priorities". So the study of ecolinguistics focuses and reveals discourses that go against the researcher's stance and ecosophy, thus each study may have a different starting point and different worldview against which discourses will be evaluated. This also highlights the importance of subjectivity and positioning of the researcher. I analyse the discourses in the texts and then judge

them against my formulated ecosophy. Which discourses are destructive, i.e. predominantly working against the ecosophy? Which discourses are ambivalent, i.e. similar to the aims of the ecosophy but have differences, and can beneficial discourses be found to resonate with the ecosophy?

If power is immanent in all social relations and there is simultaneously an inherent distrust of authoritative power, of social relations and even of values and norms of illustration, then there is a problem for one's own normative viewpoint. Should we strive for no normative viewpoint? Is it possible to argue without adopting a normative stance? Or does pretending to have no normative stance only mean failing to recognize one's own (implicit) normative viewpoint? Even if discourse analysts frequently assume a critical stance towards hegemonic norms, their research is typically based on implicit ideals of freedom or autonomy, for example, when these researchers expose hegemonic discourses or propose alternative interpretations and/or emphasize oppressed discourses. Such scholarly work implicitly refers to a normative viewpoint, that is, to a position that can be employed as a positive and normative point of reference by presenting informed alternatives.

Another approach often used by critical discourse analysts is to openly defend a particular normative standpoint. Although critical of hegemonic norms, such researchers defend particular norms that also can have (undesired) power effects. When adopting a normative viewpoint before performing discourse analysis, these researchers must assume a normative position outside of the criticized material.

However, my aim is not to demonstrate the way in which research is always value- and ethics-laden, but rather consider the grander implications of engaging in critical methodology. Which brings us to the bigger picture.

4. Political ramifications of methodology– science as a depoliticised arena

The micro choices have a cumulative effect on the macro. Constructing knowledge also means constructing nature and I will take it a step further: it is also constructing a political reality. If our research deals with a particular conflict or social problem, those engaging with it may phrase it in scientific terms, as if devoid of political motivations, but economic and political interests are always there, even if institutionally motivated.

Latour (1987) warns against assuming that only armies, large corporations or other obvious culprits of the (capitalist) system have the power to push technocracy in their preferred directions. What Latour warns against is the 'creeping' of a certain way of doing things that establishes as the right way and in so doing, marginalises freedom of thought, speech, and doing research. In other words, critically evaluating social and political constructs. And as I said, we are at the precipice of this. How is this connected to methodological considerations?

Policy is the result of multiple projects, and policy makers construct narratives, maps and facts by selecting what they consider to be the most important aspects at hand. Here the effects of political power are at their clearest. If in the world of research, the fact that knowledge changes can be valued as progress rather than simply dismissed as mistaken science, in policy and activism facts need to be stable for them to be of use.

If we are discouraged from considering our axiology, and we are denied of exploring and critiquing we do not only become separate from ourselves and who are, exploring our passion and our values, in the end we will be faced with an ineffective empty academic praxis that does not perform its checks and balances, because academia functions not only as a contributor to knowledge, but also as a political watchdog, and we have seen this is the Frankfurt School.

5. Conclusion

To end my reflection, science and its resulting common sense, coupled with institutional pressures mean that we forget our own embeddedness in our research environment. What remains of utmost importance is for us as researchers to show where inequalities of political or economic power are systematically reproduced, where exploitation of human and nonhuman animals occurs, and where business operates as though separated from society, doing all of this, whilst their origins are obscured by emptying science and technology of their political and cultural dimensions.

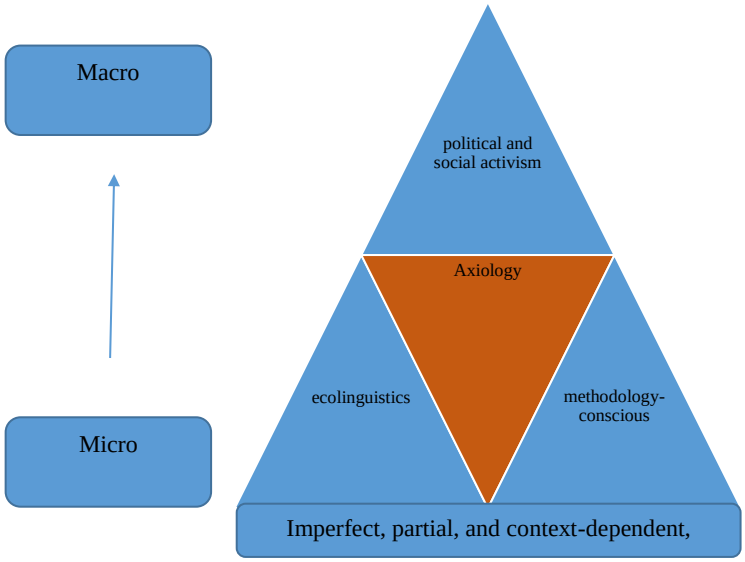

Fig. Methodo-axiological framework

6.4 Research Design

6.4.1 Data

Data is drawn from multiple sources in order to gather a rich overview of the hedgehog protection arena. Commensurate with the interpretivist paradigm, this research follows an inductive method, with small data samples, covering a wide range of data that is then investigated in-depth (Burrell and Morgan, 2016). It has a slight postmodernist flavour as well, as it focuses on absences and silences, knowledge and meaning, as a direct result of power relations. The thesis challenges dominant views as phenomena that contribute to extinction (Saunders, Thornhill and Lewis, 2019).

The data gathering procedure involved three types of data: (1) secondary written and publicly available texts extracted from online annual-integrated reports of two large international agrochemical companies: Bayer (2018) and Syngenta (2018); (2) secondary multimodal data of videos from the same companies' websites; (3) spoken discourse from interviews with agrochemical companies, NGOs, academics, hedgehog carers, local authority members such as councillors and ecologists (see Table 6 section 6.4.4)

6.4.2 Secondary written data

Bayer and Syngenta, the agrochemical corporations at the centre of the study, were the subject of intense scrutiny. In addition to an analysis of the corporation's website and media releases, CEO letters, videos and images, a review of the companies' annual and environmental reports was undertaken. Reports from 2018 were analysed following an ecolinguistic framework, discussed further below (Stibbe, 2015). The analysis of the reports concentrated on the corporations'

disclosures on biodiversity practices in general and the reporting of the wildlife and animal species in particular.

While all the data under analysis are labelled as integrated reports, there is no clear definition of what an integrated report (IR) is, what elements it should contain, and when it comes to environmental disclosure the voluntary nature of the endeavour further reduces comparability across IRs (Gibassier, Rodrigue and Arjaliès, 2018). However, since the data all pertain to the sector of agrochemicals, produced by listed multinational corporations there is a case to be made for examining the extent to which the sector accounts for its effect on the environment at large, species extinction and protection and hedgehogs, in particular.

Bayer Annual Report 2018 (275 pages)	**Syngenta Sustainable Business Report 2018** (55 pages)
Text 1: Chairman's Letter (p.6-10)	Text 1: Chief Executive Officer's statement (p.2-3)
Text 2: Report of the supervisory board letter to stockholders (p.12-17)	Text 2: Creating value now and for the long term (p.4)
Text 3: Our commitment to preserving biodiversity (p.69)	Text 3: Our offer (p.6)
Text 4: Impact of crop protection products on the environment (p.73-74)	Text 4: The Good Growth Plan (p.18-19)
Text 5: 1.6.3 Environnemental Protection (p.77)	Text 5: Our commitment is to enhance biodiversity on 5 million hectares of farmland
Text 6: 1.4.3 Societal Engagement (p.61)	Text 6: Help biodiversity flourish (p.26-27)
Text 7: Stakeholder dialogue promotes acceptance and business success (p.34)	Text 7: Non-financial performance summary (p.52)

Table 4: Summary of the chosen texts under analysis

Both companies have received awards for their reporting and transparency, as well as for environmental outreach on sustainability. For example, Bayer AG (2020) was identified by the Carbon Disclosure Project (CDP) as an international leading position as a sustainable company in areas of climate and water, and EcoVadis

honoured Bayer with a Gold Level rating for sustainability. Bayer continues to be included in the important sustainability indices FTSE4Good, MSCI World Low Carbon Target Index, STOXX® Europe Sustainability Index and the STOXX® GlobalESG Impact index.

In terms of involvement with upholding the UN's SDGs initiative, Bayer is committed to the U.N. Sustainable Development Goals (SDGs) and has published a company position paper detailing this. Bayer positions itself as a world leader in which "Our innovations, products and services contribute to overcoming some of the biggest global challenges, including the goals of "Zero Hunger" (SDG 2) and "Good Health and Well-Being" (SDG 3) in particular" (Bayer AG, 2018b: 32). Similarly, Croda (2020), an adjuvant company included in the primary data was awarded the ICIS Innovation Awards earlier in the year 2019 to celebrate innovation within the chemical industry and celebrates companies that show high levels of innovation within their products and processes, as well as providing benefits to the environment and advancing product sustainability. This award bears importance for crop protection products because its application includes drift reduction within agricultural applications. These companies have been consistently considered as sustainability leaders and reporters by the DAX index and the Dow Jones Sustainability Index. Therefore, analysing the environmental aspect of stewardship towards species is critical as part of their sustainability efforts. Additionally, the concept of double materialty (see also sections 2.4, 3.5, and 11.2.1) currently taking roots in the financial sector would provide the necessary pressure, and preamble to a statutory reporting on species extinction, or at the very least, view species loss as a material risk (Atkins and Macpherson, forthcoming).

6.4.2.1 Rationale for the specific text choices and rationale for using agrochemical companies

The state of the natural environment as reported by the IPBES (2019) continues to reveal human activity as the principal culprit in the acceleration of the disappearance of wildlife, with more than 1 million species threatened with extinction as discussed in chapter 1.

A large part of human activity that greatly and negatively impacts the natural world is agricultural activity (Silva *et al.*, 2019). For example, the UK alone utilises an area of approximately 174 million hectares of agricultural land (Pesticide Action Network UK (PAN), 2018; Goulson *et al.* 2018). Agricultural practices increasingly rely on the use of pesticides, which affect not only the natural world but every aspect of human life.

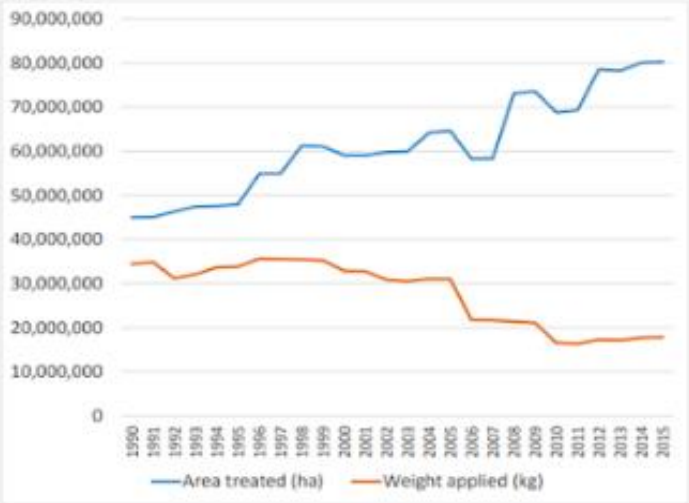

Fig. 18: Area of crop treated (blue) and mass of pesticides applied (red) from 1990-2015 (Goulson, Thompson and Croombs, 2018: 3)

In the UK, between 1990 and 2016, pesticide use has risen by more than 63% with the UK's Pesticide Action Network (PAN) reporting increases in toxicity, and

in areas of land and crops treated (PAN, 2018). The global market for pesticides is valued at around $65 billion per year and growing (Gillam, 2017; BBC Research, 2012). Therefore, agrochemical companies must account for the impact their products may have on vulnerable species that could be affected as the result of the application of pesticides (Mathews *et al.*, 2018).

The methodology seeks to uncover representations and erasures of nature. Additionally, the way in which biodiversity is discursively constructed will be examined, in an attempt to make the argument that biodiversity discourse across the reports erases species. The texts, all retrieved from the online version of the reports are treated in the analysis as 'hypertext' a term coined by Ted Nelson in the 1960s to refer to electronic text that was characterised by non-sequential writing with texts that branch out to other pages and present choices for the reader (Kok Kum Chiew, 2004). Thus, hypertexts are dynamic, alterable and multi-sequential. The meaning-making pathways or 'trajectories' (Baldry and Thibault, 2006) created between linked pages can be indicative of the way in which the companies construct their identities, and frame environmental degradation and species protection.

As Milne et al. (2009) note, such representations can be argued to be constitutive of the way that agrochemicals have come to 'know' and 'do' accounting for biodiversity. Therefore, the way in which biodiversity is constructed and framed could constrain the adoption of the extinction account framework, for example, as 'material' or not. However, with the onset and take up of double materiality corporations will be faced with pressure to account for species. Although not a legal requirement as carbon emissions are in the UK for example, double materiality is being rolled out through the EU Green Deal and is becoming entrenched across financial sectors. Indeed, it's not just about climate-related impacts anymore: Mark

Carney, former Chair of the FSB, is now, as UN Special Envoy for Climate Action and Finance, pushing for worldwide mandatory climate disclosure ahead of the COP26 climate summit, elevating the concept of double materiality to a matter of global concern (Atkins and Macpherson, forthcoming).

6.4.2.2 Rationale for choosing CEO letters

While CEO letters do not directly relate to environmental protection and action the company undertakes, they play a role in the way in which the company sets its attitude towards stewardship and governance that extend to all aspects of the company's activities. Amernic et al. (2007: 1844) emphasise that "annual letters to stockholders by CEOs are not merely mundane discourses of seemingly minor importance", rather they possess an institutionalised role that extends far beyond a narrow target audience of shareholders. Publicly available texts, the letters are published to provide a "personal accountability narrative". The institutionalised nature of the letters plays an important role in structuring thinking "about issues of governance […] the corporate world in general, and government […] they are excellent examples of 'shaping of meaning'. Following Amernic et al. (2007), CEO letters, have been identified as the most read text of the annual report.

In relation to a common question of whether CEOs are the true, personal authors of their letters, Amernic et al. (2007) note that many successful CEOs have expressed their strong role in writing letters, with few delegating the responsibility to others, as the authors suggest "the thinking and issues that infuse the CEO's letter are determined primarily by the CEO […] and as such can be regarded as indicative of the CEO's mindest […and] they assume legal responsibility for its content". This could be seen as an incentive for spurring CEO accountability to at least approve the

final version. However, Amernic and Craig (2006: 200) importantly emphasise that it does not matter as such whether CEOs are the authentic authors of the letters, because the words are "symbolic and emblematic" of the ideology that the company wishes to transmit (if not impose) on others, using the power and resources the company possesses. In other words, the CEO letters can be viewed as instruments for the reification of the company's ideology, motivated by financial, economic and political interests.

Mäkelä and Laine (2011: 218) identify CEO letters as "the most powerful and influential types of corporate reporting". CEO letters have cultural and political significance through which stakeholders, and in particular shareholders who are the target audience for these come to understand environmental issues as they are framed by the corporations. Clatworthy and Jones (2006) assess whether companies performing poorly financially engage in an increased impression management. The authors examine the chairman narrative statement of 50 highly profitable and 50 highly unprofitable listed UK companies and find that the reporting is, overall, consistent with impression management.

CEO letters are perceived to mirror corporate culture (Mäkelä and Laine, 2011). Because the letter always prefaces the report, it sets the tone for the entire opus and could be said to represent management's views. CEO letters are the most widely read part of the annual report and as such have been considered to have political and cultural importance in the sense that they shape dominant discourse on ESG issues (Mäkelä and Laine, 2011: 220). Focusing on the identified relevant text affords a closer and more detailed analysis of a smaller corpus.

Even though the aim of this study is not to compare the companies, selecting two companies in the same industry of agrochemicals provides an important and relevant database for examination. Syngenta and Bayer are two big multinationals that together account for 40% of the market share. Bayer has over 110,838 employees in over 90 countries, and Syngenta also operating in over 90 countries, with 28,704 employees (Bayer AG, 2018b; Syngenta, 2018a). They differ in their backgrounds. While Syngenta is owned by ChemChina since 2017 and unlike Bayer, does not hold segments in Animal Health and only operate in Crop Protection (although Bayer are in the process of divesting from it, with a loss of over 12,000 employees hanging in the balance). The empirical material is derived from the annual integrated reports of 2018, as the most recent data available at the time of writing.

6.4.3 Multimodal data

All types of corporate reporting is now placed online on the companies' website. Moreover, in some instances, the printed version of the report is different from the online version, and is substantially shorter (e.g., compare Bayer 2018 online and print versions).

The online version makes use of hypermodal affordances, incorporating links alongside the written content that enrich the reader's knowledge, integrating a variety of genres of texts. Multimodal data has been collected from Bayer and Syngenta's websites and includes images but also videos and accompanying music and sounds. The videos have been transcribed using Adobe Premiere which permits to segment the videos into sections according to frame number and the visual images were tagged, similarly to textual analysis (Baldry and Thibault, 2006).

6.4.3.1 Bayer

The data for this analysis have been extracted from Bayer's website where the company has launched a new initiative to render their operations and activity more transparent. Specifically, the data concerns one webpage titled: Crop Science Bayer: Understanding Regulatory Science for Crop Protection. A sub-heading reads Environmental safety of which a video has been extracted for analysis. It should read 'product safety'. The website is interactive and gives a navigation panel:

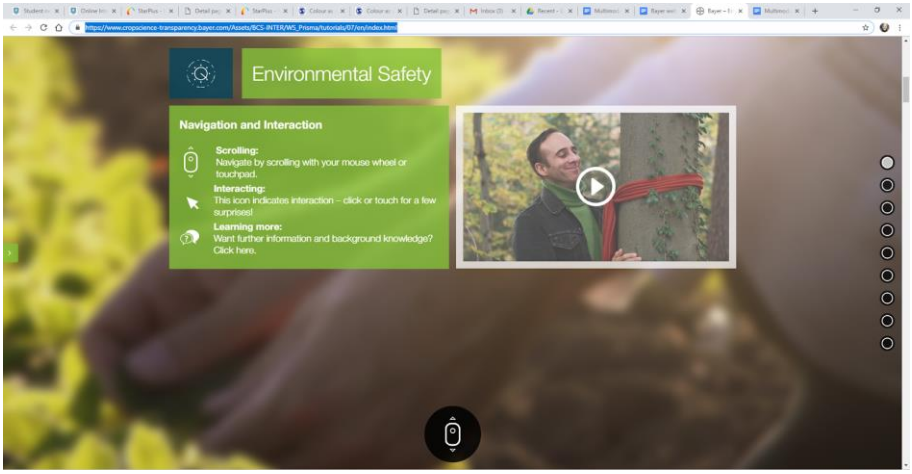

Image 1: Screenshot of navigation panel on Bayer's interactive website (Bayer AG, 2018a)

The analysis of this page will proceed from top to bottom, starting with the video that is the first item a reader encounters. Of course, there is no way of knowing in which order readers will approach the text. Therefore, I will proceed with analysis according to the layout provided by Bayer, assuming this is the order they wish readers to follow.

I have chosen to focus on the videos following Maier (2011) who correctly notes that digital media tends to have a broader and larger audiences. The topic of this video, allegedly environmental safety is a challenging and ambitious aim for

Bayer and a multimodal analysis of this type of data has not been done in previous SEA studies. The data have been coded at the level of frame and shot in a Microsoft Word table document in terms of image attributes, with the full wording of each units of analysis (Bateman, 2016) such as the social actor and the types of knowledge selection processes. The visual and verbal modes were combined after the spoken language has been transcribed and the added to the table combining the visual and spoken semioses. Such a table offers the possibility to code systematically each frame in terms of what knowledge is disclosed.

6.4.3.2 Syngenta

In 2018, Syngenta boasts carrying out 150 listening sessions across the globe, expressing the company's interest in learning from various stakeholders. Video 1 purports to constitute a response to stakeholders which may also be telling of Syngenta's accountability and transparency.

Video 2 directly addresses biodiversity, and bees in particular. Data is coded at the level of frame and shot, in the same method as the Bayer videos.

Bayer (Bayer AG, 2018a)	Syngenta
Video 1: Bayer for more TRANSPARENCY: Environmental Safety (Bayer AG, 2018a)	Video 1: Syngenta: Responding to our stakeholders (Syngenta, 2019b)
Multimodal Text 2: CREEPY, CRAWLY, FUZZY, BUZZY OR DOWNRIGHT YUCKY … … BUT WE CAN'T LIVE	Video 2: Syngenta Operation Pollinator (Syngenta, 2018b)

WITHOUT THEM. (Appendix C)	

Table 5: Multimodal texts for analysis for Bayer and Syngenta

6.4.4 Interviews – Primary spoken data

The arena concept is drawn upon in presenting and analysing the data from agrochemical companies as central, but also from many other stakeholders (Tregidga, 2013). The arena concept recognises the political and contested nature of the practice being analysed and is particularly useful in highlighting the range of participants in an arena and their different ideologies, rationalities and logics. As demonstrated by Georgakopoulos and Thomson (2008: 1120) "within an arena, it is assumed that different actors use social resources to pursue their objectives. These resources include money, power, social influence and evidence". Arenas consist of a range of participants including political institutions, rule enforcers, issue amplifiers, supportive and reforming stakeholders and the general public (Georgakopoulos and Thomson, 2008).

Following Tregidga (2013), each arena participant is assumed to attempt to influence the outcome of the decision process. As such, the arena concept is useful in explaining and analysing complex issues which involve multiple groups and individuals. It is also useful here as "while the practice of one corporation is considered, the actual regime of governing embraces a variety of relationships that

require a broader analysis than would be possible if the corporation only formed the basis of analysis".

Interviews lasted from half an hour to over an hour, conducted both in person, on the phone and on Skype, discussing the corporation's biodiversity practices, including perceived motivations, ostensible rationale and modes of implementation (see appendix A for interview questions). This elucidated aspects of the practicalities of biodiversity and the benefits to the company and to the biodiversity under discussion, as well as some of the challenges.

Organization	Interviewee Code	Role
Company 'C'	C1	Head of science communication
	C2	Head of biodiversity initiative
	C3	Head of biodiversity strategy
	C4	Environmental safety
	C5	Entomologist
	C6	Head of environment and sustainability
Company 'S'	S1	Head of business sustainability
	S2	Environmental safety
	S3	Head of sustainable farming
Company 'D'	D1	Head of sustainability Group
	D2	Biodiversity committee
	D3	Chemical engineering
Local councils	E2	Ecology unit
	E3	Local MP

	E4	Head of farming project
NGOs	NGO1	Communication officer
	NGO2	CEO
	NGO3	Project manager
	NGO4	Hedgehog officer
	NGO5	Pesticide Program Specialist
	NGO6	CEO
	NGO7	Ecotoxicologist
	NGO8	Head of policy
Hedgehog Rescuers	R1	Midlands rescue
	R2	Northern rescue
	R3	Northern rescue
	R4	Northern rescue
	R5	South west rescue
	R6	South west rescue
	R7	Northern rescue
Academics	O1	toxicologist
	O2	Biodiversity and environmental science specialist in pesticides and pollutants

Table 6: Research participants: interviewees codes and roles

Interviews with local authority representatives were conducted in 2018-19 with 3 participants in total who are engaged in varying levels in biodiversity accounting, some were ecologists, park planners, council employees and MPs. Adopting an approach used by Weir (2018b) in his study of biodiversity accounting practices in

local councils, I aimed to listen to participants with a broad range of familiarity with biodiversity accounting. Interviews were recorded and later transcribed. As Gaia and Jones (2017) highlight, councils play a central role in protection of wild spaces and the environment. They manage large public areas of land, much of which are rich in biodiversity. They are thus responsible for planning and regulating many activities which may impact on biodiversity. Local councils need to be accountable to society for the actions undertaken to conserve biodiversity as they act as stewards of the environment (Jones, 2003).

Finally, as Dey and Russell (2014: 1) comment, studies that only focus on organisation disclosures "may perpetuate, rather than reform, unsustainable organisational and societal behaviour" by continuously placing their discourse in the centre of the arena, when in fact, as Cuckston (2017) notes, it is important to see the ecological problem as central, with various players and stakeholders that surround it. But of course, an over-reliance on the notion the sustainability as a systems issues, dilutes the responsibility corporations have towards the protection of the environment and species (Dey and Russell, 2014). An example of a systemic approach that has failed is, as mentioned in chapter 3, the CBD.

Alongside governance systems and frameworks, Dey and Russell (2014) note that it is important to consider the role of other non--corporate actors in framing and legitimising (or de--legitimising) the ecological and biodiversity impacts of organisations, i.e., external accounts. Therefore, interviews with insect and mammal NGOs were conducted, as well as with hedgehog rescuers across England.

6.5 Research analysis: Ecolinguistics

The interpretive and normative nature of this thesis defines the need for ecolinguistics as the overarching umbrella framework for this project. Tregidga et al.

(2012) point out that the current methods for analysing the quality, meaning and accountability of organisational reporting are practically dominated by quantitative content analysis, with few studies investigating the 'nature' and 'meaning' of reporting and their systemic and social effects.

6.5.1 Discourse, narratives, stories, reports or disclosures? Some definitions before we start

It is important at this point to provide a definition to the term *'discourse'* and other synonymous referents in Critical Discourse Studies (CDS), as there are radically different approaches to discourse resulting in "a bewildering range of overlapping and contrasting theorization" (Fairclough, 2003a: 124).

Fairclough (2003a: 124) views discourses as not only representing the world "as it is (or rather is seen to be), they are also […] imaginaries, representing possible worlds that are different from the actual worlds and tied in to projects to change the world in particular directions". In other words, changing discourses has the potential to alter reality.

In their introduction, Flowerdew and Richardson (2018) provide a definition of discourse as a specific set of meanings expressed through different semiotics that construct social institutions and social groups. Stibbe (e.g., 2015) uses the term *'stories'* to denote unquestioned and dominant assumptions, ideologies, frames, and metaphors that can be found within prevailing hegemonic discourses. In other words, discourses can be analysed and critiqued for the presence of destructive ideologies and ways of framing certain environmental issues by locating indicative linguistic and non-linguistic features and patterns within them. In this conceptualisation of discourse, therefore, discourse can be realised by all semiotic systems including visual, aural, and material (clothing, appearance, etc) systems of signs, which I refer to here as multimodality (Flowerdew and Richardson, 2018).

6.5.2 Historical evolution of Ecolinguistics: language and biodiversity

Ecolinguistics as a field has evolved over the last 45 years and its genealogy has been presented in several detailed reviews (e.g., Alexander and Stibbe, 2014; Steffensen and Fill, 2014; Chen, 2016; Fill and Penz, 2017). The roots of ecolinguistic thought, emerging as a reaction against the Sapir-Whorf hypothesis, originated in Einar Haugen's (1972; 2001) early formulation of ecolinguistics known as the *Ecology of Language.* Steffensen and Fill (2014) trace four strands of ecolinguistic development in Haugen's work: symbolic ecology, natural ecology, sociocultural ecology and cognitive ecology. In his essay, Haugen first pointed to language being part of a larger environment (LeVasseur, 2015), in which a complex interaction between the social, natural environment as well as between individuals occurs. This strand of ecolinguistics, termed *symbolic ecology* by Steffensen and Fill, takes a metaphorical approach to 'ecology' that conceptualises language as operating in a human 'environmental ecology', thus borrowing from the natural world's notion of ecology, encompassing issues such as language loss, language diversity language shift, code-switching, pidginization and creolization[10]. Biolinguistic diversity, a term coined by Nettle and Romaine (2000) who investigate the extinction of languages, correlate how language diversity in different geographies reflects the complex relationship between the communities, the natural environment and species loss. Hale et al. (1992) support this view and claims that ''just as the extinction of any animal species diminishes our world, so does the extinction of any language". In fact, it was Haugen who articulated the connection between language loss and biodiversity

[10] Pidgin languages are created in an environment in which people have no common language and develop a narrow range of functions. For example, on Carribean slave plantations in the seventeenth and eighteenth century, African people were separated so that they do not have a means to communicate and plan an escape. On sea coasts, pidgins evolve in multilingual contexts for trade. Pidgins normally have a short life, as trade wanes so does the language. A creole is a pidgin that remained and developed native speakers. It has an expanded vocabulary, structure and a broader range of functions (Holmes, 2013).

loss and extinction, arguably influenced by and drawing on Arne Naess' deep ecology. The current ecolinguistic approach rests on Haugen's identification of the need for an ecological philosophy that underpins current ecolinguistic studies (Steffensen and Fill, 2014:8) and differentiates it from sociolinguistics (Chen, 2016).

Current ecolinguistic scholarship has diverged from the Haugenian metaphorical conceptualisation of the ecology of language, and is interested in how linguistic structures could play a role in determining the survival of all life on Earth. Simultaneous to this latter turn in ecolinguistic research was the publication of Silent Spring by Rachel Carson (1962) concomitant with the publication of the Brundtland Report and a rising awareness of looming environmental crises and increasing degradation.

However, it was not until the 1990s that ecolinguistics in the Hallidayan tradition that makes a connection between language use and environmental degradation began to emerge. This conceptualisation and direction of ecolinguistics has been attributed to Halliday's (2001) seminal speech at the World Conference of Applied Linguistics held at Thessaloniki who aimed to bring an awareness of anthropocentricity to language studies (albeit still containing strong anthropocentric features) and create a link between environmental crises, ecology and the socially situated study of language, thus broadening Haugen's initial concept of the ecology of language. Specifically, Fill (2001: 49) notes that "linguistic anthropocentrism comes to the surface in the way languages name all natural phenomena from the point of view of their usefulness to humans". Central to this tradition that differentiates it from the Haugenian and the biolinguistic traditions is the espousal of an ecosophy. According to Stibbe, founder and convenor of the International Ecolinguistics Association, "ecolinguistics analyses language to reveal the stories we

live by, judges those stories according to an ecosophy, resists stories which oppose the ecosophy, and contributes to the search for new stories to live by" (2015: 183). Additionally, as Fill (2001: 48) notes, Halliday's work also touches on ecocriticism, connecting language with growthism, classism and speciesism, to which I now turn.

6.5.3 The eco-critical turn in ecolinguistics

Ecology, as defined by Darwin, was concerned with the "'evolution' of organisms and the development of humans in this evolution" (Fill and Penz, 2017: 3). Although the Darwinian approach to evolution that favours competition is not wholly useful to the understanding of ecology, it is Darwin's follower, Ernst Haeckel's later definition of ecology as "the study of the interrelations between organisms and their living and non-living surroundings – including organisms of the same and of other species" emphasising the interrelationships and interdependence that is of most importance to the Hallidayan strand of ecolinguistics (1866/II:286, in Fill and Penz, 2017: 1). Thus, in the Hallidayan strand of ecolinguistic, in which ecology is understood in its biological sense, how language is used vis-à-vis the natural environment, or as Fill (2017: 3) eloquently summarises, "ecolinguistics deals with the impact of language and discourse in describing, but also aggravating and perhaps alleviating, environmental problems". In this conceptualisation, ecolinguistics has an emancipatory potential, as will be discussed in a later section.

This strand branched into a new avenue for research, one that has as its focus, and more aligned with Critical Discourse Analysis (CDA) and Critical Discourse Studies (CDS) agenda, to "critique forms of language that contribute to ecological destruction and aiding in the search for new forms of language that inspire people to protect the natural world" (Stibbe, 2015: 9). There is a direct link between linguistic

diversity, biodiversity, ecological health and survival, as Stibbe and Alexander (2014: 107) note, "when local languages are displaced by dominant world languages such as English what is lost are the discourses which encode everything people have learned about living sustainably in the local environment. These are replaced by discourses such as those of economic growth, consumerism and neoliberalism that are at the core of an unsustainable society." Vananda Shiva (2010: 83) makes observations on the use of language in democracy and economics. The ecological crisis, mass extinction experienced today is rooted in socio-political change. But there are fish in the oceans, and there are trees and earthworms in the soil, and they count, too, for life on earth. But they were left out of the thinking on democracy". Indeed, animals have very little legal protection, and none have citizenship status. Shiva points to the polysemy of 'growth', in which the metaphorical meaning appropriated by economics as in 'economic growth' stands in contradiction to sustainability efforts. If fact, this appropriation of the meaning 'growth' is extending the metaphorical: "But if trees in the forest are growing they aren't 'growing' economically" (ibid). The public, the voters are not considered as stakeholders in corporate activity, particularly concerning sustainability and environmental issues. In her discussion of biopiracy in the patenting of seeds by corporations such as Monsanto, now Bayer, Shiva (2010: 86) correctly identifies language use in an agricultural agreement that advances a perception of agriculture as not being part of nature: "it doesn't have the word 'soil' in it; it doesn't have the word 'food' in it; it doesn't have the word 'farmer' in it. But what it does have is 'market access', 'export competition', 'domestic support'".

"Language, then, is relevant to the extent that it plays a role in how humans relate to each other, to other organisms and to the environment" (Alexander and

Stibbe, 2014: 104). Crucially, as Alexander and Stibbe notes, the emphasis in this approach to ecology is not simply on the interaction but on the sustaining of life of ecological systems and beings.

Although there is no currently agreed-upon definition of ecolinguistics (LeVasseur, 2015), I follow the definition of ecolinguistics articulated by Alexander and Stibbe (2014: 105) as more than "just the analysis of texts which happen to be explicitly about the environment, and is more than just a metaphorical way of thinking about language contact. Instead, ecolinguistics is, primarily, the 'ecological analysis of discourse […] the study of the impact of language on the life-sustaining relationships among humans, other organisms, and the physical environment".

Form of story	Definition	Linguistic features
Ideology	A story about how the world was, is and should be in the minds of members of a group	Discourses i.e. characteristic language features used by members of a group
Framing	The use of a source frame to structure a target domain	Trigger words that bring a particular source frame to mind
Metaphor	A type of framing where the source frame is from an imaginable area of life that is distinctly different from the target domain	Trigger words that bring the source frame to mind
Evaluation	A story in people's minds about whether an area of life is good or bad	Appraisal patterns i.e. patterns of language, which represent things positively or negatively
Identity	A story in people's minds about what it means to a particular kind of person	Forms of language that characterise people*
Conviction	A story in people's minds about whether a particular description if true, certain, uncertain or false	Facticity patterns i.e. linguistic patterns that represent a description as true, uncertain or false

Table 7: Ecolinguistic framework (Stibbe, 2015)

Erasure	A story in people's mind that something is unimportant or unworthy of consideration	Patterns of language which erase or diminish
Salience	A story that something is important or worthy of consideration	Patterns of language which foreground an area of life

The ecolinguistic framework focuses on eight types of stories, or discourses labelled as ideologies, framings, metaphors, evaluations, identities, convictions, erasure and salience. These will now be described in detail as follows.

6.5.4 Ideology

Ideologies are belief systems about how the world was is, will be or should be which are shared by members of particular groups in society (Stibbe, 2015: 22). Ideologies have structure and they can be identified through the choices made in language and semiosis (Mooney and Evans, 2015). Ideology, created, reinforced and maintained through language over time, becomes a 'common-sense' that shapes a pervasive, accepted worldview replete with values and beliefs.

For ecolinguistic analysis the aim is not to question the facticity of a text or an ideology but whether the ideology encourages the protection or destruction of the ecosystem. For example, the ecosophy of the thesis calls for the protection and consideration of all species, so a story which sets some species as more important is a speciesist one and stands in opposition to the ecosophy. In this way an ecolinguistic analysis resists discourses which convey ideology which can be considered to play a role in ecological destruction, termed destructive discourses (Stibbe, 2015).

One dominant destructive discourse is an economic one, particularly in the discourse of industrial agriculture where 'living beings are treated in accordance with the

economic-technological ideology like objects that are produced, managed, optimised and utilised" (Trampe, 2001). Trampe (2001: 238) concludes that, "the language-world-system of industrialised agriculture demonstrates that humans are about to lose contact with their natural environment thus endangering their very survival".

However, even discourses that aim to deal with environmental problems and can be considered positive (including ones produces by agrochemicals, for example), are problematic because all texts arise from the same society, and can be subject to pursuing interests of governments, rather than being purely ecocentric.

6.5.5 Framing

The term frame, introduced by Bateson (1972) framing and reframing derives from various fields that treat the concept in different ways. For example, Tannen and Wallat (1987) examine the changes in frames during an interaction in which knowledge schemas trigger cues for the switching frames. Frames in the context on an interaction refers to a sense of what activity is being engaged in, how speakers mean what they say. Goffman (1959), in his early work on impression management, viewed interaction as a performance, shaped by the context of the situated interaction. In Goffman's interactional frame, the individual is fully agentive, that puts a consistent front or a face to advance their agendas.

"Framing essentially involves selection and salience. To frame is to select some aspect of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described. Typically, frames diagnose, evaluate and prescribe" (Entman, 1993: 52 in

Amernic, 2007: 1858). Following this then, frames organise a belief system and highlight, construct and position particular issues, actors and beings either in a salient or absent position. In other words, frames can render something or someone salient, while abstract or erase others.

The definition of frames used here will follow Stibbe's (2015: 54) that draw on the above: "A frame is a story about an area of life that is brought to mind by particular trigger words. Framing is the use of a story from one area of life to structure how another area of life is conceptualised. Reframing is the act of framing a concept in a way that is different from its typical framing in a culture".

6.5.6 Metaphor

Metaphors are a type of cognitive frame that equate an abstract notion in physical terms. Stibbe (2015: 64) defines metaphors as structures that use a frame "from a specific, concrete and imaginable area of life to structure how a clearly distinct area of life is conceptualised". Metaphors consist of a source frame mapped onto a target domain. For example, in the metaphor CLIMATE CHANGE IS A TIME BOMB, the source frame 'time bomb' structures that target domain 'climate change' (Stibbe, 2015: 67). According to Nerlich and Jaspal (2012: 93) metaphors are so important that choosing the wrong metaphor can "contribute to the extermination of our species". And indeed, what is important in ecolinguistic analysis is to consider, using the context in which the metaphor is in, whether the metaphor is destructive, ambivalent or beneficial against the ecosophy.

Importantly, metaphors are used to set up reasoning or metaphorical reasoning (Johnson, 1983). Metaphors have been analysed both in accounting literature and in linguistic analysis. Metaphor is a way of translating reality, an abstract often

incoherent, into terms more easily understood and digestible. Similarly, accounting can be understood as a metaphor in itself as it abstracts from the natural world creating certain visibilities.

In sum, metaphors can be powerful cognitive frames as they can convey vivid and simplifies images in the minds of the audience.

6.5.7 Identities

Interviews with NGOs, agrochemical companies, public authorities, academics and other stakeholders affords us to examine the identities as performed, positioned and co-constructed in interaction. Ecolinguistics investigates the identities that emerge through interaction and what subject positions they take.

Some of the questions ecolinguistics can answer in the analysis are what kind of identity do the participant construct in the interaction? Are they ecological identities such as stewardship identity? Politician identities? Owner or consumer identities? How are stakeholders referred to and what subject positions are they ascribed? (Stibbe, 2015).

A discursive approach to identity views the subject as something that is not fixed, but an ongoing sociocultural and historical product of discourse (Benwell and Stokoe, 2006). Unlike Foucault's 'discursive production of the subject' where identities are seen as the products of dominant discourses, an approach that completely erases the individual subject and an outside, colonising force is shaping and directing the individual. I view this as problematic because this approach means that all meaning is situated not within the self, but as a mere effect of discourse and ideology, taking away the agency of the individual. There is a paradox in Foucault's one-sided view of identity. If our identities are 'made' by dominant discourses, then

they will continuously reproduce social inequality. Because to operate against the reproduction of social inequalities, one must be aware of it. An awareness implies agency.

Butler (1990) attempts to reconcile the paradox by positing that an individual is "never fully determined by power, but neither is it fully determining (Benwell and Stokoe, 2006: 32). Similarly to Goffman's (1959) work on the interactionally produced self in his 'The presentation of the self in everyday life' and his discussion of impression management, Butler's concept of performativity views identity as a discursive practice that is performed and shaped by the context in which it occurs and over time, becomes more fixed, albeit still subjected to the particular co-construction that is contextually situated. For Goffman, the agency is total, and the performance is conscious and deliberately carried out in order to manage a specific persona to further the speaker's objectives.

6.5.8 Convictions and facticity patterns

Facticity patterns (through linguistic features such as presupposition, modality, quantifiers) have been examined in ecolinguistics mostly in the area of climate change (e.g., Norton and Hulme, 2019). This is an important aspect to examine in relation to agrochemicals as their discourses, promoting particular ecologically destructive convictions may be cemented in people's minds as true. Additionally, examining conviction and facticity patterns in interviews is useful to reveal whether the facticity of hedgehog carer knowledge and information is undermined as untrustworthy, unscientific and unreliable.

6.5.9 Erasure

In relation to marginalised discourses and counter-discourses, erasure analysis pertains to the examination of those who are backgrounded, excluded and erased from texts and other semiosis. When animals, or aspects of their lives such as their homes, families and friends, emotions and feelings, are ignored or not mentioned systematically from a text, it creates a story (Stibbe, 2012) that those participants are unimportant or irrelevant. As Stibbe (2012: 145) writes in *Animals Erased*, "it is unlikely that the ecological systems that support life will be given priority if they are missing or erased from key discourses".

The definition of erasure I follow notes that (Stibbe, 2012: 146): "Erasure is a story in people's minds that an area of life is unimportant or unworthy of consideration". In terms of linguistic features, I will be examining a pattern of linguistic representation, "of an area of life as irrelevant, marginal or unimportant through its systematic absence, backgrounding or distortion in texts" (ibid.). For example, Schleppegrell (1997) analyses nominalisations in environmental discourse in education materials concluding that nominalisations are particularly effective at erasing human agents and thus suppressing their responsibility in relation to environmental destruction. Instead of employing transitive structures such as 'X polluted Y' and 'X degraded Y', verbs have become nominalised into a single noun (pollution, degradation), omitting X, the actor and effectively erasing them.

Erasure analysis begins with a particular text, observing who and what is mentioned or not at all, and which should be. Stibbe (2012: 149) differentiates between three levels of abstraction: (1) the void, where a complete exclusion occurs; (2) the mask, where erasure occurs through a distorted version of the entity excluded; and (3) the trace, where someone or something is partially erased, but elements of them are still present.

"The concern of the accounting researcher in studying organizations should be to understand and explain what is not happening" (Choudhury, 1988: 551). A second approach to the study of accounting absence is "to attempt to seek out instances of absence that are the result of conscious decision and action (inaction?) by management" (Choudhury, 1988: 553). As Stibbe (2015: 149) notes, analysis of erasure begins with a particular sentence and, "the observation that something which is present in reality, and could possibly have been represented, has been excluded". One single occurrence is not sufficient to demonstrate erasure; it is therefore an established pattern across the text that is the aim of this analysis. Therefore, I follow Halliday's Systemic Functional Linguistics framework for micro-analysis of the texts (Halliday, 2004).

An ecolinguistic analysis of erasure is not only to point out that species have been erased in discourses found in annual reports, but also to demonstrate how they have been erased. Knowledge and awareness of the mechanisms of erasure can help companies to reverse the erasure and represent species more centrally.

6.5.10 Salience and re-minding

Salience and re-minding relates to PDA in the sense that pointing out what is 'missing' or erased is brought to the fore and an alternative to the dominant discourse is presented. Salience is most often found in multimodal analysis, in what is given most attention to due to size, placement, colour, and definition (Kress and Van Leeuwen, 2002).

For example, Atkins et al. (2015) draw on a utopian genre, where narrative and song cycle are juxtaposed with a contemporary capitalist framing of nature. Serving as a counter account, pictorial accounts can be viewed as a critique of the existing

state of the environment and a vision of a more sustainable future which organisations and their stakeholders must strive to achieve.

Nature diaries (Atkins and Maroun, 2020) which provide an archival account of the natural world are an example of narrative accounts, an "important narrative, pictorial and artistic reference for modern society's effect on the environment; an account of the value of nature at the deep ecological level and an alternative to the official environmental reports being prepared by companies" (Maroun and Atkins, 2020: 4). Finally, the texts that can exemplify an alternative relationship with nature may be need to be imagined in utopian writings until more positive discourse become the dominant ones. The utopian accounting genre engages with creating texts that are salient with nonhuman animals and placing them as central and sentient, essentially creating positive discourse that paves the way to a new relationship with the natural world.

6.5.11 Ecosophy

The evaluation of a discourse begins with a normative ecological philosophy against which the discourses found in the texts are judged. The term ecosophy, or ecological philosophy, coined by Naess, is central to Stibbe's (2015) ecolinguistic framework and the way in which ecolinguistic analysis is conceptualised. This section outlines the adoption of an ecosophy in the framework and traces its roots to Naess' Deep Ecology. Finally, the section outlines the thesis' ecosophy of animal rights.

6.5.11.1 Ecosophy as the basis of ecolinguistic approach

Kravchenko (2016: 103) in his discussion of the role of language as a vehicle for constructing reality, locates the positivist epistemological assumptions of scientific thought as the main challenge in addressing the environmental crisis when

he claims that "[T]he ousting of the ideology of holism from scientific research, and the persisting reliance on analytical methods have led to an extreme fragmentation of our knowledge of the world and language as a specific domain of human existence in this world which sets humans radically apart from all other known biological species". In studies of racism for example, analysts rarely state what value system they are using to judge discourses against as it is treated as self-evident that racism is negative (Stibbe, 2018). In ecolinguistics the need to articulate a value system is more important and yet more complex. The oppression of nature and speciesism involves multiple human groups interacting and co-creating a complex reality that undermines the systems on which life depends. As a result, to answer the question: 'what makes a discourse positive', for ecolinguistics that will depend on the analyst's ecosophy.

One key element of the ecolinguistics approach as conceptualised by Stibbe (2014, 2015) refers to the worldview and ecosophy against which texts are judged. The notion of ecological philosophy was first developed by Naess (1989) who coined the term deep ecology in his *article The Shallow and the Deep, Long-Range Ecology Movements* (Naess, 1973) as both an ethical and scientific framework. For Naess, philosophy was a way out of the ecocatastrophe, a way to action. The epistemology taken in this project, follows from Naess's presentation of an ontology in which nature is inseparable from humans and humanity. "If this ontology is fully understood, it will no longer be possible for us to injure nature […], as this would mean injuring an integral part of ourselves" (Naess, 1990: 2). Naess (1973: 99) defines an ecosophy as "a philosophy of ecological harmony […] openly normative it contains norms, rules, postulates value priority announcements and hypotheses concerning the state of affairs […] The details of an ecosophy will show many

variations due to significant differences concerning not only the 'facts' of pollution, resources, population, etc. but also value priorities". Therefore, the study of ecolinguistics focuses and reveals discourses that go against the researcher's stance and ecosophy, thus each study may have a different starting point and different worldview against which discourses will be evaluated. This also highlights the importance of subjectivity and positioning of the researcher, which will be discussed in a later section.

As Stibbe (2015) points out, while ecosophies are a statement of epistemology and values and positioning of the author, they also need to be based on evidence. The ecosophy chosen is based on an intrinsic value of beings, and larger-than-self values (Crompton, 2010), where the acknowledgement of other species' equal right to those enjoyed by most humans is correlated with pro-environmental attitudes and behaviour, whereas extrinsic values are found to promote environmentally destructive behaviours. "A strong focus on financial success is associated with: lower empathy, more manipulative tendencies, a higher preference for social inequality and hierarchy, greater prejudice towards people who are different, and less concern about environmental problems. Studies also suggest that when people are placed in resource dilemma games, they tend to be less generous and to act in a more competitive and environmentally-damaging way if they have been implicitly reminded of concerns about financial success" (Crompton, 2010: 10).

Importantly, I would like to note that this is only one possible ecosophy and I do not claim it to be the right one, or the most suitable to provide answers to the sixth mass extinction we are faced with. However, my focus and personal belief is that future discourses should celebrate the free lives and wellbeing of all species and

promote justice and equality. Finally, the ecosophy chosen for this research forms a strong part of my axiology.

6.5.11.2 Deep Ecology

Following Atkins and Maroun (2018; Maroun and Atkins, 2020), the point of departure for the ecosophy espoused here is Naess' deep ecology. Naess defines deep ecology as a movement rather than a specific view of reality, indeed stating that it "is not a philosophy in any proper academic sense, nor is it institutionalized as a religion or an ideology" (Clark, 1996). An important conception of deep ecology that supports this methodology is its presupposition of the importance of open dialogue and the promotion of discussion, supporting my axiological position of advocacy.

Naess' deep ecology rejects human centrality in favour of a view of interconnectedness of living beings all valued intrinsically, "Ecologically responsible policies are concerned only in part with pollution and resource depletion. There are deeper concerns which touch upon principles of diversity, complexity, autonomy, decentralization, symbiosis, egalitarianism[11], and classlessness" (Naess, 1973: 95).

In the principles of deep ecology Naess sets out the need to control populations, including human population as every living being has the 'basic' right for living space, and life quality. Another important principle is Naess' positive evaluation of cooperation and the need for diversity in order for life to flourish. Naess stresses that by exploiting nature and nonhuman animals, both humans and living beings are none the richer, as both suffer from a diminished potential: "The exploiter lives differently from the exploited, but both are adversely affected in their potentialities of self-realization" (Naess, 1973: 96). In other words, it could be said

[11] Naess emphasises this is 'in principle' and killing will take place in certain circumstances. This is discussed further in the next section.

that hedgehogs are rapidly dying out, inching their way to extinction, while on the surface it appears as though 'life goes on' to those manufacturing, using and abusing pesticides. However, following Naess, every living beings' quality of life and the life potential itself – diminishes.

However, Naess, although emphasising "a deep-seated respect, or even veneration, for ways and forms of life" (1973: 95), does not present a convincing, workable or practical solution. Naess clearly, if not explicitly, evokes the right for nonhuman animals to negative rights: "Ecologically inspired attitudes therefore favour diversity of human ways of life, of cultures, of occupations, of economies. They support the fight against economic and cultural, as much as military, invasion and domination, and they are opposed to the annihilation of seals and whales as much as to that of human tribes or cultures" (Naess, 1973: 96). I now turn to another normative ecosophy that does just that.

6.5.11.3 Animal Rights and wild animal sovereignty[12]

A recent horrific news item reveals the need for a systemic change for the way animals are conceptualised in society. A man was convicted for mutilating and torturing a live hedgehog and was sent to prison for six months (Davies, 2020). That is the maximum sentence that can be imposed. This clearly demonstrates that wild animals are not in receipt of adequate legal protection. Given legal personhood, the law would have had more weight to protect the hedgehog.

While deep ecology differs from animal rights, they share commonalities that may be more beneficial to focus on than their differences, as they can strengthen placing the interests of animals and the environment at the forefront of agendas. The

[12] Sovereignty does not strictly imply complex institutional differentiation, and there are many human communities who lack such organised systems, but rather are governed by custom

point of conversion between deep ecology and Animal Rights Theory (ART) lies in a shared “love of nature”. The positions can be characterized by the assumption that individual nonhuman entities (in animal rights) and even ecosystems (in deep ecology) have value beyond their instrumental value (Kopnina and Gjerris, 2015). As noted above, Naess (1973) identified a unity between all living beings, rejecting an anthropocentrically-motivated indirect concern for the health of nature dubbed shallow ecology.

The movement of animal rights and animal advocacy has come a long way through various battles from its modern 1824 beginnings in Britain with the establishment of the first Society for the Prevention of Cruelty to Animals (and became what is known today as the RSPCA), with its primary aim to prevent abuse to carriage horses, now embodying an ever growing social and political force (Donaldson and Kymlicka, 2011).

Drawing on the work of Regan (1984), animal rights has been defined as a commitment to a number of goals, including the abolition of animal experimentation, dissolution of commercial animal agriculture, and elimination of commercial and sport hunting.

While there have been many successes, globally, it can be argued that the movement has failed, as the numbers of animals annihilation suggests. Wild animals continue to pay the price for an ever growing, relentless human population that takes away their homes. In tandem with the growing population and the need for ever more space, factory farms and meat production surpasses killing 56 billion animals per year, not including aquatic animals, globally (Donaldson and Kymlicka, 2011).

What is certain, is that in the last 180 years that the animal rights movement exists, we have made no substantial progress in abolishing their exploitation and

marginalisation. Any victories are at best marginal as they do not fundamentally and systemically challenge the deeply ingrained social, political and legal paradigms that enable speciesism[13].

The main three discourses along which animal issues are discussed include the 'welfarist approach, in this approach animal welfare matters but only to the extent that their exploitation for human 'needs' is met. In fact, 82% of Europeans were found to vote for the protection of the environment, animals and nature (META, 2019). In this approach, the focus is on the health of ecosystems of which animals are a vital component, disregarding individual animals' fate and the 'basic rights' approach. Each of these, while having different supporters and limits, has not been able to deliver meaningful change and respite for animals.

Therefore, in response to these limitations of the two approaches, many activists and concerned citizens follow an animal rights lifestyle. In complete forms of the approach, animals are seen as having basic, inviolable rights[14]: "Animals do not exist to serve human ends: animals are not servants or slaves of human beings with the right not to be tortured, imprisoned, or culled because they are eating too many rare orchids or altering their local habitat. With respect to these basic moral rights of life and liberty, animals and humans are equal, not master and slave, manager and resource, steward and ward, or creator and artefact" (Donaldson and Kymlicka, 2011: 4). This is the normative stance the ecosophy of this project takes,

[13] The limiting of basic rights to humans, and disregarding the sentience of other beings. The premise of according basic justice and inviolable rights to non-human animals stems from the view that animals are conscious, sentience beings and have a distinct subjective experience of their own lives which demands protection. Limiting these to humans "is morally arbitrary" (Donaldson and Kymlicka, 2011: 24)

[14] Inviolable rights are different to what is normally understood by 'animal rights' in that the term inviolable rights implies that an individual's most basic interests cannot be sacrificed for the greater good of others (Donaldson and Kymlicka, 2011: 19). For example. An ecologist who believes a species should be culled in order to save a 'native' species could be said to be a defender of animal rights. In the same way, a person cannot be killed even if their organs may save others.

as I believe this is the only effective protection of animals from exploitation, which takes into account taking away their land. I acknowledge that thus far, this position remains politically marginalized, as Donaldson and Kymlicka note.

The reason for the deeply embedded moral hierarchy that places animals below humans can be found in most of the world's religions, although marginal voices calling for a vegan cruelty-free lifestyle can be found (e.g., Roth, 2010; Keisar, 2020).

Donaldson and Kymlicka pose that animal rights has been ineffectual because it has concentrated on the negative rights of animals such as not to be killed, confined, tortured or separated from their family, while not emphasising the positive obligations we owe to animals: "an obligation to respect animals' habitat, or obligation to design our buildings, roads, and neighbourhoods in a way that takes into account animals' needs, or obligations to rescue animals who are unintentionally harmed by human activities or obligations to care for those animals who have become dependent upon us" (2011: 6).

Some countries have given nature certain rights and personhood. For example, New Zealand gave Te Uruwera forest legal standing[15] (Warne, 2019), and Ecuador includes nature in its constitution (Tanasescu, 2017). In this section I focus on wild animals who live all around us, in cities, homes, gardens, parks teeming with "non-domesticated animals – feral pets, escaped exotics, wild animals whose habitat has been enveloped by human development, migrating birds" and of course, hedgehogs (Donaldson and Kymlicka, 2011: 8). Interaction between humans and animals is inevitable, and as the hedgehog population trend of flocking into urban settings increases, so normative questions arise about the nature of the relationship.

[15] Standing refers to the ability for environmental groups or citizens to challenge decision in courts (META, 2018)

Hedgehogs are increasingly becoming dependent on humans and increasingly share habitat. In their animal rights theory, Donaldson and Kymlicka present an account of animal rights that combines universal negative rights as well as positive rights by focusing on the notion of citizenship. Citizenship does not only relate to universal human rights, but each citizen holds rights and responsibilities towards their co-citizens as well as foreigners. In this complex system there are those who do not fit neatly into the insider group, such as refugees who are not citizens yet they live in a territory which generates group-differentiated positive duties depending on their membership status. This applies to animals as well. Some animals form their own territories. Some animals are migrants who choose to or are forced to move into human cities. In this way, animals, according to ART, are seen as not only suffering individuals but also as "neighbours, friends, co-citizens and members of communities ours and theirs" (Donaldson and Kymlicka, 2011: 24). Importantly, it imagines a world where humans and animals can co-exist on the basis of justice and equality.

ART's premise is that protective rights are owed to all sentient beings[16]. Sentience, or possessing a distinctive subjective experience demands a kind of protection found in inviolable rights. To only bestow these on humans alone is speciesist. The ART developed by Donaldson and Kymlicka therefore holds that animals have inviolable rights in virtue of their sentience and the fact that they have subjective experience of the world. In fact, the authors note that the animals most cruelly abused are the ones whose consciousness is least in doubt: dogs, horses, cats are all domesticated because they can interact with us. Monkeys, rats and pigs are

[16] The discussion of animal sentience is beyond the scope of this section. However, Smuts (1999) describes the presence we recognize in another, we sense inside their body that there is "someone home".

experimented on precisely because they have similar responses to humans. We can recognise consciousness even without being able to understand what it is like to be the other: a bat, a deer, or a mentally disabled person.

As in the human case, some animals can be viewed as co-citizens whose interests count in determining our collective good, others are viewed as temporary visitors, or denizens, and others are residents in their own political communities.

Citizenship is not only about active political participation. Of course, animals cannot vote, but citizenship is more than this. Citizenship functions to give someone a place to live, a territory. It gives someone the right to live somewhere. Many humans cannot exercise citizenship agency, such as children or people with mental disabilities or dementia. Yet, they are members of a political community in this sense. "Citizenship theory […] affirms values such as autonomy, agency, consent, trust, reciprocity, participation, authenticity, and self-determination" (Donaldson and Kymlicka, 2011: 58).

Citizenship is not ability-bound. We do not take away citizenship from vulnerable humans, regardless of competence. The misconception that animals cannot be citizens rests on the assumption that citizenship necessarily entail competence for active political citizenship, and as I have argued, following Donaldson and Kymlicka (2011: 60), is not at the core of awarding citizenship. "Entering into relations of citizenship is [...] entering into relationships that involve facilitating the agency of our co-citizens, at all stages of their life course and at all levels of mental competence". Of course, not all animals will be classed as co-citizens[17].

[17] Domesticated animals in this theory are morally required to be awarded citizenship, although this presents a morally difficult position in AR. For some AR theorists, the status of dependency and

There are four main ways that render wild animals vulnerable to human activity: direct intentional violence, habitat destruction and encroachment, inadvertent harms such as pollution and pesticides, and positive interventions. Wild animals should be seen as belonging to their own sovereign communities. While many AR theorists argue that wild animals should be 'left alone' to get on with their lives and that they are equipped to survive 'out there', contact and interaction with humans is inevitable, and more importantly, needs to be regulated to create "norms of justice" (Donaldson and Kymlicka, 2011: 63). Hedgehogs are an excellent example of this need. Hedgehogs are being left alone, no one is hunting, capturing or exploiting them on a wider scale, yet their habitat is destroyed, and they are extremely vulnerable to human activity. Their food is disappearing due to pesticide use, and they are increasingly becoming more and more dependent on human detritus, leftovers, direct feeding and shelter. Hedgehogs in the wild and in cities are vulnerable to indirect side effects of human activity, and this can be clearly seen in the absence of hedgehog tunnels and other wildlife corridors. Hedgehogs are unable to cross roads safely, and wander around freely because of barriers erected by humans. Therefore, even if they are 'left alone' in the 'wild', they are still vulnerable because humans alter their environment, for example, by removing hedgerows. Hedgehogs may be crossing from being wild animals, that is, animals living relatively free of direct human management, meeting their own needs for food, shelter and social structure, to what Donaldson and Kymlicka call liminal animals, wild animals living in close association with humans. The theory proposed expands traditional ART as it has been criticized for neglecting issues of habitat destruction focusing primarily on direct and intentional violence towards animals.

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forced participation in human society is inherently exploitative and oppressive and they call for the extinction of domesticated animals (Donaldson and Kymlicka, 2011).

So, what are the appropriate relations between human and wild animal communities? While we have a duty not to infringe on their right to life, we also have a duty to respect their autonomy.

The argument of citizenship for wild (and domesticated) animals stems from the same injustices marginalised people have suffered throughout history: "these acts of aggression, subjugating so-called primitive or uncivilised people to colonial rule, were often justified by denying that the victims were worthy of being self-governing" (Donaldson and Kymlicka, 2011: 168). Wild animals, in the view of the politicised animal rights theory, have suffered similar injustices which makes it necessary to establish sovereignty for animals. In the 'stewardship' approach, in contrast to the ART, habitat is set aside for animals in the form of a park, wildlife sanctuary or refuges for human and animal benefit with varying degrees of human management. In the sovereignty approach, if humans visit the territory they do so as visitors, not as stewards or managers. This allows wild animals to shape their own communities, focusing on their capacity to pursue their own good.

To sum up, this ecosophy of an extended ART focuses on granting inviolable rights as well as basic rights to animals. The sovereignty approach to the complex relationship between humans and wild animals sheds light on the obligations we have for wild animals and their right to communities, leading autonomous lives. As a community, wild animals cannot be invaded, colonized, or robbed. These rights will ensure that humans will not continue to destroy wild animals' habitat.

6.5.12 Emancipatory discourse or Positive Discourse Analysis (PDA): What role can ecolinguistics play in the search for positive new discourses to live by?

This section introduces the emerging concept of PDA and the way in which ecolinguistics can be a vehicle that engages with texts in a transformative and emancipatory manner.

Ecolinguistics attempts to accomplish two goals. The first, expose the dominant discourses of unsustainable industrial civilisation that promote ecologically destructive behaviour. For example, the agricultural industry tends to employ discourse that reduces the natural world to a machine, a resource to exploit. This has been the main focus for CDA, focusing on problematic power relations, oppression and exploitation in texts, and unveiling how these are resisted (Fairclough, 2009). However, this step offers little in the way of promoting beneficial alternative forms of language in order to move forward (Stibbe, 2018).

For Martin (2004), PDA offers alternative discourses to hegemonic ones: "We need to move beyond a singular focus on semiosis in the service of abusive power – and reconsider power communally as well, as it circulates through communities, as they re-align around values, and renovate discourses that enact a better world" (Martin, 2004:197; also cited in Stibbe, 2018: 168). Therefore, PDA is, similarly to CDA, "fuelled by the potential for analysis to have an effect – however small – on the social world" (Macgilchrist, 2007: 74). In fact, the exploration of the implementation of a new accounting framework for extinction (Atkins and Maroun, 2018) is in effect creating a new story, encouraging new narratives/discourses on which to build a new society.

As discussed above, earlier research in ecolinguistics tended to focus on the notion that only a deep grammatical change in language could effectuate a new, more ecological world-view. Without a deeper linguistic change, Fill (2001) argues, we

will be left with 'surface ecologization' (Stibbe, 2018:166) comprising what Harré et al. (1999) term in their book *Greenspeak*, a manner of various genres of advertisements, political speeches and company communication essentially capitalising on PR and impression management.

Nevertheless, PDA can be seen to provide resistance and raising the visibility of counter discourses. Methods for Positive Discourse Analysis are based on similar methodology to CDA involving detailed analysis of texts to examine hidden ideologies. While CDA focuses on a large number of texts that typify dominant discourses of society, PDA searches for texts outside the mainstream, "which are not yet pervasive" (Stibbe, 2018: 176) that could offer new, more positive discourses for building better relationships with animals based on equality, respect and protection. In this way, PDA can focus on more detailed analysis of smaller numbers of texts to reveal positive features, because, unlike CDA, it does not need to establish if these patterns are widespread and form the dominant discourse (Stibbe, 2018). Therefore, PDA can be emancipatory for more marginalized groups who produce texts, such as those written by NGOs and animal rights organisations. For example, Macgilchrist (2007), using PDA, investigates strategies for making marginalized discourses and framing of Russia more visible in news media. More specifically, she examines five counter-discourse strategies: logical inversion, parody, complexification, partial reframing and radical reframing, in news items that challenge the common, dominant naturalised frames used in media to describe Russia as dominant, aggressive and imperialistic. She finds that counter-discursive strategies, particularly radical reframing is a particularly effective strategy in contesting dominant frames in a case study of a football match in *The Guardian* reporting *The Chechens' American Friends*, which successfully challenged the mainstream reporting of the Russian-

Chechen conflict. As Macgilchrist suggests, *The Guardian* has a strong stance on the conflict, regarding Russian as the responsible entity for repressing the Chechen independence movement using military force. Macglchrist asks how an article that presents a radically different perspective on the matter comes to be published seemingly despite the line toed in the newspaper. The way in which this article breaks the usual framing of Russia oppresses Chechnya is by introducing a new frame of global geopolitical and neoconservative influences as drivers of the conflict. This reframing is successful as it allows for counter-discourse to appear in mainstream media.

Martin (2004) views PDA as a complementary constructive social action, to the deconstructive aims of CDA. Martin emphasises that both constructive and deconstructive approaches are necessary in order to accomplish change (Martin, 2004: 183). Martin suggest that there is a need for uplifting, positive and encouraging stories and discourses, not only disheartening accounts and examinations of oppression.

One of the first studies conducting an ecolinguistic investigation of positive discourse is Goatly's (2000) analysis of William Wordsworth's *The Prelude*. Goatly compares the linguistic features of the poem with an edition of The Times newspaper and demonstrates that Wordsworth's poem gave nature more agency than the Times. For example, nature is given an actor position such as *the eagle soars; the rain beats hard*. The nature was also given a voice in Sayer positions such as the river murmuring; wild brooks prattling. Goatly aptly states that "the view of the natural world represented by Wordsworth, along with aspects of his grammar, provides a much better model for our survival than that represented by the Times […] to survive

we had better take note of Wordsworth […] rethink and respeak out participation in nature before it rethinks or rejects our participation in it" (2000: 301).

An important arena for PDA is evaluation and emotions, complementing CDA and SFL, in which, as Martin (2004: 191) signals, have been weak. The way communities come together centres on their attitudes to particular issues, their empathy towards others. Martin exemplifies evaluations of emotions of aboriginal children who were taken away from their families as a way to create community solidarity. On the anniversary of the *National Sorry Day* in Australia, Martin claims that the notion of apology (saying sorry) "takes us to another realm of evaluation dealing with the rights and wrongs of how we behave —beyond emotion to ethical considerations". Particularly relevant to my project, examining evaluations of NGOs and companies in relation to extinction can be telling for enacting change and promoting more beneficial discourses for protecting hedgehogs and all species from extinction.

The final step after identifying beneficial discourses, is promoting the language and linguistic features such as presuppositions, pronouns, participants, verbs, etc., and on a macro level the discourses that "tells a useful story" (Stibbe, 2015: 33).

6.5.12.1 Critique and limitations of PDA

PDA has been criticized for opening a dangerous avenue for issues being subsumed by corporations. In other words, there is a danger that by using the newly found positive discourse, that in itself may turn into propaganda (Flowerdew and Richardson, 2018). Nevertheless, as Macgilchrist (2007: 83) argues, using reframing techniques "could be a very useful strategy for academics to break into the consensus of whichever issue they feel strongly about".

Another critique concerns the positionality of the analyst, necessarily taking a stance (or outlining their ecosophy in the case of an ecolinguistic analysis) and appearing naïve and biased. However, Martin (2004: 184) dismisses this when he claims that "[…] critique is usually undertaken from comparable high moral ground; it cannot escape the values of its readings".

In sum, an ecolinguistic PDA involves analysing the ideologies implicit in texts through a close examination of their linguistic features, and comparing them to the analyst's ecosophy. If the stories reveal ideologies that align with the analyst's ecosophy, the discourses can then be judged as positive, and can then be used by organisations whose aim is to promote animal equality and rights. Positive Discourse Analysis is a search for new ways of using language that tell different stories from those used in current industrialized societies.

6.6 Methods of ecolinguistic analysis: an eclectic framework

Because the ecolinguistics framework followed here does not specifically offer a micro-analysis heuristic, multimodal analysis of videos and images, or spoken discourse analysis, the following sections outline and describe the approach to the detailed analysis carried out on the variety of data, all under the umbrella of the ecolinguistics framework.

6.6.1 Systemic Functional Linguistics (SFL)

The ecolinguistics framework described above allows to unveil macro discourses in society through patterns in linguistic data. The data needs to be analysed on a micro-linguistic level and that will be achieved through systemic functional linguistics.

For Halliday who conceived of the Systemic Functional Linguistics framework middle-theory, language is an experiential resource and its use is bound by choice: ‘‘a theory of experience; a theory that is born of action, and therefore serves as a guide to action, as a metalanguage by which we live’’ (Halliday, 2001: 195). In other words, while Halliday points to problematic macro discourses in language ‘above the sentence’ (Harries, 1952 in Jones, 2012: 37), he argues that inherent in the English grammar are structures that are inadequate to represent the world. For instance, Halliday points to Standard Average European languages in which natural ‘resources’ are conceptualised as limitless due to the uncountable nouns used to denote them: *air, water, soil.* Another example is not according nonhumans particular verbs: e.g., *what's the forest doing?* would not be judged as acceptable.

Halliday's (2004) Systemic Functional Grammar was a catalyst in advancing the connection between (1) the area on knowledge in which participants operate which he termed the ideational or experiential metafunction and (2) the way in which this relates to the construction of relationships between an author and their audience, the speaker and other participant in the interpersonal or tenor metafunction, and (3) how these two levels build on each other and interact with this third aspect of mode or textual metafunction which is the medium in which the text occurs. Importantly, this conceptualisation of textual function, away from the previous linguistic focus on the sentence saw language output as a series of choices that create a particular social reality and therefore, “constituted first and foremost a mode of social action” (Iedema, 2003: 31). The ‘systemic’ in SFL refers to the choices speakers make as they constantly select language and construct their experience and worldview (Schleppegrell, 2012). In the analysis I will focus on three main areas of SFL described in the following sections.

6.6.1.1 Transitivity analysis

Transitivity analysis concerns types of processes or verbs, and the types of participants in the clause (Halliday, 2004). Halliday classifies processes as material processes, which enact a physical action, mental processes involving thinking, feeling, or sensing, verbal processes of saying or communicating. Each process involves different types of participants (see table 8).

Processes	Participants
Material	Actor, Goal or Affected
Mental	Senser, Phenomenon
Verbal	Sayer, Receiver, Verbiage
Existential	Existent
Relational	Carrier/Attribute, Token/Value
Behavioural	Behaver, Behaviour

Table 8: Transitivity analysis of process types and participant types (Halliday, 2004)

The transitivity clause analysis is useful because it can reveal who is given agency to act, how participants are represented, for example as being passive and have something done to them or are taking an active role.

Goatly (1996, 2000, 2006) argues that the grammar of transitivity supports a particular world view upheld by modern positivist science and anthropocentrism, separating human animals from the rest of living beings. Goatly notes a division of

agentive participants, affected participants and circumstances that categorise certain paricipants as exercising power over others.

Another feature of English is the separation of agent and affected participants, a barrier for a holistic worldview. For example, when an agent acts on a participant, (a farmer purchases a pesticide), it makes it seem as through the farmer is not affected by the damage caused by the products.

However, as Steffenson and Fill (2014) suggest, while this approach is important in raising awareness of ecological damage, it is limited in that it does not offer a solution to the existing ecological problems that do not stem from language but rather that ‘‘there are no ecological problems, only the social and political problems that invariably underlie and cause ecological damage’’ (George, 1990: 225, in Steffenson and Fill, 2014: 10). In other words, while language has an inherent structure and engineering it to some degree has been successful in some social change campaigns such as sexism, language cannot be seen in isolation to other social and political elements.

6.6.1.2 Facticity

Linguistic features that are telling of building facticity are modal verbs such as *must, might, can, could, will*. Modality demonstrates the speaker’s commitment to an action or its probability. Another feature is the bringing of an expert voice authority or the authority of consensus. Quantifiers such as many, some “can be used to gloss over a lack of concrete evidence” (Machin and Mayr, 2012: 192).

Presupposition also constructed taken-for-granted notions, representing a particular state-of-affairs as the ways things are.

6.6.1.3 Nominalisation

A powerful device of erasure, can be used to exclude participants in a clause. For example, the word *destruction* is a conversion of a verb into a noun that forgoes mention of the person responsible for destroying (Fairclough, 2003a).

6.6.2 Multimodal Critical Discourse Analysis (MCDA) and SEA visual analysis

The notion that images are also a system of choices that can be mapped onto the three metafunctions proposed by Halliday's SFL have been developed by Kress and Van Leeuwen for static texts (Kress and Van Leeuwen, 1996), with more recent studies turning towards the analysis of dynamic text (e.g., Baldry and Thibault, 2006).

Linguistics tended to marginalise non-verbal aspects, however now "Both business and scientific communications now accept, and often expect, multimodal artefacts as the medium of exchange. Many traditional genres such as annual reports are nowadays considered to be essentially multimodal and achieve appeal to, and persuade, their readers via photographs, graphs, tables and so on" (Bateman, 2016: 311). Looking at discourse alone is not sufficient in order to provide a full account of meaning in data, particularly of power relations, which requires semiotic categories beyond language itself (Kress, 2012). In this way, multimodality means treating all modes as equal, and stepping out of the centrality of language itself to consider all modes as cultural resources in the production, construction and representation of knowledge. "To make a sign is to make knowledge" (Kress, 2012: 45).

The ecolinguistic framework does not provide a heuristic for analysing multimodal semiosis, but draws on the work of Kress and Van Leeuwen (1996). The starting point for a multimodal analysis is to extend the analysis of language to other

semiotic resources such as gaze, postures, moving and still images.

An important aspect of multimodality is the notion of choice. The semiotic resources people choose to draw on (or are positioned to use) is indicative of the way in which communication is shaped. Multimodality is a field of application rather than theory (Jewitt, 2009: 2). The term is strongly connected to three main perspectives: social semiotics, discourse analysis and interactional analysis, emphasising different aspects of multimodality. While language is a key aspect in a multimodal analysis, it is seen as embedded in "a wider semiotic frame". This allows to investigate language, communication and meaning-making in a multimodal environment, such through different modes and genres: written and spoken language on websites (videos) and annual reports. I follow Kress' (2009) social semiotic theory approach to communication that draws on Halliday's three metafunctions: the ideational metafunction that describes what goes on in the world, the domain and action or event; the interpersonal metafunction that represents the social relations of those involved in the communication; and the textual metafunction that looks at how those messages cohere in their respective environments and contexts.

Multimodal description involves both intermodal and intramodal interpretation and how different modes interact and describing how different modes are constituted. Kress (2009: 54) defines mode as "a socially shaped and culturally given resource for making meaning. Image, writing, layout, music, gesture, speech, moving image, soundtrack are examples of modes used in representation and communication". Kress argues that while all social and cultural phenomena have meaning in their respective environments, some do not have as their primary function representation and communication and in this case, there is the question of whether they should be considered as modes. However, Kress does admit that they can be

used to make meaning, it could be argued that as there is choice involved, at least in wealthy western countries, in what to eat, wear, which furniture to buy - there is indeed a meaning and identity that is communicated through the choices.

It is important to undertake a multimodal analysis investigation especially now in the climate of what is termed 'post-truth' and the era of 'fake news'. The relationship with truth and knowledge is changing, as Jewitt (2009: 3) indicates. With the introduction of the internet, connections between people and the dissemination of knowledge across the local, national and global boundaries have fused, with Jenks (1995 in Jewitt, 2009: 3) arguing that "the world has become a visual phenomenon that conflates looking, seeing and knowing". However, the arts and medieval book illustrations confirm that the visual has always been an important semiotic resource for representing and constructing the social world (e.g., Gallhofer and Haslam, 1996).

The trend towards meaning-making in multimodal media centres on two strata. The first is the decentralisation of language as the main and preferred communication medium, and the second is a change in the role of ever increasing technological developments of images and moving images, and design.

Iedema (2003: 33) argues that "this blurring of boundaries among the different semiotic dimensions of representation has been linked, on the one hand, to changes in our 'semiotic landscape'". However, it could be argued that boundaries have always been blurred, for example in the domain of religion textual and image of sacrifice have always been interlinked. It is rather the prevalent and ubiquitous presence of multimodality and the developing affordances of new media that enable interdiscursivity and intertextuality to manifest beyond text. Importantly, as Kress and van Leeuwen (1996) note, cultural, political and economic factors also play an

increasingly vital role in the anchoring (Barthes, 1977) of text to other semiosis thus linking neo-liberal economic democracy to changes in the process of meaning-making: “Global flows of capital dissolve not only cultural and political boundaries but also semiotic boundaries (Kress and Van Leeuwen, 1996: 34).

However, the way in which representational orders and links are constructed is an ever-changing, fluid aspect of meaning-making. This is of course visible in the domain of web design, particularly in institutional website layout and online-available reports, as Iedema (2003: 38) highlights: “The computational sphere is clearly a very influential engine behind the renegotiation of what different semiotics are made to do, with its ability to digitally represent and thus fuse into a single medium spoken and written language, image and sound. But the extent to which formal bureaucratic and corporate organizations have adopted multimodal ways of (self-) representation is remarkable too. Their formal documents and organizational reports appear to be increasingly deploying a ‘post-modern’ mixing of visual and design resources”.

Gallhofer and Haslam (1991) note that to reach audiences better we have to go beyond the conventional form of the annual report. And it is vital to explore other communicative media such as through stories, songs, plays or videos. In this way, the internet creates possibilities for multiple ways of communicating. While the authors argue that this will allow other views to be made visible other than the dominant ones, it could be argued that dominant views co-opt more marginalized ones.

However, as Hansen (2018) suggests, visual communication has been an important element for NGOs and pressure groups in bearing witness (Purdy and Krajnc, 2018) to environmental destruction, animal exploitation and documenting cruelty. Further, Hansen provides a definition for ‘visual environmental

communication research' as a research "concerned with theorizing and empirically examining how visual imagery in the broadest sense (photographs, film, scientific/graphical representations using charts and graphs, maps, models, drawings, cartoons, paintings, artistic exhibits, installations or performances) communicates and conveys/constructs messages about the environment" (Hansen, 2018: 180). The interest in analysing visual communications as embedded and anchored (Barthes, 1977) in a text as part of broader semiosis is to examine the role of the visual in the wider political and cultural construction and representation of and animals, extinction and other environmental crises. Hansen and Machin (2013) view this multimodal approach playing out across three strata. On the first level is a fine-grained analysis of the "semiotic, discursive, rhetorical and narrative characteristics of the visual". The second level relates the discursive to broader macro structures such as the contextual, cultural and historical elements of the visual. Finally, the relational sites of communication are taken into consideration: the audiences. Therefore, this approach is in line with Stibbe's (2015) ecolinguistic framework that seeks to examine social ideologies and the way in which they are embedded in the discursive construction of knowledge (Hansen, 2018: 180).

A multimodal approach to analysing the visual is therefore vital in order to understand how the symbolic representation of extinction and wider environmental problems informs stakeholders' understanding of the value of ecosystems and the role hedgehogs play in them.

6.6.2.1 Contribution to visual analysis in Social and Environmental Accounting

This project adds to a small but growing accounting literature that interprets such constructed visual images in annual reports (Mouritsen, Larsen and Bukh, 2001;

Davison, 2008; Justesen and Mouritsen, 2009). In social and environmental accounting there has been a growing interest in analysing the use of visual elements in annual reports (e.g., Davison, 2004, 2008, 2010) rhetoric and repetition, facework (Campbell, McPhail and Slack, 2009) use and abuse of graphs (Beattie and Jones, 1992).

In her article examining rhetoric and repetition in the visual and textual annual reports of BT, Davison (2008: 793) suggests that, "the words and pictures of the discretionary material are better able than the accounting numbers and regulatory disclosures to add flesh to corporate identity, to emphasise markets, products and other facets of a company's life".

Maier (2011) takes a multimodal discourse analysis approach to an analysis of environmental communication of CNN news website. As Maier points out, it is important to analyse how environmental discourse across various modes (spoken, visual both images and physical interaction, graphics and intertextuality) bring about social practice. Although Maier's article focuses on the media's role and power in framing knowledge around climate change, this is applicable to companies as well. Furthermore, by analysing the agrochemicals' webpages, the discourses may reveal the relationship that we currently have with the environment and more importantly, the quality of knowledge they divulge and the way in which the companies frames environmental issues and whether their initiatives delivers on accountability and transparency. "The way we communicate with one another about the environment powerfully affects how we perceive both it and ourselves and, therefore, how we define our relationship with the natural world", and how it shapes our future relationship with and stories about nature (Cox, 2006: xiv).

6.6.2.2 Some limitations of a multimodal analysis

A key criticism directed at multimodal research is its seemingly impressionistic approach to analysis. How can a researcher establish the meaning of gaze or gesture? Jewitt (2009: 26) clarifies that linguistics as well as fine arts face this challenge of establishing a fixed meaning and concludes that this is "resolved by linking the meanings people make (in whatever the mode) to context and social function" (Jewitt, 2009: 26). Another response to the critique that I follow in this thesis is to triangulate the multimodal data (e.g, images, videos) with interview data and secondary written data.

Another limitation for multimodality is that it is seen to be importing and imposing linguistic terms, for example by adapting and following Halliday's (Halliday, 2004) SFL metafunctions (Section 6.6.1). However, SFL is different to other linguistic syntactic approaches in that in its core is a social component, a perspective grounded in social semiotics. By describing and identifying which discourses are present in the context, and what is the social function of the representations described, a multimodal analysis can reveal the construction of relationships, what discourses are made explicit, what is challenged and can be applied to examine in detail environmental issues through specific instances (Jewitt, 2009: 27).

6.6.3 Spoken Discourse Analysis

In order to unveil the type of identities the interviewees construct in the interaction, this section outlines the methods of analysing and approaching the interview data.

Following a slightly different meaning of framing in this analysis, I follow Goffman's (1959) notion of self-representation, with the assumption that in face-to-face interviews people construct a certain representation of themselves for the researcher. Paying attention not only to what people say but how they say it can provide an insight into the construction of knowledge in the hedgehog protection arena (Cameron, 2001). Spoken discourse analysis enables us to glean that even when people speak 'in their own words', these may not actually be 'theirs' but through the voice(s) of their community or organisation. This allows spoken discourse analysis to investigate the social voices or discourses that are available to the participants. This also connects to the earlier position taken in this project, that reality is discursively constructed, made and remade in interaction with the discourses[18] people have access to.

Additionally, words have indexical meaning. For example, 'this', 'soon', and 'there' are deictic words, indexing a specific context (Jaspers, 2012). This means that to decode meaning in interaction, we must look to more than only the words themselves, and look at indexical meanings as well. Indexicalities can be seen through contextualisation cues (Auer, 1992) that may occur in the form of prosodic features such as intonation, accent, codeswitching, style shifts, or non-vocal ways such as gaze, gesture mimics etc. Making inferences on meaning of talk is bound up with identity and evaluation (Jaspers, 2012).

Interactional sociolinguistic analysis looks at small-scale interaction in order to provide a microscopic and insider view on larger social processes that crucially depend on these small-scale actions. This approach to spoken discourse analysis

[18] Here I make the distinction between 'discourse' in the singular and 'discourses', after Foucault (Foucault, 1972: 49) who defines discourses as "practices which systematically form the objects of which they speak", while 'discourse' in the linguistic terms refers to language in use (Cameron, 2001; Gee, 2013).

offers an excellent tool for analysing the tension between here-and-now interaction and more established discursive practices. In putting a microscope on interaction, IS makes clear that communication can never be taken for granted but always involves collaboration, collusion and negotiation (Jaspers, 2012).

The data elicited in the interviews falls between naturally occurring talk and narrative, as the questions are designed to elicit extended narratives from the participants, with minimal interruptions from the researcher (Cameron, 2001). Taking into account that "talk is always designed by those who produce it for the context in which it occurs" (Cameron, 2001: 145), the participants are not giving information on a passive, 'wall'-like of an interviewer, rather they are actively constructing their accounts in that particular situation of the interview. However, when I started doing the interviews, some of the participants felt that this way of proceeding was not structured enough around a series of questions and there were moments in the interviews where participants clearly ask what it is I would like to know.

An important reason for opting to carry out a spoken discourse analysis is that in contrast with content analysis in which statements are extracted from the interview and placed under a particular theme through a process of coding is that in spoken discourse analysis what is said is taken into account as well as how it is said and how it fits in the overall flow of the event. Content analysis often takes out chunks of the talk out of their original location, grouping together sequences on the basis that they are referentially linked. However, from a discursive analysis perspective, interactive discourse is not treated referentially, because it performs function as well. In other words, while speakers refer to state of affairs in the world in their talk, they also 'do' other things through talk such as construct their identities, manage relationships with

others in the room, maintain their face, promote or protect their organisation. Cameron (2001) notes that at times, these interpersonal considerations overpower other considerations such as being truthful or informative. Thus, by taking out talk from the interactional context in which it is set, i.e., separating a question from its answer as content analysts do, they risk losing sight of those interpersonal factors that may motivate a particular answer. The interview situation itself presents a face-threatening activity because participants are asked to essentially give account of themselves, their knowledge, their opinions, experience and feelings. Every answer is designed to do a particular interactional work. In relation to multimodal analysis, another limitation highlighted by Jewitt (2009: 44) of using Computer Assisted Qualitative Data Analysis Software (CAQDAS) such as NVivo is that although it offers systematic ways of storing data, it is biased towards a hierarchical, linear, time-oriented representation.

6.6.3.1 Transcription considerations and interview method

The transcription allows for a systematic analysis of the talk. Structured interviews may influence participants into a predetermined route. Therefore, the Problem Centered Interview (PCI) is employed in this project to allow for a speech event that closely resembles natural conversation that is jointly constructed to a certain degree. The PCI combines minimal interviewer structuring that allows for an uninterrupted narration and narrative and a second part of semi-structured interview that allows the researcher to focus further. However, it is acknowledged that the semi-structured interview does not produce naturally-occurring data because of the time constraint that affects what participants say. Due to the small-scale nature of the project, this may present a shortcoming to this study (Benwell and Stokoe, 2006: 141). As Scheibelhofer suggests, PCI used in a variety of social science research is

"a useful method if the research focuses on biographies or on questions closely linked to biographical experiences" (Scheibelhofer, 2008: 404).

6.6.3.2 Transcription Conventions (adapted from Pichler and Williams, 2011)

The following is the key of the symbols used in the transcription process of the spoken discourse analysis.

{laughter}	non verbal information
xxxxxx{laughing}	paralinguistic information qualifying underlined utterance
/	rising intonation
\	falling intonation
...	hard voice
(?)	doubt about accuracy of transcription
CAPITALS or %...%	increase/decrease in volume
Bold	speaker emphasis
-	incomplete word or utterance
'.....'	speaker quotes another
=	latching on
(.)	micropause
(-)	pause shorter than one second
Yeah:::	lengthened sound
<...>	faster speed of utterance delivery
.hhh; hhh	in-breath; out-breath
[....]	beginning/end of simultaneous speech/two voices heard at once
→	Arrow at left highlights key line in example

6.7 Ethics and Limitations

6.7.1 Access and scope

Ethical approval was obtained and informed consent forms have been signed by all interview participants, as well as having explained the project. Names have been replaced with code names to protect identity and institution. All recorded data was transcribed and the recordings were deleted.

One major limitation in the project is the number of interviews with the companies. Access was limited and cooperation a challenge.

From an analysis point of view, although the data sample is limited, as Amernic et al. (2007: 1862) note, "this kind of deconstructionist reading" helps reveal stories that contribute to the reification of the authoritative position held by corporations like Bayer. One of the criticisms of CDA spans the notion that demystifying ideology is in itself an ideological process (Samec *et al*., 2017). However, as Krzyzanowski claims, no research is value-neutral. In other words, critical discourse analysts identify a problem that interests them. A solution proposed by Krzyzanowski is that the analysis, following particular frameworks can help in guiding a research that could be replicated using precisely the same steps.

6.8 Conclusion

Ecolinguistic analysis can be useful in exposing the dominant discourses prevalent in society, that create a particular reality, or as Stibbe (2015) terms, stories-to-live-by. It is important, not only for linguistics, but any member of society to be able to identify them, question them from an ecological and social justice perspectives and challenge them. Once identified, new stories will need to be identified in order to overcome the challenges we are facing in the world. Anyone who is concerned with ecological issues necessarily uses language and communicates and therefore is in a position to consider the role the language they use in reifying, resisting or addressing the issues at hand.

As Stibbe (2015) points out, if those who use destructive discourses are unwilling to change, then an ecolinguistic awareness of those discourses can be used by key stakeholders such as investors, voters, and consumers to put pressure on them. In this way, ecolinguistics can be used to examine the discourse of

agribusiness, economics, politicians, advertisers and journalists to raise awareness of potentially harmful discourses, resist them, and opening up space for more beneficial ones. The study is aimed towards practical application through raising awareness of the role of language in ecological destruction or protection, informing policy, informing investors and practitioners' considerations or providing ideas that can be drawn on in redesigning existing texts or producing new texts in the future, such as integrated reports (Stibbe, 2014).

Central to ecolinguistic analysis is the adoption of an ecosophy (or a number of value systems) against which discourses analysed are judged to determine whether they are destructive, ambivalent or beneficial. Ecolinguistics considers how humans are embedded in ecological systems that support life, making it better suited to address species extinction. Profound changes are needed to reverse the colossal loss of life in the current sixth mass extinction. The reorganising of language can be an emancipatory tool in ushering in such changes.

Chapter 7: Written and Multimodal Discourse Analysis: Bayer

"As man proceeds towards his announced goal of the conquest of nature, he has written a depressing record of destruction" (Carson, 1962: 81).

7.1 Introduction

Bayer's acquisition of Monsanto may have increased its market share, but at the same time, has opened up a can of worms Bayer cannot seem to be able to close back up. Faced with more than 100,000 lawsuits, litigation risk of $8.8 billion to $9.6 billion (Gillam, 2020a) and pressure from its stockholders (Burger and Weiss, 2020) NGOs and academics have forced Bayer to recognise the need to address their values, particularly the issue of transparency and the safety of their pesticide products. Adler et al. (2018) note that some businesses have become cognizant of the need to account for biodiversity, and mitigate their environmental impacts in order to manage reputational, operational and market risks. Some have not. Bayer's dubious roots are linked to their operations within the German conglomerate I.G. Farbenindustrie[19] during World War II that developed a cyanide-based pesticide, Zyklon B responsible for the killing of over a million Jews in concentration camps. Prior to the deployment of the lethal murderous gas, I.G. Farbernindustrie synthesised an organophosphate insecticide known as tabun, followed by an even more toxic nerve gasses sarin and soman (Hersh, 1968).

The focus of analysis is on the way in which language features such as metaphors, labelling, repetition, evaluation, as well as visual semiosis in the video

[19] In Leverkusen, where Bayer's headquarters remain to this day.

and text (see Appendices C, D, E, F and G) combine to create a specific version of reality to convince audiences, particularly stockholders as the analysis will demonstrate, that pesticides are safe to people, animals and the environment. Focusing on impression management (Solomon *et al.*, 2013) and Bayer's communication strategies in this critical time in the company's history may reveal the way in which Bayer struggles for legitimacy. A controversial time can also provide an opening for transformational change, either from interior reflection of the board of directors or from shareholder and stakeholder pressure. The analysis will attempt to reveal whether the company is embracing this opportunity to effectuate meaningful and positive change.

Annual reports are found online with links integrated throughout, directing the reader to further information on the company's website. While the internet opens and allows for extended communication and easily disseminated information, Gallhofer et al. (2006: 685) warns that "those in power can use the internet as a way to control knowledge, the status quo, commons sense and reify dominant discourses." In this way, an examination of Bayer's online communication via their website through texts, videos, images, and other semiosis may reveal whether transparency and dialectic communication are values upheld and revered by Bayer.

7.2 'Self-interest' versus 'common-interest' frame

Bayer positions itself as a world leader. The report leads with a common interest discourse, evident in Bayer's report, through rhetorical questions reflecting Bayer's stance as a governing body that values and upholds people's common-interest (T1):

> *42b. how can we feed a constantly growing global population in an era of climate change?*

42c. how can we use innovation to shape demographic change […]?

42.f how can we ensure that the world manages its finite resources responsibly and sustainably?

These rhetorical questions could be said to be akin to those individual nation states might pose. Bayer positions itself as part of an international community in which "the common-interest frame views individuals as inherently concerned about both themselves and others, and the value that they place on these things cannot be fully captured in economic terms. People, other living things and nature have an inherent value that is irreducible to economic value. Freedom is to be assessed through the extent to which people are unconstrained in developing as human beings in the manner they desire. Individual nation states are part of an international community with many shared dependencies and responsibilities" (Crompton, 2010). Bayer claims it gives farmers a certain freedom to prosper and grow. However, a recent report (Pesticide Action Network UK (PAN), 2020) reveals acute pesticide poisoning in more than 11 smallholder farms in low and middle income countries. More worrying is the fact that hardly any of the poisoned victims received any medical treatment, the result of which implies that none of the poisoning incidents reaches national medical statistics and is therefore unable to influence policy. It is therefore a hidden health and social crisis, the scale of which is virtually unknown.

Within the latter *common interest* frame the *elite governance* frame is nested. The elite governance frame holds that political power is consolidated in the hands of elites. People cannot be trusted to solve their own problems through deliberative means: strong leaders must take control and act on their behalf (Crompton, 2010). Discourses of the elite governance occur throughout the texts. Bayer positions itself

as a world leader that 'knows best' and, moreover, is powerful enough to control this. This can be seen in several presuppositions in the interrogatives above (42b-f):

T1 42f. How can we ensure that the world manages its finite resources responsibly and sustainably?

This interrogative clause illustrates the authoritative and powerful positioning of Bayer in the CEO address. Within this rhetorical question are folded several presuppositions. Firstly, that resources can be managed sustainably and that sustainability is a concept that is agreed upon. Secondly, that resources should be managed, the word 'managed' itself erases facets of exploitation, degradation and stealing habitat of nonhuman animals. These presupposition are further cemented by solutions proposed by Bayer:

T1 43 The answers to these questions will clearly determine not only our future prosperity but also our social cohesion

Clause 43 presents as a fact that the above questions are problems that can be solved. Here the pronoun '*our'* shifts from denoting Bayer as an individual to an inclusive *'our'*, bringing in the stockholder reader into the consideration of Bayer's practices. Despite such dire consequences brought by pesticides to human and environmental health, Bayer continues to reinforce the common-interest frame, observed through the CEO's utilisation of a slogan-like structure:

10 Our products have helped to improve the lives of our customers – patients, consumers and farmers.

The cost of the use of Bayer's pesticides on the environment and people's health, sucha s Dewayne Johnson's[20] for example, is not accounted for.

[20] Johnson, a school groundskeeper, won the first case against Bayer in 2018 when a jury unanimously found that exposure to Monsanto's glyphosate-based herbicides caused him to develop non-Hodgkin lymphoma. More importantly, the jury found that Monsanto acted to hide the risks of its products "in

7.3 Responsibility: erasure and evasion

While Bayer positions itself as a powerful world leader, the company nevertheless displays repeated instances of avoiding and displacing responsibility, for example:

> *T1 7 "the strategic progress we made and the company's solid operational performance were overshadowed by the uncertain outcome of the product liability litigation concerning glyphosate"*

The nominalised underlined prepositional phrase in the passive clause exemplifies Bayer's skirting the issue inherent in glyphosate: its carcinogenicity.

Trust and judgment are two recurring discourses found in T1 as Bayer attempts to restore trust that has been breached following the acquisition of Monsanto and the ever mounting litigation that ensued. Bayer views its responsibility as extending only as far as the stockholders are concerned, as can be gleaned in T1. In his letter, the CEO rejects the judgment of a court of law, but accepts and welcomes the judgement of the stockholders:

> *T1 7 After we had to accept a ruling - which we consider to be incorrect – by a court of first instance in the United States*
>
> *T1 35 We want to be judged – also by you, our stockholders – on our adherence to these values and our attainment of the ambitious targets we have set for the coming year*

The only voice that is allowed to be heard in the IR pertains to the Canadian government, in support of Bayer's position:

conduct so egregious that the company should pay Johnson $250 million in punitive damages on top of $39 million in past and future compensatory damages" (Gillam, 2020b).

T1 32 Most recently, the Canadian health ministry once again reviewed the safety of glyphosate, stating unequivocally in January 2019 that "No pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed."

In terms of responsibility, the reference chain in T1 (11) demonstrates that Bayer deflects responsibility for under-performance on external factors: *(6) share price dropped – (7) overshadowed – uncertain – (15) difficult market environment – negative currency – growing uncertainty – production bottlenecks – structural problems*. While these may be true, the author avoids discussing Bayer's responsibility in connection with the harmful effects of glyphosate and RoundUp, a final pesticide product that contains glyphosate as well as other toxic adjuvants that have been found to increase the toxicity of the overall product, as discussed in chapter 4. RoundUp is a metaphorical name for the pesticide, borrowed from the military domain or hunting, controlling or forcefully driving people or cattle. The phrase was widespread during WWII denoting a German security and exploitation tactic in occupied territories. Roundup was also a codename for the plan to invade Northern France in 1943 under the name Operation Roundup by the Allied Forced (Delaney, 2002). Discourse of transparency is peppered with proclamations of adherence to values, (34) clear values are anaphorically referred to, obscuring the alluded clarity as the reader is left to deduce what those are.

However, when examining the reference chain for Monsanto in T2 it can be noted that the link between Monsanto, Bayer, litigation, and glyphosate is never directly made. Mr Wenning, the chairman of Bayer's supervisory board skilfully pirouettes noun phrases tout autour the crux: Monsanto, now Bayer, is facing

litigation. Glyphosate and RoundUp have been found to cause cancer by a court of law in the U.S. However, this is never said outright. Phrases such for example:

T2 (20) the Monsanto transaction - the performance of the Monsanto business - the related risks and the integration of the business

T5 (13) the acquired agriculture business

When the risk is mentioned, Monsanto is not, and when Monsanto is mentioned, Bayer is not. Courtis (1998, in Clatworthy and Jones, 2006) argues that narratives can be obfuscatory by burying adverse or negative news through more difficult writing styles.

The next example reveals the distance Bayer attempts to place between itself and Monsanto:

(47) Monsanto's glyphosate business

In sum, the analysis above demonstrates that while Bayer claims to uphold transparency, it continuously attempts to evade responsibility and connection to Monsanto.

The safety of the products discussed in T4 mentions glyphosate as a *(14) nonselective herbicide* – but as chapter 4 illuminated, glyphosate is not a herbicide, but only one ingredient of a final product. As Beck (1992: 26) correctly notes "What may seem 'insignificant' for a single product, is perhaps extremely significant when collected in the 'consumer reservoirs'. A pollution analysis oriented to nature and products is incapable of answering questions about safety, at least as long as the 'safety' or 'danger' has anything to do with the people who swallow or breathe the stuff. In other words, the insignificances can add up quite significantly. Do they thereby become more and more insignificant - as is usual for sums according to the rules of mathematics?" Indeed, Beck refers to the simplification and abstract

reduction of nature's complex web of life and interconnectedness (also discussed in Sullivan and Hannis, 2017) to which I turn in the next section.

7.4 Erasure of biodiversity

7.4.1 Naming and labelling: erasure of species

Beck asks, "And what is biodiversity? Are people not part of that equation?" (1992: 24). Naming the world is a prerogative of power. Biodiversity occurs in the entire integrated report a total of 11 times. The term is not lexically linked with a particular species, nor does Bayer provide a clear definition of the concept.

Thus, the first void erasure that can be observed concerns the terms *biodiversity* and *ecosystems* recurring three times and once respectively in the IR. As signalled by Stibbe and Zunino (2008), the high level of abstraction of the terms and diverse meanings cannot be captured by one definition. DeLong (1996: 746) investigated the various meanings of biodiversity and suggests that the primary danger of using the terms is its vulnerability to the manipulation of interested entities to suit their needs.

Specifically, in Bayer's IR, in T3 biodiversity is relegated to the role of circumstance:

10

Together with farmers and scientific experts,	we	are working to find	solutions [to preserve biodiversity.]
subordinate clause	S	V	O
Circ: manner	actor	Pr: material	goal

The use of collective or mass nouns, such as *biodiversity* runs the risk of massification, of abstracting and erasing the "direct relationships with individual

animals: an individual can be seen, heard, and empathised with, but a 'species'" (occurring only three times in the entire IR) (Stibbe, 2012: 73), or a 'biodiversity' (occurring 11 times) cannot. Indeed, the only nonhuman animals mentioned in the entirety of the report are bees, occurring only twice as a non-modified plural noun, versus six times as a premodifier noun in phrases such as in T4 (2) *bee health, bee care program*.

Similarly to terms *biodiversity* and *ecosystems*, lexical items such as *environment* and *sustainability/sustainable* in the report are polysemous. One meaning of environment and sustainability is 'working environment', co-textually occurring with health and safety. In this context, anthropocentricity is evident when examining the occurrences of 'environment' as adjectival modifier in noun phrases that pertain to human safety:

> *T7 (29) As a consequence, direct contact between Pharmaceuticals or Consumer Health and the respective customer environment, and especially patients, is regulated in very different ways for each segment.*

The environment is not a central concern for Bayer, and when it appears in its second meaning pertaining to the natural environment, it is relegated to a noun modifier.

Similarly, Mansoor and Maroun (2016) find the absence of a clear definition of biodiversity in their analysis of biodiversity reporting of the food and mining sectors in South Africa to be the clearest indicator of an inadequate approach to biodiversity management and integrated reporting. This finding is similarly evident in Bayer's report through the lack of cohesion in T3 that is exemplified in the reference chains (1) and (2) (see appendix C, 13.3.3 for full chains).

Chain 1: Direct reference to biodiversity/species

preserving biodiversity (title) - (1) respect biodiversity - (2) our principles on biodiversity - (3) United Nations Convention on Biological Diversity - (5) biodiversity in the segments (title) - (9) the recovery and protection of natural and semi-natural habitats - (10) preserve biodiversity - (12) U.N. Convention on Biological Diversity - (13) Convention on Biological Diversity - (14) protected - natural characteristics, biodiversity and other factors

Chain 2: The natural environment

natural resources - Nagoya Protocol - genetic resources - (6) genetic resources - (7) crop plants - (8) sustainable agriculture - a healthy environment - (9) ecological enhancement measures - (14) natural characteristics - (15) protected areas

Firstly, it can be noted that there is no cohesion between lexis that denotes the environment, and that which denotes species or 'biodiversity', in chain 1. Within chain 1, *respect for biodiversity* follows on to *(2) Bayer's principles on biodiversity* that are based and propped onto the UN CBD.

Interestingly, chain 2 is titled *The Natural Environment*, however the lexical items are from the domain of biotechnology, denoting change. For example (9) *ecological enhancement*. Chain 2 reveals Bayer's ideology of the control of nature. The natural environment is a domain from which (1) resources are taken, genetic resources are used, plants are crop, nature is used for agriculture and nature is not enough, it needs to be enhanced.

Lexis such as *(6) harmony*, *(1) respect*, are in conjunction with the *(7) utilization (1) use* of the natural environment. This technocratic discourse e.g., (T5) *(3) - ecologically and economically expedient and efficient* further supports the claim

that Bayer reifies an ideology in which nature is nothing more than a resource. Beck (1992: 24) summarise this point aptly that, "[T]here exists accordingly a danger that an environmental discussion conducted exclusively in chemical, biological and technological terms […] runs the risk of making the same mistake for which it has long and justly reproached the prevailing optimism with respect to industrial progress; it runs the risk of atrophying into a discussion of nature without people, without asking about matters of social and cultural significance".

Sullivan and Hannis (2017: 1471) in their effort to question underlying ontological and ethical assumptions concerning the value of the natural world in current conventional accounting, discuss the challenge of 'translating' ecological value into numbers and conceptualising nature as effectively a free service provider. The authors summarise the conversion of ecological entities into numerical figures as a process in which, "every step [..] specific value-laden choices make and shape the value entities that get counted". Moreover, Ingold (1992) emphasises the flaws of conceptualizing nature as a passive object that is simply there for the taking. He stresses the importance of the mutual dependence of human and non-human. "Yet tacit but socially reproduced habits of thought and action continue to make it acceptable for state-sanctioned scientific experts to be granted the privilege of determining what counts as nature, and how best to manage it for the common good." This is the dominant discourse Bayer 'taps' into and reproduces in their report, thus perpetuating a version of reality in which nature is manmade to be controlled by humans, for the benefit of (certain privileged) people. Framing nature as a 'capital' and equating it with a monetary measure runs the risk of subordinating it to financial or economic considerations (Maroun and Atkins, 2020) or misleading

ourselves into believing that nature, somehow, needs humanity (Gray and Milne, 2018).

7.5 Metaphors: Bayer as a person

The word 'corporation' is in itself a metaphor as it contains in its etymology and root the Latin for body, flesh or person: *corpus* and *corporare*, the infinitive verb means form into a body (Stibbe, 2015). This is a dead metaphor because the meaning does not readily presents itself.

The text positions the company as Senser of mental processes and the metaphor of THE CORPORATION IS A PERSON is conveyed in the discourse of agribusiness through hyponymy and metonymy [21] in a way readers are unlikely to notice. It could therefore be considered a sleeping metaphor[22]. For example, in T7, Bayer is a Senser

[21] Hyponymy refers to a group of words that all belong to the same hypernym. For example, hedgehogs, foxes, and badgers are all co-hyponyms of 'mammal', their hypernym.
Metonymy refers to the substitution of one noun with another that is more abstract. For example, "You'd end up cutting its head off while the beef was still alive'", replacing the name of the animal with meat (Moore, 2014: 66).

[22] Traditional thinking on metaphors has divided them into two camps: dead and alive.
This well-established classification of metaphors is explicitly challenged by George Lakoff and Mark Turner's claim that a huge amount of so-called dead metaphors (that is, conventional metaphoric expressions) are in fact alive: "Determining whether a given metaphor is dead or just unconsciously conventional is not always an easy matter. However, there are plenty of clear cases of basic conventional metaphors that are alive— hundreds of them— certainly enough to show that what is conventional and fixed need not be dead" (Lakoff and Turner 1989 , 130).
seemingly dead metaphors may potentially be activated during language use, and hence, they must be considered as either sleeping (when showing a low or no degree of activation). In this way, BAYER IS A PERSON (or indeed the CORPORATION IS A PERSON) can be thought of as a sleeping metaphor when it is in use in the annual report.

Martin (1991) contends that scientists' social, cultural, and political beliefs are tacitly enfolded into the tropes they contrive to describe their work. She refers to these as "sleeping metaphors" (Martin 1991:501) for the way their cultural intent lies hidden in scientific content. To illustrate, she examines scientific accounts of fertilisation. Early explanations constructed it as a romance between the passive 'feminine' egg who receives the heroic 'masculine' sperm, thereby imbedding cultural notions about women and men into biological science. Martin notes that more current research indicates that the egg actively draws the sperm in and absorbs it, prompting scientific discourse to rewrite the egg from a passive entity to a dangerous and aggressive femme fatale who, like the black widow spider, devours her 'prey.' This continued rendering of the egg according to social conventions of femaleness perpetuates and naturalises such stereotypes.

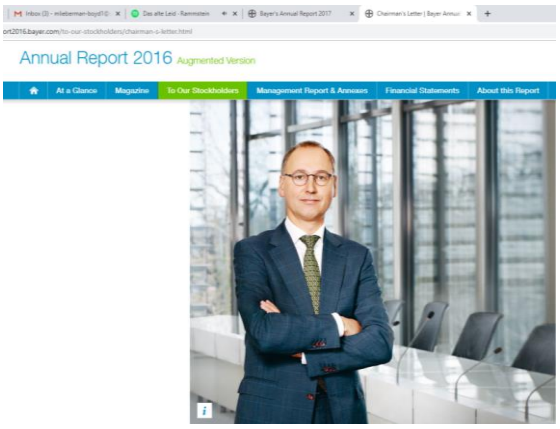
7 instances out of 10, while in T6 Bayer is the only entity that is given the ability to feel, and think as conveyed by the verb *focus*:

T7 (9) We fundamentally distinguish four stakeholder groups with which we engage in discussing different issues in various dialogue formats.

T6 (1) Bayer's societal engagement focuses on people who work worldwide in education, science, health and social innovation, and who are committed to improving living conditions.

Gray (2013: 465) holds that the IR, and in particular the CEO letter is "a narcissistic articulation of the unchallengeable but clearly admirable qualities of the organisation, its values and its directors; an articulation of what the environment means to the organisation (or what they would like you to believe that it means to them); an attempt at influence and manipulation often intended in ways of legitimation; or, on occasions, a genuine attempt to articulate the extent of an organisation's interactions with its non-economic, natural environment".

Since this report (Bayer AG, 2018b) does not have many images, compared with that of 2017, I have analysed the current images in the text, but also contrasted them with the ones from the previous year, finding an interesting progression. Preston et al. (1996) note that the absence of images are common strategies for "communicating" poor performance and at the same time signalling responsible management. As Davison (2008) suggests, visual portraits of business leaders constitute an important form of impression management, perception management, or even ''intangibles".



(Bayer, 2016)

(Bayer AG, 2017)

(Bayer AG, 2018b)
(Image 2) (11)

The present text for analysis, Bayer's 2018 Annual Report has not been designed with high levels of visual multimodality, and compared to the 2017 annual report possesses only one image of the CEO. As mentioned above, the main consideration for selecting the 2018 annual report is to examine the very latest approach and rhetoric to species protection. However, due to the paucity of images, there is a need in this instance to compare the given data with available older data.

An interesting observation is in the progression of the images (Kress and van Leeuwen, 1996). In 2016, the CEO is shown standing upright in what seems like a boardroom. His hands are folded midway on his midsection in assertiveness and resolution. The context of the report is at the beginning of Monsanto's acquisition, Werner's biggest and most important legacy as a CEO. He is sporting a small, closed-mouthed smile, radiating confidence. Physically he is positioned furthest away from the camera compared to the other two images. This suggests creating distance and authority, particularly in tandem with his gaze direction. He is looking straight into the camera, meeting the reader's eyes in confidence and assurance, creating "a visual form of address" (ibid: 117).

The 2017 image features the CEO closer to the camera, still smiling and meeting the reader's eye. The smile and eye contact seek to enter the reader into a relation of social affinity with the CEO. This time, his hands although clasped in front of him, are more open suggesting trust. Similarly to the 2016 image, he is standing upright, but this time he is leaning on a glass surface which project diminished stability.

Finally, the image in 2018 completes the series of a declining and questionably completed acquisition. The CEO's legacy is in danger, following the

shareholder's vote and 40% drop in shares. Firstly, the most marked difference can be observed in that, like a student hiding behind their desk, the CEO is sitting down at a table, with one elbow supported. "Tables have similarly long been used in portraiture may be used to close gaps between subjects, as a resting place for the subject's hands, to display artefacts of personal, organizational or social significance, or to maintain distance from the spectator and retain a sense of dignity" (Campbell, 1990, in Davison, 2010: 174). His hands are no longer clasped in front of him, but are gesturing as though he is in the middle of an explanation, or self-justification. His facial expression is also altered compared to the previous two years. He is no longer smiling. He is supported by both the chair and the table. His gaze no longer meets the reader, and looks off camera, possibly at another interlocutor. The image constructs a conversation, in which the CEO has levelled himself with others, and could be said to attempt to project openness albeit tempered with a degree of anxiety. The distance from the camera is the closest of all the images. Kress and van Leeuwen (1996) suggest this construct trust and levels the playing field.

7.6 Facticity and scientific discourse

"'Facts' are always also imbued with cultural and political features, whose influence is powerful even if it is subtle or hidden" (Berglund, 2001: 833). Science cannot be treated as an unproblematic mirror of nature. Science is taken to be empty of political and social biases. This assumption neatly obscures the way in which experts, are integral to the very disagreements they are invited to resolve. It is experts who judge what is relevant, what needs to be legislated, who should decide, and how, what becomes recognized as a problem.

T1 (30)Yet the facts have not changed: glyphosate is a safe product.

T7 (15) We always focus on a fact-based dialogue.

Bayer presents itself as a scientific institution. However, as Berglund (2001: 836) notes, these are now established to be thoroughly embedded in social and cultural systems and that "scientific institutions and individuals within them make choices based on moral and social values as well as on technical and cognitive grounds". Viewed in this way, 'facts' are constructed. Berglund, importantly suggests through her analysis of the debate around forest conservation in Finland that the agreement by the warring parties to employ the language and tools of scientific management covers over serious political disagreements between them, but also disqualifies other elements from public debate. It obscures political and economic tensions, which, by their very nature, are not amenable to technical solutions.

The tenacity of natural science discourse is based partly in the way it provides a sense of continuity and security, but also a sense that nature, as the parameters within which life unfolds, offers a depoliticized arena for seeking collective decisions. Grammatical metaphor, nominalisation, is a key feature of scientific discourse (Schleppegrell, 2012) and occurs copiously throughout Bayer's IR.

T1 (7) After we had to accept a ruling – which we consider to be incorrect – by a court of first instance in the United States, the strategic progress we made and the company's solid operational performance were overshadowed by the uncertain outcome of the product liability litigation concerning glyphosate.

T3 (7) At the same time, Crop Science is committed to the preservation and improvement of crop plants and to the equitable distribution of access to their utilization.

T2 (multimodal) (20) Their services to the ecosystems of our planet include soil fertilization, pollination and organic waste recycling.

Clause 20 is especially revealing of the scientific discourse through the lexis from the domain of biological science e.g., *soil fertilization, pollination*. The nominalisation of these items additionally erases the exploitation of beetles, butterflies and spiders, as their lives are framed as services (for which they do not receive payment or consideration – they are not accounted for). An alternative sentence that would place them as actors or doers would give them the agency and present them as beings that have their own interests and lives to go about (Donaldson and Kymlicka, 2011; Singer, 1973): e.g., *Beetles recycle organic waste; earthworms fertilize the soil.*

In the misleading 'science-based' approach currently adhered to by UK trade at the moment, instead of a pesticide manufacturer having to demonstrate that their product is safe, regulators must offer a very high level of scientific proof that a product is dangerous. However, evidence of harms may not emerge for many years and, in the meantime, some of the negative impacts caused – such as the development of malignant tumours or the extinction of particular species – may be irreversible (PAN UK and Sustain, 2020).

7.6.1 NGO voices: the sound of silence

The CEO in his address emphasises that activists and professional critics of agriculture (T1 29) are not part of the collective 'we', and are blamed for the resulting uncertainty:

T1 29 This played into the hands of the activists and professional critics of agriculture. Among consumers and stockholders, it mainly caused uncertainty.

The idiomatic phrase *'play into the hands of'* has been checked against the BNC[23] to evaluate the prosody of the phrase. It has been found to have negative prosody, all concordance lines have been read and scanned for contextualised meaning. *To play into the hands of* in the context of the above example could be said to mean that the activists and professional critics have taken advantage of certain false and incomplete information, i.e., the outcome of the trial that Bayer has already rejected in the outset of T1, the CEO letter. This implies once again that Bayer attempts to shrug off any responsibility, pointing the finger to others as they attempt to hold Bayer accountable.

The company depicts itself as being involved with stakeholders through "wide consultations". The text resorts to solidarity pronoun 'we'. "'We' is a small word, common in everyday speech. It is even more common in utopian discourse, and satirized in its dystopian counterpart (Levitas, 1995: 89-103). *We*, as Levitas suggests, embodies not only a common identity but a collective agency, of humanity. The extent to which 'we' is repressive needs to be examined in the context in which it is used, as it can signify both the expression of solidarity as well as repression of individuality. Levitas concludes that 'we' can be repressive when its use disguises relationships of inequality and oppression. What is repressed here is the possibility of a radically other sort of society, in which a company such as Bayer should embrace

[23] The British National Corpus is a 100 million word collection of samples of written and spoken language from a wide range of sources, designed to represent a wide cross-section of British English from the later part of the 20th century, both spoken and written.

critique. ‘We’ is also implicitly human, not encompassing nonhuman animals, common in the approach to sustainability, further developed in section 10.7.2.3 (Cielemęcka and Daigle, 2019).

What (29) *Professional critics of agriculture* means is unclear but could be interpreted as a euphemism for academics, while at the same time removes further credibility and authority by suggesting that activists are not professionals, nor do they have the ‘right’ knowledge.

7.7 Agrochemical fairy tale: a multimodal analysis of Bayer’s Transparency initiative video

Bayer had a challenging two years since their acquisition of American giant Monsanto completed in June 2018. Bayer, following mounting pressure from shareholders and stakeholders alike launched the Transparency Initiative in December 2017 in order to reveal how it conducts its safety testing. In 2018 Bayer won an Agrow award in for Best Public Outreach Program: “Bayer was selected as the winner from a shortlist of eight finalists; the category recognizes excellence in the communication of information on the benefits of agrochemical or agbiotech products” (AG, 2018).

Award or not, Bayer’s share price has plunged by 40% since its takeover of Monsanto. It is now worth less than the $63bn it paid for Monsanto. Critics accuse Bayer’s CEO of infecting a healthy firm with underestimated legal risks related to Roundup, Monsanto’s infamous herbicide (The Economist, 2019). Bayer inherited Monsanto’s litigation burden now facing lawsuits by more than 13,400 plaintiffs across the U.S. (Bellon, 2019). Focusing on awards in this manner is typical impression management, rather than focusing on negative issues (Corvino, Bianchi Martini and Doni, 2021).

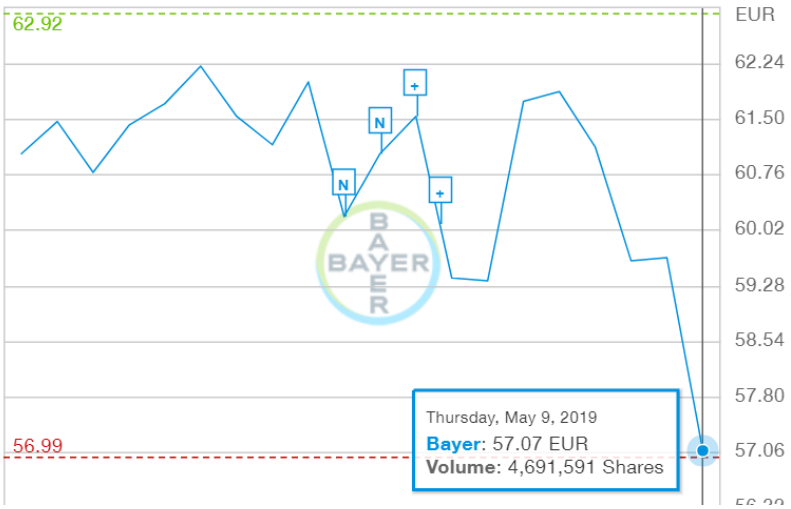


Fig. 19: Bayer's shares chart as of 8th May 2019 (AG, 2019)

In face of this, how does Bayer reclaim its legitimacy as holders of knowledge and power through their corporate narrative? What are the dominant discourses Bayer utilises in competition with other voices in the pesticide arena, and does the Transparency introductory video analysed here promote transparency? How is the video constructing the relationship between Bayer and its stakeholders? Who is represented in verbal mode? Who is represented in visual? Which institutions are named? Analysis of the chosen texts may provide insights as to how Bayer constructs discourse to legitimise their narrative and ideology.

In order to answer the questions I analyse two main texts from Bayer's corporate website. Text 1 (Appendix E, 13.5) is a video titled: *Bayer for More TRANSPARENCY: Environmental Safety* created by Bayer as an introduction to their new Transparency initiative. Text 2: *Creepy, Crawly, Fuzzy, Buzzy or Downright Yucky… But we can't live without them* is a rather infantile titled document published

by the Bee Care Centre as Bayer's answer to a research conducted on insect decline (Hallmann *et al.*, 2017).

This section will demonstrate the interplay between the verbal and visual components of the various sections in the report, constructing a complex web of intertextual voices and positions which Bayer attempts to tone down (Vasta, 2005). This could be said to be done in an attempt to downplay Bayer's conundrum following the acquisition of Monsanto and the surge of lawsuits.

The analysis examines Bayer's Transparency Initiative on their corporate website. Research on corporate narrative, environmental disclosure and reporting agrees on their persuasive nature and a degree of greenwashing and impression management (Solomon *et al.*, 2013). Impression management (Goffman, 1959) views company communications as a performance of its identity to its audience. The impression the company conveys shapes the way in which it is perceived, and the legitimacy and power it has over the production of knowledge.

The focus of analysis is on the way in which language features (metaphors, labelling, repetition, evaluation), visual semiosis in the video and text combined by Bayer to create a specific version of reality to convince lay audiences as the genre indicates, that pesticides are safe for people, animals and the environment.

Focusing on impression management and Bayer's communication strategies in this critical time in the company's history may reveal the way in which Bayer struggles for legitimacy. A controversial time can also provide an opening for transformational change, either from interior reflection of the board of directors or from shareholder and stakeholder pressure and the analysis will attempt to reveal whether the company is embracing this opportunity to effectuate meaningful and positive change. In the fields of visibility analytic, questions are posed relating to

what is made visible by governing activities as well as considering the way in which they have been made visible. An important aspect of the fields of visibility analytic is that the analyst should take account of the ways in which certain things are made visible or illuminated and others hidden or obscured (Tregidga, 2013). Vinnari and Laine (2017) are the first in the accounting literature to examine moving image from a discourse theoretical perspective.

7.7.1 Narrative Theory

This particular analysis is underpinned by narrative theory. Narrative is essential to the way humans understand reality. Without a narrative thread to provide a meaningful connection between events, we find it difficult to make sense of the world. Narratives give significance to bare facts and information and contribute to the framework through which our world view is constructed (Lakoff, 2010).

The study of narratives built from concepts introduced by de Saussure's structural linguistics, in what became known as *the narrative turn* (Bateman, 2016). Structuralists such as Barthes noted that narratives can be presented in a wide variety of formats, such as through the media, in written texts, images, conversation and other genres (Morrison, 2018).

Language is not the only means by which environmental issues are constructed and represented in Bayer's discourse. The visual address establishes an imaginary contact with anonymous viewers demanding their attention and involvement. Such analysis gives us a new lens through which to examine this practice, and highlights the power of narrative and storytelling in environmental communication (Morrison, 2018).

I begin by exploring Bayer's multimodal discursive strategies that are employed the video through a narrative analysis following Propp's (1968/2009) standard fairy tale structure.

Section	Propp's Terminology (1968/2009: 119-127)	Terminology used here
Section 1	I The Initial Situation	Setting the scene
Section 2	II The Preparatory Section	The Challenge
Section 3	III The Complication	The Complication
Section 4	IV Donors	The Request
Section 5	V From the Entry of the Helper to the End of the First Move	The Helper
Section 6	VI Beginning of the Second Move	The Reasoning
Section 7	VII Continuation of the Second Move	The Resolution

I Setting the Scene

The video portrays two main participants. A narrator, using American English variety that may signal the new acquisition and the adoption of the organisational culture of Monsanto, is present throughout the video through voice-over and switches between frames as the narrator, voices the second participant and adopts the authoritative voice of Bayer.

The second participant, who I label as 'the average Joe' (Joe), represents the audience the video aims at exemplifying the first utterance: (1) 'This is you'. As he ambles through a managed forest or a city park, Joe is not given a voice, instead, he reacts to the narrator, somewhat like a puppet, with facial expressions and vocalisations. He is only given five short moments in the entirety of the video, which serve to construct his identity as a tree hugger and a 'hippie' (8) and (9). In (9), Joe is vocalising to a flower, and the narrator responds with a dismissive 'well, yeah'. Only in section 6, The Reasoning, Joe is given an exclamation as a response to which I return to later in that section.

Joe is presented as a 'fact guy', a person that knows everything about the environment, or at least thinks he does: 'You just know things' (4) implying the average person does not have the 'right' facts. The environment is constructed and represented as the sublime (Peeples, 2011). Peeples introduces the concept of the toxic sublime as a means of analyzing the tensions arising from visual representations of environmental contamination: beauty and ugliness, magnitude and insignificance, the known and the unknown, inhabitation and desolation, security and risk. Because of the toxins' invisibility and banality, individuals often attend to environmental problems not because they are the most dire, pressing, or dangerous, but because they are the most evocatively articulated. Beck (1992: 23) states,

''[Toxins and pollutants] generally remain invisible, are based on causal interpretations, and thus initially only exist in terms of the (scientific or anti-scientific) knowledge about them. They can thus be changed, magnified, dramatized or minimized within knowledge, and to that extent they are particularly open to social definition and construction''.

The sites depicted in the images, forest, countryside, crop field are all decontextualized, as discussed by Hansen and Machin (2013), resulting in a disconnect between concrete environmental problems, food production, the political and financial.

The representation of iconic animals such as the red squirrel, the butterfly, fox, and owl together with the somewhat silly image of 'Joe' and his ongoing silencing in the video, may be said to act as mechanisms to diminish the concerns voiced by the 'average Joe', and other stakeholders.

II The Challenge

In this stage of the fairytale, the narrator presents the problem: (9) 'that's why you hate crop protection and all that pesticide stuff'. This presents and dismisses the concern Joe has with safety of pesticides and their effect on the environment.

Employing 'crop protection products' T1 (27) as a euphemism for pesticides, from images depicting pristine golden fields of wheat bathing in the crepuscular sun to images of rolling green hills, pesticides and their application are represented visually as benign, with an image (10) of a farmer spraying with very minimal protective gear[24] reifying the safety and mundanity of pesticide use.

[24] The HSE lists guidelines for personal protective equipment (PPE) including:
- Protective bib and brace overall with protective elbow-length gloves, or wrist-length gloves cuffs inside protective (plastic) elasticated elbow-length sleevelets; or

These seemingly innocuous and benign images are contrasted with the destruction of a forest by a bulldozer (12) juxtaposing with Bayer's stated aim of the Transparency Initiative "to remove the barriers surrounding access to detailed information on the safety of crop protection products that can engender misunderstandings and distrust. By enabling access to study data in parallel with background materials, we hope to foster an open, science-based dialogue on crop protection products".

In addressing the concerns raised by Hallmann et al. (2017) who carried out a study of insect populations in a conservation area in Germany and found 70% of populations to be declining, Bayer dismisses the role pesticides may play in adversely affecting insects and claims insect decline is multifactorial caused by other human activities (T2-34) "sacrificing habitat of insect species. Hedgerows, field edges, weedy patches, meadows, orchards, pasture, soil sealing, urbanization, light pollution […]". In the same token, the video does not discuss pesticides as one pathway causing any harm, other than to target organisms (section 6). In this speciesist view that some species are beneficial and some are harmful, we are reminded of what Carson put so poignantly, "Such plants are 'weeds' only to those who make a business of selling and applying chemicals" (1962: 76).

In the video, the narrator assumes Joe's point of view of pesticides sarcastically (9) 'you hate all this pesticide stuff because you know its only purpose is to destroy the environment'. The image that accompanies the verb 'destroy' is that of a bulldozer knocking down a tree in the frame of 'deforestation'. While the destruction

- A suitable two-piece suit and wrist-length gloves with cuffs inside the jacket sleeves safety wellingtons or water-repellent boots with a good grip
- Even when the product label does not say you need to wear PPE, it is good practice to wear basic PPE (such as overalls, suitable protective gloves and boots) at all times when handling pesticides or their containers (HSE, 2019).

caused by deforestation cannot be under-estimated, the damage of pesticides touches the fragile, nearly-invisible life systems and their impact has a lack of visual representation, which means "a lack of social or political power as there is nothing to show, no compelling visual evidence of the extent or severity of the problem" (Peeples, 2011: 374).

Peppered with pop culture intertextually indexing 'pure evil' characters such as Lord of the Ring's Sauron eye, and Star Wars' Darth Vader, the theme of good and evil runs through the narrative, reinforcing that the true evil is not pesticides, nor is it Bayer, but the target organisms (my bold):

> *(14) "c'mon look at all those liquid injection straight out of* ***hell*** *stuff*
>
> *(20) not because we're* ***evil***
>
> *(30)* ***evil*** *diseases*

Text 2 accuses 'people' of simplifying environmental degradation and insect decline by blaming pesticides alone: (30) "looking for causes, many people think that they have found an easy equation". And these people do not live according to Bayer's reality because (32) 'But a reality check shows that there is no such simple explanation' but whose reality?. However, Bayer's representation of good and evil could be said to be decontextualized out of the complexities involved in assessing pesticide safety.

III The Complication

Propp describes that it is during the complication that the hero (or something of the sort) enters the tale. In this section, the narrator shifts frames (Goffman, 1974) speaking in the voice of Joe:

> *(14) "c'mon look at all those liquid injections straight out of hell stuff good God"*

In fact, Joe is accused of not really knowing what crop protection is: (13) "okay you don't really know what crop protection does to the environment", implying that the average person is ignorant of an issue that affects every aspect of our lives. Moreover, the average person is represented as having limited ability to access information:

(15) well here's the thing while having all the information available at any time

The next shot portrays Joe speaking to his smartphone: *(16) hey siggy*, presumably a synonym to Apple's Siri. The tech female robot voice replies: *I want cake* followed by a hollowed dim *comical sound*.

To soften the assault on the audience, the narrators uses a general 'we':

(17) there are some topics left we still don't know much about

And thus begins Joe's quest of the true, real knowledge of pesticides.

IV The Request

The next common phase in a fairytale narrative is that of a journey, in which tasks are initiated, or requests made of our hero to get to know the true facts, and turn into a fact guy:

(18) And that's when a fact guy turns into a gut guy

In this section Joe discovers details about the complication through Bayer, the Helper.

V The Helper

In the next section common to most fairy tales, a helper is introduced, who is often a magical agent sent to assist the hero in their quest (Propp, 1968/2009).

*(19) well perhaps we could help we're **Bayer***

Kress (1993: 174 in Merkl-Davies and Koller 2012: 179) reminds us that "language use in corporate narrative documents is never 'innocent', because it is use to achieve a variety of economic, social and political goals and is thus 'as ideologically saturated as […] text[s] which wear [their] ideological constitution overtly'". Reinforced by the fluttering of the Bayer flag in the accompanying image, Bayer is presented as the expert authority. Like a nation state, the low angle at which the viewer is positioned in respect of the flag makes it appear towering and powerful. Bayer's authority is further entrenched by their appeal to science:

(21) but because deep down in our curious scientist minds

The narrator frames the 'gut hunch' that Joe has about plants getting sick in science and evidence, signifying that Bayer is a rational, evidence-based company. However, in T2, the scientists are not dressed in their iconic white lab coats or doing any 'scientific work' in the image, while their expertise is expressed specifically, in contrast to the scientists in the video.

Kroma and Flora (2003) write that ideology is maintained by powerful symbols analyse the social construction of pesticide advertisement. The use of scientific knowledge is a way to dominate nature, which is conceived of as the enemy. In the video, the spider (12) is depicted sarcastically as 'little friend' and the caterpillar as 'ugly' (28). However, in text 2, spiders and butterflies are evaluated positively: (10) "Insects, like beetles or butterflies, and related arthropods, such as spiders, are important for every single human on the planet: "because they enable us to live".

The discourse of technocracy as the ultimate aim in agriculture is a discourse in which the control of nature is not neutral but it is intrinsically a social process

guided by political aims that are often biased in favour of powerful interests (Kroma and Flora, 2003). This is evidenced in text 2:

(103) "Bayer is getting ready for the future, preparing for agriculture 2.0"

This statement is strengthened by the voice of Bayer's expert ecotoxicologist. In this reality constructed by Bayer, technology will finally conquer nature and replace the bees and other insects, but until then, some of them are needed, anthropocentrically as the subtitle of Text 2 suggest "we can't live without them". This claim is supported by the noun phrase 'their service' (T2 (9)). Nature, and particularly bees and insects are conceptualised in a metaphor of workers who provide invaluable (and unaccounted for) services to humans – pollination. For example, (12): 'Each species specializes in different roles, performing services which bring benefits to humans". Nonhuman animals are recontextualised as workers without pay, mere slaves.

T2 *(9) "Without their services, our ecosystem would collapse," says Bayer researcher Dr. Sascha Eilmus*.

(12) Each species specializes in different roles, performing services which bring benefits to humans.

VI The Reasoning

In this section, the narrator explains the previous section. The agrochemical company is strategically repositioning its content to reflect a more holistic approach to agricultural practices where an ecological discourse is reflecting Bayer's attempt at controlling the narrative and definition of what crop protection is and what Integrated Pest Management means.

The UK government, as part of its 25 year environmental plan committed to make IPM its central strategic approach to agricultural pest management post-Brexit,

aims to put in place schemes to reverse the rising trend of pesticide use. However, what IPM is, how it should be used and who gets to define it, is a battleground in which voices from agrochemicals, NGOs, governmental bodies and other stakeholders tirelessly compete.

IPM is an approach to managing pests, diseases or weeds under which chemical pesticides are used only as a last resort – if at all. It sits in direct contrast to the majority of conventional agriculture in which pesticides tend to be the first weapon of choice for dealing with unwanted organisms. The Pesticide Action Network NGO group defines IMP as a system which "tackles pests and diseases through the use of a combination of different control methods, based on good crop husbandry, physical, plant breeding or biological control methods, underpinned by effective pest, weed and disease monitoring strategies. Properly implemented, IPM systems can effectively deal with harmful pests and diseases whilst maintaining crop yields and farmer income" (Cohen, 2019). "If we allow pro-pesticide groups to define IPM then we will continue with the current 'business as usual' approach in which pesticide use continues to rise while UK biodiversity plummets. IPM in the UK will become just another greenwash, a means for justifying the continued dousing of our countryside in chemicals" (ibid).

Not only do agrochemicals compete for the definition of IPM in the discourse of agricultural practices, but effectively ellipt governance bodies and regulators as a character in the narrative:

> *(32) Well due to heavy regulation standards all over the world [a crop protection product simply cannot be released]*

Beyond the universally accepted principle that pesticides must be regulated in order to minimise harms to health and environment, there is not a standard global approach

to the governance of pesticides (PAN UK and Sustain, 2020). Regulation standards are not uniform across the world, and in the EU, each member state has its own competencies. Moreover, agrochemicals lobby governments to reduce and eliminate any governance and regulatory schemes (PAN, 2018). In the regulation process, it is the agrochemicals who produce the studies for the risk assessments for the active substance and formulation, effectively exploiting a loophole they help to create by influencing government bodies, such as the EPA in the US (Gillam, 2017). In the UK, FERA, a company that tests chemicals' safety for both government and the private industry may be in a similarly jeopardised position as the EPA (Gillam, 2017).

7.7.1 Co-opting dominant cultural discourses – the pseudo-ecologist discourse

Nature, with its unpredictability and inconsistency, presents a risk for food production. To take the risk out of nature, science and agro technology engineer, manipulate, and control nature. Kroma and Flora (2003: 22) emphasise that "[t]echnological control over nature is neither neutral in respect to nature nor in regard to society […] It is intrinsically a social process guided by shared aims that are formulated in the political sphere".

To appear more 'green', agrochemicals employ a pseudo-ecological discourse. The discourse of (pseudo)- ecology is salient across the examined texts, exemplified in the use of domain expert lexis such as 'beneficials' (e.g., T2 (52)) versus 'target organism' (e.g.,T1 (28)). In both texts, living beings are divided into a dichotomy of 'good' or 'bad' through a number of qualifiers. Negatively evaluated as (T2) 'creepy', 'crawly', 'downright yucky', or positively 'fuzzy', 'buzzy', 'beneficial', seen through the dichotomous questions T2 (1): 'Yuck or cute? Destroyer or savior?

Survival whizz or fragile fairy?' grossly ignores the complexity and interconnectedness of ecosystems in an infantile manner. For example, Goulson (2019) suggests that most herbivorous insects are specialists, adapted to eating one specific plant species. In contrast, Sacha Elimus in T2 (38-41) suggests that "pest insects continue to thrive despite being exposed to crop protection products […] we are actually creating habitats for them. They are specialists at consuming our crops […] so they have a heyday while the specialist insects which rely on rare wild plants are declining because their homes are in the shrinking natural or semi-natural landscapes". The rise in monocrops and decreased diversity of weeds in the fields contributes to the thriving of particular pest insects. Roundup has been developed together with the genetically modified crops that have been designed to withstand Roundup. Agrochemicals, and Bayer and Monsanto in particular, are therefore at the forefront of promoting, developing, and selling monoculture agriculture.

Importantly, pesticides are not named as a possible source of the decline in either text. The narrator goes further to place pesticides on the same level of impact as every other human activity:

(25) like actually every human action it leaves a (26) footprint

This is followed by a fast change of images that include a stadium, golf course, a large junction and industrial parks. These represent a variety of environmental problems: air pollution, land seal, light pollution, and habitat loss and fragmentation.

When it comes to delivering on accountability and transparency of pesticides, the word itself is ellipted, and the effects are not qualified:

(27) and since we're taking intensive care of <u>the effects on surrounding nature</u>

Additionally, the name of the pesticide products are absent from both texts. Names such as Roundup, Lasso, some of the most widely used herbicides, are metaphors of war, reflecting the control and attempt to bring nature into submission. Bayer admits that (T2 (38)) 'pest insects continue to thrive, however, despite being exposed to crop protection products', but does not say that they thrive due to developed resistance, a rising concern with farmers worldwide and an environmental and health concern, because this leads to an increased use in herbicides. Bayer presents itself to be in affinity with nature, creating its products with nature in mind and exercising an almost statutory obligation to:

(35) we test and (36) we protect

This evokes the American L.A. police motto *To Protect and To Serve*, adopted in 1963 and used by many other police forces of authority and control.

The Reasoning section ends with Joe, the hero's own voice when he exclaims (*38) Wow.* The journey of our hero to acceptance of Bayer's ideology is complete.

VII The Resolution

To conclude a fairytale, Propp details a range of potential climaxes, including a recognition, exposure, transfiguration, punishment or a wedding (1968/2009: 127). In this video, as seen from the end of section 6, Joe is shown Bayer's perspective on pesticides, which he accepts as new information. This is hedges by the narrator:

(39) however we don't expect you to love pesticides now

(40) we know that you still have concerns

And Joe is given another opportunity to vocalise in his own voice *(41) mmhm* and given a sliver of agency.

The Resolution ends with an appeal to emotion by the narrator:

(41) so may be the only thing we want you to know is that we care

(44) and to promise you that we will work our lovely scientists asses off to make crop protection safer and better every day

Perceived emotional force in the stressed 3-part phrasal verb *work ass off* contributes to the promise Bayer is making to create safe products. Swearing, as demonstrated by Jay and Janschewitz (2008: 285) occurs in informal situations. Interpersonal swearing is a complex communicative act that is influenced by the relationship between the participants. The effect the phrase has is to create a close personal setting, as "swearing is appropriate and not impolite amongst peers in casual settings". In the video, Bayer is creating an informal, equal status between the narrator and the audience, that of peers where using swearing is acceptable, while at the same time, where knowledge is concerned, Bayer positions themselves as authoritative, and emphasises Bayer as the holder of knowledge when it comes to facts about pesticides:

(45) so while we're at this you at least got some facts along the way

(46) to be able to move things into perspective for yourself and become that fact guy again

7.8 Conclusion

In the agrochemical sector, we see a never-ending cycle of products developed and released into the market without thorough testing that ensures safety to all living beings. For example, in the glyphosate debate, the European Parliament passed a resolution in 2016 suggesting that glyphosate should not be approved for longer than 7 years and that it should not be used at all in public spaces. In addition, the European Parliament said that spraying glyphosate to ripen crops before harvest "is unacceptable because it increases human exposure" (Gillam, 2017: 170). MEPs

urged the European Commission to invoke the precautionary principle originating in the 1980s and included in the Rio de Janeiro UN General Assembly, although flawed in its anthropocentric stance in its claim that: "Human beings are at the centre of concerns for sustainable development," the report emphasised that "[humans] are entitled to a healthy and productive life in harmony with nature". Stating that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (Assembly United Nations General, 1992).

Like all commodities, pesticides go through a life cycle, in which at first they are heralded as the magical potion, and, with mounting scientific evidence results in a ban. This is followed by another 'better' product developed to capture the market share. Patent protection for pesticides, like with medicine, expire eventually and new products are developed. What keeps this cycle in operation are powerful corporations that not only lobby legislators, but reify the ideology of technocracy, pseudo-ecology, nature as a resource as the dominant social discourse that perpetuates what is now seemingly natural practice of using pesticides in agriculture and in all walks of life.

As demonstrated in the analysis, the communicative act in the video and the complementary text (T2) is to persuade the viewer and reader of Bayer's perspective: that pesticides are safe, only affect the target organisms, and that pesticides are the same as any other human activity in terms of the impact on the environment.

With intertextually embedded images of pop culture 'evil' characters and everyday phrasal verbs such as work our scientists asses off', the video makes light of an insidious, abstract and invisible cultural, social, environmental malaise. The discourses embedded in the images move between the discourse of nature as fragile

and need of protection (e.g., T1 (36-37) and T2 (57, 77)), discourses of the nature as a resource that needs to be controlled (e.g., T1 (3) and T2 20)), and discourses of nature as sublime and pristine (T1 (24)) (Hansen and Machin, 2013). Through these identified discourses, Bayer constructs pesticides as benign, and environmental crises as multifactorial, of which pesticides are not a factor.

Through the pseudo-ecologist discourse, what Beck calls the counter-experts, Bayer positions itself not as a rapacious multinational but a sensitive ecologist and steward of the environment who considers the public good as first priority.

Consensus, as the video analysis demonstrates is done not through an authentic and meaningful two-way conversation but through a problem-solution rhetorical strategy in which Bayer has the professed answer (Moody-Stuart, 2006). Additionally, the findings suggest that Bayer uses personalisation and evaluation strategically to legitimise itself as the authority of knowledge and thus normalise the use of pesticides that are portrayed in an abstract and benign way that obscures their destructive nature.

There is a need to challenge one of the main underlying assumptions in Bayer's (2018) report in relation to future needs in agriculture and agribusiness. Bayer claims that, "agricultural productivity therefore needs to increase in view of declining per-capita acreages, the challenges presented by climate change, and increasing pesticide resistance. We expect the demand for high-value seed and crop protection products to rise in light of the need to produce sufficient food and animal feed to meet the growing demand in spite of limited acreages". Extant research identifies 'win-win', 'eco-efficiencies', and a 'business case' as salient discourses in sustainable development in which businesses claim to be able to achieve higher value, with 'minimal impact' (Milne *et al.*, 2009: 1212). Indeed, the emphasis in IR

on ‘value creation’ is thought to limit the extent to which a company will hold itself accountable (Deegan, 2020). Bayer projects an ‘objective; universal reality of lack of world food, and that the reason for the lack of food is nature’s inability to cater to human’s needs without the intervention of manmade agricultural technologies and pesticides. This is done by the removal of cultural specificity and diversity through stereotyping, silencing grassroots communities and organisations who are erased in the videos and IR.

The analysis provides an understanding of how the use of linguistic features that have been examined here such as transitivity analysis in which actors, goals, types of processes and circumstances were examined, use of metaphors, evaluative adjectives, and features of personalisation, and nominalisation construct an ideology of achieving an idealised state in which agrochemical products are the go-to product for farmers and consumers, and how they are used to win support for the company and regain legitimacy.

The reader may be wondering where the hedgehogs are in this analysis, and whether the author should, in fact, be ‘expecting’ to find reporting on hedgehogs. Bateson (1979: 47, in Choudhury, 1988) observes that, “zero, the complete absence of any indicative event, can be a message... The letter you do not write, the apology you do not offer, the food you do not put out for the cat -- all these can be sufficient and effective messages because zero, in context can be meaningful”.

It was the aim of the analysis to demonstrate that Bayer does not acknowledge the danger inherent in their pesticide products. The only protection Bayer extends to the natural world is not building on protected areas. No species other than bees are mentioned in the report, and damage caused to human health, as can be observed in the Johnson case, is vehemently rejected as long as the

stakeholders are satisfied. At the time of writing, the settlement for Mr. Johnson is still in flux, with Bayer working out how to forestall future litigation.

Chapter 8: The truth lies in fragmented tales: Syngenta Written and multimodal ecolinguistic analysis

8.1 Introduction

This chapter continues to examine corporate governance of biodiversity disclosures, with the hope of finding a twinkle of extinction-related disclosures. Corporate practices and their accompanied disclosures, are not always transparent and often hide much more than they reveal in order to disseminate their worldview. Corporate discourse, particularly environmental discourse found in integrated annual reports, is "underpinned by a cohesive though not explicit ideological system" (Breeze, 2011: 23). Analysing discourses through which "corporate practices are constituted can be a way into this hidden world of corporations" (Jaworsk, 2020: 667). While several authors (e.g., Rutherford, 2003; Clatworthy and Jones, 2006; Cho, Roberts and Patten, 2010) focus on linguistic obfuscation in financial statements specifically, they note the importance of transparency for promoting effective corporate governance in narrative disclosures as well.

Syngenta's history dates some 250 years, with the last twenty years emerging from the merger of Novartis[25] Agribusiness and Zeneca Agrochemicals to form Syngenta (Eckelkamp, 2020). The global position held by Syngenta together with its long-rooted history in corporate lobbying inculcates the view that Syngenta holds immense corporate lobby power as well as the financial means to disseminate and influence 'their way of doing agriculture'. While Bayer was busy finalising its Monsanto acquisition, Syngenta saw 2018 as its first year under ChemChina. Earlier in June 2020 Syngenta consolidated its business into what is now known as the Syngenta Group made up of four agrochemical giants: Syngenta Crop Protection, Syngenta Seeds, ADAMA, an Israeli agrochemical, and Syngenta Group China, their reach and influence ever greater (Syngenta Group, 2020; Eckelkamp, 2020). Syngenta has eight primary product lines, which it develops, markets, and sells worldwide; its five product lines for pesticides are selective herbicides, non-selective herbicides, fungicides, insecticides and seed care. The issue of 'better food' and 'safely' relates to field crop seeds include both hybrid seeds and genetically engineered seeds, some of which enter the food chain and become part of genetically modified food.

A pertinent example of Syngenta's failure to disclose the true effects and risks of their products can be observed in Syngenta's current deluge of public pressure. While Syngenta is not tangled up in litigation[26] as Bayer is over transparency and liability, the company is nevertheless under a torrent of mounting

[25] Novartis was found to have paid $1.2 million to Essential Consultants, a shell company following the 2017 inauguration of Donald Trump. Novartis claims to help understand and influence the new administration's approach to drug pricing and regulation, but it was later found by the report (Wyden et al., 2018) that Novartis solicited reduced drug pricing that later appeared in Trump's drug pricing plan.

[26] At the time of writing, about $475.6 million in claims were paid to more than 135,000 successful claimants over Viptera genetically modified corn whose introduction in the US is thought to have driven down corn prices (Neeley, 2020).

public fury. Greenpeace unearthed that the UK approved the export of more than 32,000 tonnes of pesticides in 2018 (Rowlatt, 2020). These pesticides, banned for use in the UK and EU, are intended for use in poorer countries with looser restrictions. While Syngenta contends it upholds the law in every country, the hypocrisy is hard to ignore.

The richer countries are not accorded better protection from Syngenta's 'crop protection'. In the US, NGOs sued the Environmental Protection Agency (EPA) after its decision to reapprove atrazine, an endocrine-disrupting herbicide banned across much of the world.

"The recent atrazine re-approval eliminated longstanding safeguards for children's health, allowed 50% more atrazine to end up in U.S. waterways, and perpetuated dangerously high risks to farmworkers and their families" (Wu and Donley, 2020). Despite being banned in more than 35 countries, atrazine remains the second-most used pesticide in the United States. Atrazine epitomises the intertwined nature between policy makers and corporate lobbying: the more permissive benchmark relies solely on a model developed by the primary manufacturer of atrazine, Syngenta (Wu and Donley, 2020).

Another pesticide making headlines in connection to Syngenta concerns paraquat, manufactured not 30 miles from where the author writes, in Huddersfield, Syngenta's last manufacturing plant in the UK. Almost half of the UK's 2018 paraquat shipments (14,000 tonnes) were destined for the United States, where Syngenta faces lawsuits from farmers who allege the weedkiller gave them Parkinson's disease (Rowlatt, 2020). Thus, there is a clear indication that Syngenta, much like Bayer, increasingly faces reputational and litigation risk as a result of the

company's opaqueness and lack of transparency regarding the toxicity and risk of their products to all living beings.

The above serves an example of the lobbying power of multinational agrochemicals, their quasi-political power and the way in which they ultimately shape agricultural practices that directly impact the well-being of all species. Therefore, this chapter analyses Syngenta's 2018 sustainability report, and extracted text. Sustainability reports are produced by Syngenta and serve a vehicle to disseminate, control and reify their discourse of 'sustainability' in a way that permits the continuation of 'business-as-usual'.

The creation of sustainability reports available of corporate webpages is one of the most readily available means of impressions management dissemination, as they constitute cost-effective systems to reach large audiences (Fernández-Vázquez, 2020). The chapter begins with an analysis of the names given to pesticides in Syngenta's annual report constituting discourse of benevolence and the common good portrayed through Syngenta's promotion of MFFMs. The common good discourse is enchained in the following section in the context of the metaphor of war and technocracy as Syngenta's military vehicle to control nature. The forth section reveals Syngenta's construction of reality and ideology through an analysis of images in Syngenta's annual report and videos. The final section focuses on a detailed analysis of repetition in Syngenta's images that contributes to a political construction of reality.

8.2 Benevolence, cure and the common good

8.2.1 Names of pesticides

Naming reflects and facilitates human practice (Sealey and Charles, 2013). Kroma and Flora (2003) report that pesticides' names have undergone dramatic change over the analysed periods between the mid-1940s to the 1990s. Pesticide names, therefore, reflect the intersection between culture and the way in which pesticides are positioned as products. For example, co-opting into environmental discourse, naming agrochemicals using benign names such as "Harmony", or co-opting into scientific discourse and using names reflecting dominance and control of nature such as "Prowl" (Kroma and Flora, 2003: 27-28).

Goulson (2019) suggests that pesticide names are deliberately difficult to pronounce and remember, and posits that this may serve as a strategy to discourage discussion about them. Similarly, Pool et al. (2005) identify pesticides names, classification and history of use noting that the names of pesticides had come to be known by their common names. For example, mercuric chloride was also known as corrosive sublimate; DDT being another common abbreviation for the infamous bird-killer Dichlorodiphenyltrichloroethane; Agent Orange is the more palatable name given to the highly toxic 2,4-D and 2,4,5-T herbicide. Invariably, the different chemical names resulted in confusion, and a number had to be assigned to each chemical for easy identification and reference, as Pool et al. (2005: 14) note "common names and particularly trade names can be too numerous, too long, or even too obsolete to search".

The names of the pesticides occurring in the texts analysed reveal a particular discourse Syngenta draws on from the domain of medicine. For example,

In T1, the names of pesticides are mentioned:

(13) ADEPIDYN® fungicide ; under the brand name MIRAVIS™

(14) AMPEXIO® WG Pepite® Our new generation fungicide

(15) TALINOR™ post-emergent broad-spectrum herbicide

(16) CALARIS® herbicide

(17) MINECTO® , controlling insects in vegetables and specialty crops

(18) FORTENZA™ Duo seed treatment […]early control of the devastating fall armyworm

The names of the pesticides, ranging from fungicides, herbicides, seed treatments and insecticides, all relate to the domain of medicine drugs, framing the pesticides as remedies and medicines that 'help' and 'cure'. This is evident through the nouns 'treatment', and descriptive adjective 'broad-spectrum', echoing 'broad spectrum antibiotics'. Additionally, by referring to pesticides by their euphemism 'crop protection products' (e.g., T3 (5)), Syngenta reinforces the frame of safety, representing pesticides as mundane, a prescribed medicine to help cure plants. Interestingly, however, the noun *health* only occurs once in the data, in T6,

11 We are promoting and enabling action to increase and connect habitats that support healthy and diverse wildlife populations.

Health occurs in relation to wildlife in clause 11. However, Syngenta, while admitting in image 12 that "84% of crop species depend at least partly on pollination by wildlife", does not specify which wildlife populations. While it could be argued that Syngenta acknowledges the importance of a 'diverse and healthy wildlife populations', and the role that a holistic ecosystem plays in keeping us alive, Syngenta does not explicitly mention the interconnectedness of life in an ecosystem. In fact, Syngenta further acknowledges the impact biodiversity has on business,

albeit biodiversity is not discussed in terms of loss, nor are specific species mentioned:

T6 2 The experience and evidence base we're building demonstrates that biodiversity investment makes business sense

Kroma and Flora (2003) investigate the strategic repositioning of brands through the changing of names of pesticides. They note that this is a discursive strategy in annual reports as a communication tool to influence consumer and investor perception of pesticides. In Syngenta's examined text it can be noted that the noun *insecticide* is never mentioned in the texts examined, and the gerund noun phrase 'controlling insects' is used instead, effectively masking the modus operandi of the agrochemicals. In contrast, fungicides and herbicides nouns are used three time and twice respectively. This may be due to the perception of herbicides and fungicides as benign and further removed from the more known debate over insecticides, neonicotinoids in particular.

8.2.2 Ghettoisation of fields

Disappointingly, Syngenta reframes biodiversity investment as the allocation of field margins to 'biodiversity' as a pathway for maintaining business-as-usual, as demonstrated in the following example,

13 These multi-functional field margins (MFFMs) support sustainable intensification on the more productive land.

In Syngenta's vision for wildlife, non-human animals are essentially quarantined to specific areas in which they are allowed to 'flourish' as long as they return the 'favour' and "support sustainable intensification". In Syngenta's vision, MFFMs are reminiscent of a ghetto. A ghetto is part of a living space that is set aside for minority

groups etymologically found in the Hebrew root of ghetto, *get*, (Debenedetti-Stow, 1992) signifying a bill of divorce, deed of separation, with the Yiddish *gehektes* denoting 'enclosed' space. While Syngenta's ideology alludes to reciprocity between wildlife and business, wildlife, particularly liminal animals such as hedgehogs renders them more vulnerable because they may not be viewed as 'naturally' belonging in fields while at the same time losing their habitat (Donaldson and Kymlicka, 2011). In fact, hedgehogs could be considered wild animals turned liminal through the process of habitat loss to the point in which they live amongst us not as co-citizens but as denizens. During the course of the sixteenth and seventeenth centuries, the word "ghetto" came to be used for all compulsory, segregated and enclosed Jewish quarters on the Italian peninsula (Debenedetti-Stow, 1992: 25). The key point Debenedetti-Stow makes regarding ghetto is that the term denotes a compulsory, segregated and enclosed quarters and that at the time of the existence of Jewish ghettos, no concept of universal citizenship with equal rights and participation in the governing authority existed.

Conceptualised in the realm of hedgehogs, the MFFMs no longer serve a ghetto for hedgehogs but other species are relegated as former residents of the field ghettos, as they have been displaced into urban landscapes, where they can be viewed as refugees.

The domain of medicine identified in the previous section contrasts sharply with the next section, in which metaphors of war are revealed. It could be said that the use of the medical domain to frame pesticides as a cure or a health solution is to mask the underlying aim: a war on nature.

8.3 War on nature

Discourse of war through metaphors and verbs is evident throughout the texts examined. Briefly mentioned above, '*control'* is a noun/verb associated with order, the military and war against a perceived enemy occurring nine times in the texts analysed. For example, the verbs used in conjunction with the pesticides: material verb (15) *controls*; long noun phrase *(16) fast and effective broadleaf weed control*; nominalisation gerund (17) *controlling insects*. Importantly, eight out of nine occurrences of control*[27] are nominalised, with only one as a verb in T1:

> *15 TALINOR™, was launched in the US and Australia and controls more than 45 weeds.*

The euphemistic use of control masks the mass killing and minimises the long-term negative impact of unleashing toxic substances. The discourse of war continues in V1:

> 45 *2018 has showed us what is possible when we align as one team with one plan*

The inclusive 'we', reminiscent of Zamyatin's dystopian novel (Levitas, 1995; Rudy, 1959), encompasses both Syngenta as well as its stakeholders and reveals Syngenta's ideology of a unified power that has a single target: to sell and instil their products. The 'team' in Syngenta's conception has no individuals, no individual thought or perspectives, but all follow the prescribed manifesto. And while in V1 eight Mental verbs are used with eight Senser actors that are not Syngenta referring to (2) *society*, and (33) *greenhouse gas footprints* as stakeholders who are able to feel, think and sense, they are merely tokens as Syngenta reveals its wide reach across the globe.

[27] The asterisk denotes all possible parts of speech of the lemma control*, such as controlling (v-ing), controlled (adj/adv/v.), controls (n./v/)

Furthermore, through their far-reaching developed and promoted technology, Syngenta is able to effectively 'march on Poland', disseminating their pesticides, together with their ideology, across the globe:

T7 29 We have now implemented 301 projects in 39 countries, benefitting a total of 6.4 million hectares

The ideology is evident in the gerund noun phrase underlined. In addition, the significance of the number, *39 countries*, could be said to support and contribute to the frame of safety discussed above. Syngenta is promoting a sort of 'safety in numbers', effectively demonstrating that if so many countries have participated, then the risk ought to be minimal. The gerundive phrase underlined carries a positive prosody through the gerund 'benefitting', amplifying the ideology in that presupposition, i.e., that technology and Syngenta's vision of MFFMs is a 'given', natural state of being.

8.3.1 Technocracy as the military vehicle

8.3.1.1 Technocracy, digitalisation, and innovation

The link between agrochemicals and the munitions industry has been well documented (Kroma and Flora, 2003; Hersh, 1968; Schmidt, 2015). Syngenta's wide reaching control and spread is not only accomplished geographically as discussed in the previous section, but also digitally. For example,

T1 (20) enhances our digital capacity

Through apps and technological tools such as drones, and smart applicators of pesticides, Syngenta is also able to aggregate information about farmers, use of pesticides and their application. In other words, through technology, Syngenta is able to carry out surveillance. Additionally, in V1, the image of the drone is reminiscent

of the proxy warfare substances that had been sprayed from aircraft (Keys, 2015). The drone manoeuvres in a threatening fashion, almost alive, as though technology is taking the place of living species. Technology in this frame is animated, responsive and communicative. The drone takes a 'demand' (Kress and van Leeuwen, 1996) position, making 'eye contact' with the viewer. Additionally, technology in Syngenta's annual report is synonymous with innovation. Clatworthy and Jones (2006), investigating the narrative reporting practices of the UK's 50 most and least profitable companies, find that chairman's statements report news in a manner consistent with impression management. As the authors signal, this is an important finding because the chairman's statement is the widest read section of the annual report, a finding that supports that of Mäkelä and Laine (2011: 219) who describe CEO letters as "powerful means of communication, which not only reflect organizational culture and values but also have broader cultural and political significance". Davison (2008) also examines CEO letters for repetition, finding *innovation* being repeated. This can also be found in Syngenta's T1 CEO statement:

> *18* *We also continued our leadership and innovation in seed treatment, where FORTENZA™ Duo was introduced to African and Indian growers, helping them with early control of the devastating fall armyworm.*
>
> *29* *The sessions have helped us better understand our role so we can continue to build society's confidence in the farming and agricultural innovation sectors.*

Innovation is repeated in the examined texts ten times, carrying a positive prosody in four occurrences and a neutral one in six. For example:

T2 2 Our ambition is to be the most collaborative and trusted team in agriculture, providing leading seeds and crop protection innovations to enhance the prosperity of farmers, wherever they are.

T3 18 Working more closely with downstream partners in the value chain means we can integrate innovative products and agronomic services that enable growers to deliver what they need and meet their specifications in areas such as traceability and sustainability.

The adjective *innovative* modifies the head noun *products* and *agronomic services*, embedded in the object seamlessly as a matter-of-fact manner. Arguably, innovation and its repercussions are masked in the ideological pill Syngenta offers readers as their eyes glide upon those run-of-the-mill, perfunctory phrases. Once again the surveillance discourse can be gleaned through the affordances Syngenta's technologies provide farmers, in the noun '*traceability'*.

Syngenta also attempts to control the weather. The only indication of weather can be found in the accompanying images anchored to 'climate change' (V1 00:22) *(3)*

The images where Syngenta is anchored, similarly to V2, the weather is idyllic with blue skies, perfectly sized sunflower heads. The uniformity of the flowers and fields as in image 1, all portray the discourse of control of nature. Additionally, Syngenta is intended to focus only on climate change and biodiversity alongside farmers' needs – how residues are to be tackled is not on the table. The separation of the three: climate change, biodiversity and farmers' needs demonstrates that Syngenta ignores the interconnectedness of these.

While pesticides were positioned as a healthy cure through the naming of the products as discussed in section 8.2.1, biocontrols are the weapon in Syngenta's war on nature:

> *T3 6 Data science and precision agriculture continue to reduce the quantities of chemicals needed for effective control, and new biocontrols are adding non-chemical solutions to the farmer's toolbox*

Reminiscent of biological warfare (Hersh, 1968), biocontrols are Syngenta's latest weapons development. Pesticides are referred to here as chemicals, further supporting the framing of chemical and biological warfare, albeit referred to as 'control'. In fact, The United Kingdom had an active biological warfare program from 1934 to 1956, weaponizing anthrax and researched plague, typhoid fever, and botulinum toxin. The United Kingdom ratified the Biological and Toxin Weapons Convention (BWC) in March 1975 and has reaffirmed its support for the BWC in 2005 (Schmidt, 2015). Today, the British government operates an extensive and sophisticated defensive program that includes research on potentially offensive pathogens, a task that could be carried out by agrochemicals.

With agrochemicals, like with medicine and armament, patent protection expires requiring a never-ending treadmill of a search for a new 'better' product that is not sold under a generic label.

8.3.1.2 Armament through metaphors of movement and progress

T3 is titled 'Our offer' in which Syngenta further reveals is its ideology and reifies its worldview through metaphors of progress and movement. T3 reveals a presupposition in which society expects 'progress' in farming technology enabling Syngenta to develop chemical and biological weaponry:

> 2 *Society's expectations around farming technology do not stand still; neither does the technology itself.*

Technology in the second half of the clause is a Behaver, it is given agency, an ergative, as an entity that 'behaves', it does not stand still. Ergativity is a pertinent choice of clause because ergatives can construe a reality in which energy is not 'put' on another from an outside force (like in non-ergative transitive sentences e.g., John ate an apple). In ergative clauses there is no actor, and the entity, in this case, technology is ascribed the process itself. In other words, "it's alive". This, as Goatly (2007: 312) notes, is a notion close to home of the modern scientific conceptualisation of reality as process: "the idea that any state or succession of states where we find ourselves are abstractions from a process". In other words, it removes the doer that much further from responsibility and 'clarity' of events. Similarly to the role of nominalisation, a process removed from action that is turned into a noun, abstracts from the flow of events and, finally, the creation of reality.

Technology is also metaphorically synonymous with development in the texts. For example:

T2 3 *Our strategy is to grow through customer focused innovation – not just in product research and <u>development</u>, but in every aspect of our business model.*

4 *We seek new and better ways to use resources, to <u>develop</u> and deliver products and services to farmers, and to create value for our many stakeholders – including employees, the communities where they live and society at large*.

The alarming presupposition is of inertia, an inevitability of change can be seen in the form of the noun *developmen*t, and infinitive *to develop*. This meaning can be elicited from the verb 'do not stand still', in clause 2 above, STAND STILL[28] is death, it must GO FORWARD, and CHANGE=SUCCESS/DEVELOPMENT (Goatly, 2007). This belongs to an overarching metaphor theme ACTIVITY IS MOVEMENT FORWARDS where DEVELOPMENT/SUCCESS IS MOVEMENT FORWARD. The metaphorical lexis for CHANGE IS MOVEMENT is its converse STANDING STILL or UNCHANGE IS HARD/STATIC which "betrays a bias in favour of movement/ change" (Goatly, 2007: 170). Davison (2008) finds that another group of repetitive variations emphasise speed, underlining the sense of movement conveyed by the pictures. Interestingly, the images examined in Syngenta's report conveys the opposite – slow life, while the textual lexis conveys movement and rapidity and accelerating 'innovation'. For example, image 6 portrays a man tending to a golden field of wheat single-handedly, without the assistance of technology. And although the image creates the sense that the field is endless, as the viewer cannot see any edges, it suggests a vast acreage.

[28] Block capitals denote metaphorical themes

Another interpretation may be that because technology 'works for the farmer', the farmer is able to carry out spot checks, saving them time and labour, while at the same time conveying the safety of pesticides to the touch.

In addition to the movement conveyed in the text, several early paragraphs begin with "And", which creates movement, forges links and brings expectation of something additional and new, for example:

> *T2 7 And to make our business sustainable, we have to take **the long view**: ensuring that what we do today strengthens Syngenta and the food chain for tomorrow – economically, environmentally and socially.*
>
> *T2 13 It will require **determined execution**.*
>
> *T3 12 And we continue to establish strategic partnerships and alliances with organizations such as the World Business Council for Sustainable Development, the International Rice Research Institute, The Nature Conservancy, and many scientific and academic institutions worldwide.*

Finally, military speak is rife in Syngenta's discourse. *'Determined execution'* in T2 above along with the use of the plural noun '*alliances'* in T3 12 is also found in the domain of war as well as the modifying adjective *'strategic (partnerships)'*, synonymous to 'alliances'.

8.3.1.3 The Good Growth Plan and Operation Pollinator

Operation Pollinator, is Syngenta's sister to Bayer's Bee Care Programme (Syngenta, 2019a). The name *Operation Pollinator*, metaphorical of war, replacing the UK name *Buzz Project*, a humorous play on bee sound, which could be said to reduce the seriousness of the disappearing of bees and bumble bees, and has the marketing aftertaste of impression management. Operation Pollinator aims to "supports growers to enhance biodiversity on their farms and demonstrates that profitable intensive

farming can go hand in hand with the protection of natural resources and biodiversity" (Syngenta United Kingdom, 2021). Interestingly, Syngenta's website for hosting the information on Operation Pollinator (Syngenta United Kingdom, 2021) asks the viewer to click on More Information, which leads the viewer directly onto Syngenta's Good Growth Plan website:

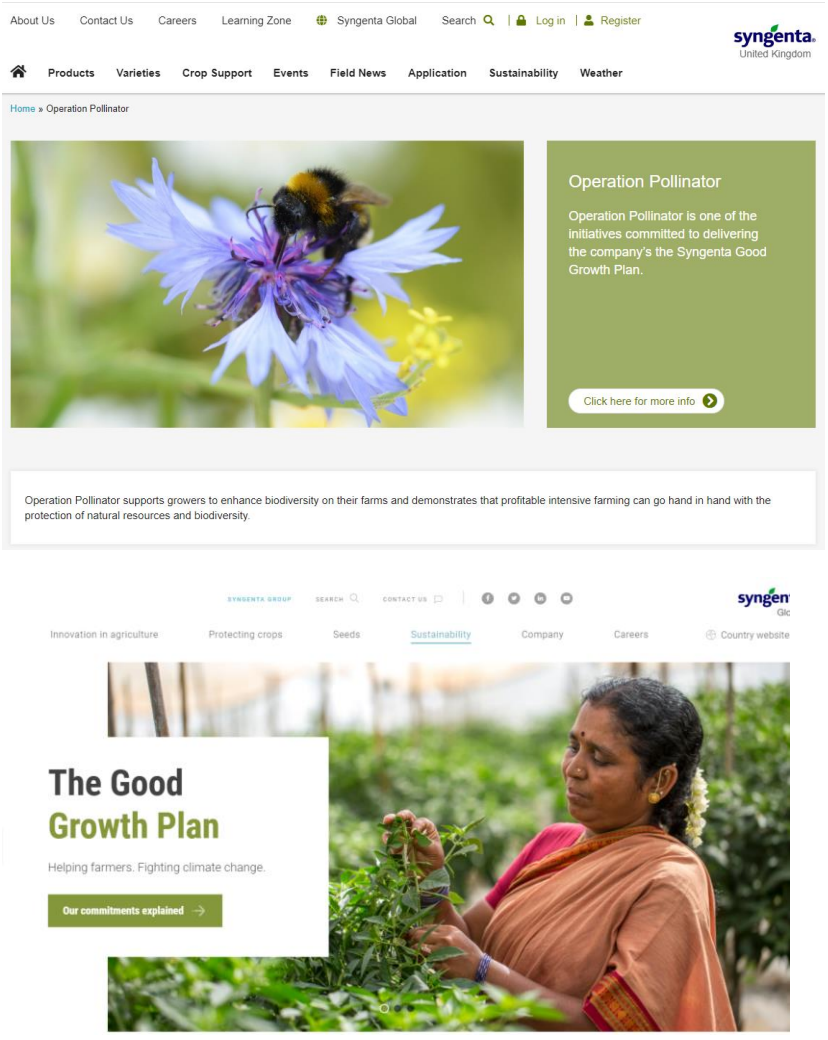


Image 2: (Syngenta Global, 2021a)

It is important to note that in the texts analysed, there is only a link to The Good Growth Plan webpage (Syngenta Global, 2021a), but not to Operation Pollinator. Syngenta seems to slowly edge away from focusing on pollinators (and even less so on other species), albeit continuing to produce guidelines to farmers on "replacing habitats essential for all pollinating insects" (Syngenta United Kingdom, 2021). This is an important observation as the Good Growth Plan focuses almost solely on climate change – further evading responsibility and transparency regarding the grave impact pesticides have on species.

The Good Growth Plan, discussed in T4, is defined and explained by Syngenta as:

> 1 *The Good Growth Plan is a core element of our strategies for both our Crop Protection and Seeds businesses to ensure their success and long-term viability.*

Text 4 embeds a link to Syngenta's The Good Growth Plan Open Data website (Syngenta Global, 2021b). The website aggregates data from soil and managed land, in relation to soil and biodiversity.

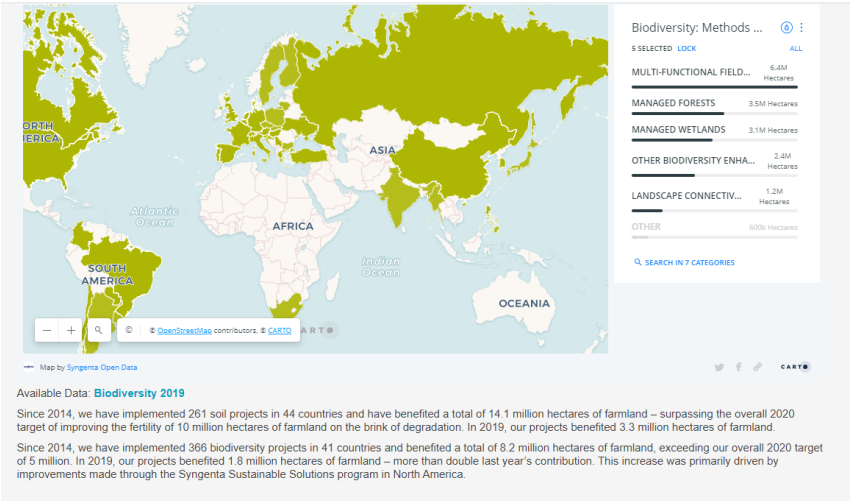


Image 3: Biodiversity 2019 (Syngenta Global, 2021b)

One approach to the analysis of "images in annual reports attempts to uncover misleading messages and demonstrate how companies […] steer the viewer away from circumstances or events that might raise uncomfortable questions about the companies' operations" (Preston, Wright and Young, 1996: 118). The image and visualisation above provided by Syngenta simplify the impact and detail of the project, only revealing areas, not quality, of the alleged benefit to biodiversity.

> "The sustainability of agriculture also relies on biodiversity – for plant breeding, pollination and food diversity. Our customers and our own seed production rely on this critical resource. Biodiversity suffers as species' habitats are lost or fragmented, and in recent decades it has been declining at an unprecedented rate. We are promoting and enabling action to protect and enhance biodiversity – primarily by managing marginal and less productive farmland alongside fields and waterways to create rich, connected wildlife habitats" (Syngenta Global, 2021a).

Syngenta not only does not acknowledge its own products' impact on biodiversity, but cites farming as the main cause of soil infertility and the ensuing biodiversity decline: "Poor farming practices expose soil to wind and rain erosion, leaving millions of hectares infertile" (Syngenta Global, 2021b). Additionally, the clause embeds a strong presupposition concerning farming. Syngenta suggests that poor farming practice, not intensive farming and its prophylactic use of pesticides, are the main causes. Further supporting the argument of the ghettoisation of wildlife is the noun phrase *'less productive farmland'* (underlined), where farmland designates the 'city limits', a land that has been usurped anthropocentrically. Additionally, the infinitive phrase *'to create rich, connected wildlife habitats'* above similarly reveals the world Syngenta creates, as wildlife habitats were connected and

rich before they were converted into agricultural land, and could be homes to many species were they farmed in an ecological and organic manner.

Finally, The Good Growth Plan (GGP) plays on two meanings, referring to farming practices, as well as company prosperity to which I turn.

8.3.1.4 Polysemy of sustainability and growth

The lemma sustain* appears thirty two times in the texts analysed, as an adjective *sustainable*, and *sustainability* as head noun modifier. For example,

T2 *9 They put sustainability center stage in the way we do business and align closely with the UN's Sustainable Development Goals.*

T3 15 *We prioritize sustainability issues at every stage of our work, from the lab to the field.*

T2 *7 And to make our business sustainable, we have to take* ***the long view****: ensuring that what we do today strengthens Syngenta and the food chain for tomorrow – economically, environmentally and socially*.

The following clause illustrates the polysemy of the meaning of sustainability, that is applied both to the growth of the business itself as well as, albeit obliquely, to the world:

T4 8 In these ways, the Plan contributes to the sustainability both of our own business, and of the wider world that we serve.

Clause 7 demonstrates Syngenta's consciousness of ESG:

8 That's why our Good Growth Plan commitments are integral to our business strategy.

9 They put sustainability center stage in the way we do business and align closely with the UN's Sustainable Development Goals.

10 If we succeed, we will achieve not only growth for our business but also ***growth for all*** *–creating value that benefits our employees, customers, communities and food chain partners.*

Sustainability is entangled with business growth in a blatant oxymoron, suggesting that sustainability and its derived lemmas allow for 'business as usual'.

T5 *4 This enables sustainable intensification on the more productive land.*

This clause clearly emphasises business as usual, as Syngenta in text 5, supports the notion that intensification can carry on. As Kroma and Flora (2003: 30) note, the connotative associations there is an associative meaning formed by the link between pesticide use and sustainability, which could "mask questions of environmental or social risks resulting from sustained use of pesticides".

8.4 The world according to Syngenta: construction of reality through static and moving images

Although the chapter has touched on images and videos in Syngenta's analysed texts, there is a need to discuss their construction, the representation of nature through them in a methodical manner and on their own.

Syngenta's largely non-contentious images are constructed in a way to represent a certain objective literal reality (Preston, Wright and Young, 1996: 119). Barthes (1977) argues that the straightforward objectivity of the photograph is a myth, and that like all forms of communication the photograph is at the same time received, or read, in the context of a stock of signs, and possesses a rhetorical code

(Davison, 2008). The images across the analysed texts refer to the following topics or domains, discussed in the next section.

8.4.1 Discourses of Science, agriculture, teamwork

In T1, images 3, 4, and 5 all depict nature: soil, plants, seedlings, being looked down upon by the participants in the image. This could be argued to reflect the ideology of control and domination of humans, or in this case, Syngenta, over nature. Likewise in T1, image 1, the height from which the photo, or the shot size (Stibbe, 2015: 34, 118) is taken is at the eye level of an adult. Similarly, image 6 in T2 depicts nature positioned inferiorly.

In terms of the representation of insects and other species, no image in the texts analysed revel in nature for any purpose other than the scientific or agricultural domains. This is consistent with the earlier observation that Syngenta, while mentioning biodiversity and running the Operation Pollinator project, is largely uncommitted to promoting the flourishing of species, let alone protect them from the adverse effects of their products. V1 is the only text in which a butterfly is present at the height of the camera but the shot is of 'offer', not 'demand'. In other words, there is no interpersonal connection made between the reader and the butterfly. Much like the human workers in images 3-5 in T1, the butterfly is similarly positioned as a 'worker', albeit one that does not earn wages, i.e., slave, nor is accounted for as an individual.

Living beings are commodified, as Trampe (2001: 238-9) suggests, "are treated in accordance with the economic-technological ideology like objects that are produced, managed, optimised and utilised", euphemisms that disguise damaging practices (Stibbe, 2015). Interestingly, more environmentally friendly traditional

farming techniques are represented favourably, disguising the more harmful technologies, such as in T2 image 6, and T4 image 10.

8.4.2 Erasure of nature's agency and erasure of corporate responsibility

V2 is replete with lexis from the domain of ecology e.g. (5.1) *habitat loss and fragmentation*; (7) *fallow land*. However, the images used erase the responsibility Syngenta has in playing a role in the loss of species. Photographs have a ''determining influence in shaping what catastrophes and crises we pay attention to'' (Sontag, 2003: 105, in Peeples, 2011). Indeed, if images represent farmers as acting upon a plant, nature's agency in growing food, working in unison with all elements of an ecosystem is erased. "Of all forms of representation, images can most easily hide their social construction. They are consistently associated with realism, a sense that what is seen accurately reflects what existed at the time of production" (Peeples, 2011: 375).

Erasure of nature and people's voice can also be gleaned from V2. V2 is narrated throughout by Syngenta's CEO discussing the (1) '150 listening sessions' that were carried out that year (2019). The lexical choice (1) 'listening sessions', (title) 'responding to our stakeholders', depict Syngenta as an interactive interlocutor in which Syngenta engages in listening and then responding. However, no other people are given a voice in the video. NGOs, academics and farmers are mentioned, yet none are represented, except the farmers and scientists of Syngenta. The only speaker is the CEO, with only one female (8) shown in a lab coat, speaking backgrounded.

As discussed in chapter 6, an image entails a series of choices (Kress and van Leeuwen, 1996; Kress and van Leeuwen, 2002) and those choices by the artist

inevitably create an ‘‘interested version of ‘reality’’’ (DeLuca and Demo, 2000: 245). Specifically, DeLuca and Demo (2000: 244) urge us to consider what “vision of nature do the photographs authorize, warrant, and legitimate?”. Nature’s agency is erased in Syngenta’s discourse of the environment, for example:

> T2 5 *All this innovation has one focus:* ***a passion for our customers****, the farmers* *who grow the world’s food*

In relative clause 5, underlined, farmers are in the position of actor, enacting upon nature, and actively grow the food. The world’s food is relegated to the position of goal in this material clause. Nature’s role undergoes void erasure (Stibbe, 2012), as plants, animals and fungi are turned into ‘food’, essentially ‘phaged’ into a noun. This observation is supported by the next clause:

> *T2 1 Syngenta plays a vital role in enabling the food chain to feed the world safely and take care of our planet.*

Firstly, Syngenta is the behaver in this behavioural clause. Syngenta is represented as a living entity that behaves, interacts and shapes the world. Stibbe (2013: 115) similarly argues that the metaphor THE CORPORATION IS A PERSON is a metaphor of importance in its own right, since it is fundamental to the rise of the corporation as a governing body in society and raises concerns that “ […] the abuse of transnational corporate power at a time when corporation after corporation is exposed as acting against the interests of people and the environment, often illegally, and with very little accountability”.

In dealing with environmental problems, a lack of visual representation can mean a lack of social or political power as there is nothing to show, no compelling visual evidence of the extent or severity of the problem (Peeples, 2011). The unseen relates to Beck’s (1992) notion of second reality of the erased.

Images in Syngenta's report all show people in contact with soil (5.1), sunflower (5.2), crops (6.2) (11), it is safe to wander around in the fields with only a hat as protection against the sun (8) (3), (4) and no protective clothing to ward off pesticide dew.

Image 4: Syngenta's pest practice spraying video (Syngenta, 2019c)

In contrast with other videos on Syngenta's website that are 'best practice' videos in various languages instructing how to correctly apply pesticides using a 'knapsack'. Somehow that image did not make it into this video. Photographs have a ''determining influence in shaping what catastrophes and crises we pay attention to'' (Sontag, 2003: 105, in Peeples, 2011). Residues are mentioned twice in V1, without specifically attributing a noun. In other words, what are the resides referring to? Residues of what?

00:21 - 00:22		(2) Four key areas that they want us to focus ↑**even more** ↓on:
00:22		climate change
00:24		biodiversity,
		water
		and residues

Table 9: Syngenta V2 transcript

Similarly to V1, there are no specific species mentioned in V2, nor seen, apart from cartoon bees, butterflies and a dragonfly. In contrast to V1, V2 is an animated cartoon video that had 2174 views at the time of writing. The animation is accompanied by an over voice narrated in non-standard American English Variety (AVE), which may have been chosen as an indexicality of power, particularly considering Operation Pollinator originated in the UK.

Like in V1, the simplistic cartoon depicts perfect idyllic weather, with blue skies, white fluffy clouds, sunshine and green rolling hills, reminiscent of the cover of the annual report. This discourse of perfection and sameness, of control of nature, is presented as the ideal à la Syngenta and an ideal that is possible to achieve and should be fabricated. However, the utopia changes in (5) where a series of "causes" appear:

00:27 -		(5) In recent years, pollinators are threatened by a combination of causes,
		(5.1) including habitat loss and fragmentation,
		(5.2) agricultural intensification *here the soundtrack cuts and this is inserted* (5.3) non sustainable use of crop protection products *this isn't in the original text that occupies the video*

		(5.4) environmental pollution pathogens and climate change *here the soft guitar score in the background stops for a second and resumes in the next frame*

The environmental degradation in this infantile video is not attributed to any actor, and humans, who are the cause of all of the listed causes, is not mentioned. Pesticides are also omitted as a main cause, and are replaced by the euphemisms 'crop protection products'. Additionally, according to Goatly (2007), the destruction of nature is not viewed as intrinsically regrettable, but as negative because it disturbs nature's 'supply chain'. Importantly, pesticides are depicted as only causing a problem when they are not used 'sustainably':

(5.3) non sustainable use of crop protection products

Which interestingly, does not appear in the text that accompanies the video below. The noun phrase (5.3) does not name a responsible for the non-sustainable use, and removes the responsibility from Syngenta.

The video begins with an idyllic, untouched 'Garden of Eden' image (2), supported by the bounty in the cornucopia, and the apple tree, as symbolic of the Garden of Eden. This 'utopian' representation could be viewed as a dystopia in which the reality created against Beck's (1992) second reality. This frame is the only one where the bees are given a voice in buzzing in the background, and birds chirping at 01:03. It is important to note that until 5.2, the images are pristine, and human-free. The video, perhaps to create a stark contrast, presents the threat to

pollinators (5), carefully emphasising that their decline is due to a "combination of causes", a rhetoric that will be discussed in chapter 9. The appearance of the power station, housing, farms, is almost magical – there is not a human to be seen.

The video presents the presupposition that it is possible to carry on business as usual, i.e., continue to build housing, power plants, as long as these activities are done 'sustainably'. The environmental degradation visually represented returns to the idyllic utopian image, with the simple solution of:

> *(6) we can help address the decline of pollinators by promoting more sustainable practices that diversify agricultural landscapes*

The tree that has been cut – regrows, the waterways fill up, the air becomes blue and clear once again. The solution, similarly to V1, does not address the myriad of environmental disasters that were mentioned in 5.1 – 5.4, nor does it address degradation, such as extinction is irreversible. This is in support of the findings by Jonäll and Sabelfeld (2019) who examine oil companies' accounting of the polar bear, concluding that the problems and critical issues that need to be addressed such as climate change (e.g., V1 00:22) are not articulated. Biodiversity in V1 is not presented as problem that needs attention, let alone extinction. The CEO notes that "(2) Four key areas that they [influencers in the agriculture food **chain]** want us to focus ↑**even more** ↓on, […] climate change, biodiversity, water, and residues" but does not specify how Syngenta will address these, or what are the risks these areas present for the company. Additionally, the CEO does not make links between the operations of the company and these issues. "When communicating to their stakeholders about prevention of biodiversity decrease, the company is not communicating a particular agenda for prevention, but rather mentioning general institutional words" (Jonäll and Sabelfeld, 2019: 347). This can be seen in

Syngenta's texts as well. For example, the following clause in T2 erases the current extinction crisis and does not provide concrete solutions to remedy or account of Syngenta's role in it:

7 *And to make our business sustainable, we have to take **the long view**: ensuring that what we do today strengthens Syngenta and the food chain for tomorrow – economically, environmentally and socially*.

Similarly, in V2, while 'pollinators' are addressed, they are referred to as 'threatened', and 'decline'. No other species are mentioned. There is a silence regarding the catastrophe of the 6th mass extinction. This is exacerbated further in T2:

8 *That's why our Good Growth Plan commitments are integral to our business strategy.*

9 *They put sustainability center stage in the way we do business and align closely with the UN's Sustainable Development Goals.*

10 *If we succeed, we will achieve not only growth for our business but also **growth for all** –creating value that benefits our employees, customers, communities and food chain partners.*

11 *Our success will be measured through the benefits we bring to agriculture and the environment.*

Clause 10 reveals the 'business-as-usual' discourse reframed as sustainability. In other words, sustainability is a go-to ephemeral concept that allows Syngenta to continue its operations unaccountable. In this worldview and under Syngenta's definition of sustainability, *growth for all* can be achieved, and is desirable, similarly to Syngenta's *'sustainable intensification'* concept introduced and discussed in T6.

Additionally, clause 11 goes further to frame Syngenta's products and actions as *benefits* they bring to agriculture and the environment.

With technology framed as a good investment that leads to sustainability. The terms 'growth', 'business strategy', 'measured', 'creating value' combine together to strongly activate the economics and business frame.

> "Treating the living world in the same discursive way as a stock of objects removes (from consciousness) what is unique about life such as consciousness, interaction and interdependence. This could be considered the second type of erasure, 'the mask', where animals and plants have been erased and replaced with a distorted version of themselves (the stock of biological resources" (Stibbe, 2015: 152).

Images 7-9.1 discuss seed mixes (Chapter 4 discussed the problems presented in seed mixes) with soil shown in all seven frames. However, no soil-dwelling animals are represented, that are very important for soil fertility, and a healthy ecosystem, particularly for hedgehogs (Maroun and Atkins, 2020). While it is noted that the video is focused on pollinators, the erasure of any other living beings, including humans from the video further illustrates the disconnected view of the living world Syngenta peddles and the erasure of the importance of all living beings in the intricate web of sustaining itself.

A stark contrast between the images throughout the annual report and the video relates to the representation of space. In V2, screenshots 5.3 – 6 demonstrate the disappearing countryside and the encroaching of human buildings populating the shot. However, image 6 in T2, image 7 in T3 depict wide open spaces in which farming takes place.

As discussed in section 8.3.1.1 in relation to concepts of innovation, development and progress in Syngenta's texts, the most common characteristics that the corporations attempt to associate with their 'brand person' (Koller, 2009: 52) are:

> "innovation, respect, excellence, integrity, performance, trust, teamwork, responsibility, growth … creativity, competitiveness, transparency, professionalism and fairness'. These self-descriptions serve various functions: describing the reality of what the company is like, presenting an ideal that employees can aim for that is not yet reality, and disguising the exact opposite traits that do exist in reality to give a false impression to external stakeholder".

The interplay of the logo, with the verbal and visual in Syngenta's report express the metaphorical traits of the company to which I turn to next.

8.4.3 Conveying openness: Syngenta's logo

Logos function as an "empty or hyperreal signifiers", conceptualised by Lemke (2003: 134) as responsible relationship of dominance contrasted with the solidarity constructed at the verbal level. Syngenta Group's new logo and visual identity "represents the vibrancy, wonder and abundance of the four elements that enable agriculture: Water, earth, plants, and sunlight" (Syngenta Group, 2020). "The four leaves of the Syngenta Group logo are a strong link to the four seasons that shape agriculture in most parts of the world".

Company logos came to be seen as part of a process of corporate image formation and projection, leading to customer perceptions and corporate associations (Cornelissen, Haslam and Balmer, 2007).

The importance of a logo as a graphic element to support a corporate identity was also discussed by Adir et al. (2012) who emphasise the way in which a logo

cements a company's image. In other words, the logo contributes to the creation of a second reality or a shadow reality of a corporation.

Maier (2011a; b) notes that corporations and their logo are visually depersonalized, and as we have seen in the empirical chapters, only the close-up shots of well-known logos takes place for the personhood of the company. That is, the logo acts as the 'face' of the company. Visually, the greenwashing companies' identities as big and well-known companies are represented through evaluative close-ups of their logos.

> "Fresh new colors signal the innovation power, pioneering spirit, and digital capability of the Group" (Syngenta Group, 2020).

Syngenta is visually front and centre in V1, where the verbal focus is on the stakeholders. For example, out of 45 frame shots, 21 directly reference Syngenta (V1 frame shot 00:15) through the logo on the shirt.

Corporate engagement with a broad group of stakeholders has risen since the late 19th century, largely criticised for being a form of impression management (Solomon et al., 2011, 2013). Syngenta mentions NGOs five times in total in the texts analysed, occurring as part of a list of other stakeholders, with no specificity. For example,

> *T1 26 In my remarks last year, I highlighted our commitment to working more closely and transparently with governments, NGOs and society to collectively find the solutions we need.*

Visually, the stakeholders represented are farmers e.g., (3), (0:33) 9 times, consumers twice, only butterfly species are mentioned twice, scientists once. Society

is only represented once, as the ultimate ‘goal’ of Syngenta’s ‘efforts’. NGOs, universities are only verbally mentioned, while food companies are visually represented in (9). Technology is prominent in the video and occurs four times in four frames. Thus considering the CEO notes at the outset the outcome of the listening session was for Syngenta to focus (2) “even more” on “climate change, biodiversity, water, and residues”, the rest of the V1 does not revisit these. The abundance of technological images in the global company websites “transmits the idea that climate change may be mitigated by the technological solutions and products which are associated with the economic activity of these corporations” (Fernández-Vázquez, 2020: 12).

These observations echo the findings of Fernández-Vázquez (2020: 12) who summarises that “The shocking scarcity of natural images on what are, after all, environmentally related texts confirms that the internet viewers’ attention is subtly displaced from environmental care as an end in itself to an alternative mental framework in which nature is a secondary actor”.

Image 5: (Syngenta Group, 2020)

As Koller (2009) suggests, logos are central elements for corporate communication. Supporting Koller’s findings, Syngenta’s new logo conveys

openness, lightness and movement. The way in which the leaves are positioned in an open fashion that, while not directly linked, present a holistic connectivity. The logo, compounded with its colourfulness conjures the image of a butterfly, evoking metaphors such agility, dynamic and vibrant. As Koller (2009: 60) emphasises, these mental models of activity 'growth' and 'innovation' "have achieved a currency that makes these models and their linguistic and visual expressions almost defining notions of the discourses and other practices of corporations". These practices, together with corporate lobby power combine to a powerful influence Syngenta has on political and legislative action to which I turn next.

8.5 Repetition in images: a political construction of reality

"Static visual images may behave in a similar way to text when an accumulation of repetitive images come together and imply movement" (Davison, 2008: 799). The overwhelming purpose of rhetorical repetition in words and pictures is to provide memorability and emphasis. It is through repetition that ideas are highlighted, clarified, nurtured and given power and purpose.

There are five images embedded in T1. The cover of the report, Image 1, depicts a pristine green field contrasted by clear blue skies, what Peeples (2011) refers to as the toxic sublime, that is, showing beauty in the horror. "the toxic sublime produces dissonance by simultaneously showing beauty and ugliness […] while simultaneously eliciting the feelings of security and risk, power and powerlessness" (Peeples, 2011: 377- 380). The fields bring to question the personal, social and environmental ethics that allows these places of contamination to exist.

Much like Yosemite National Park that became "the pristine image [….] iconic of an American vision of nature itself […]", the images found in Syngenta's sustainability report "are constituting the context within which a politics takes place—they are creating a reality" (DeLuca and Demo, 2000: 242). In this way, the images in Syngenta's report permit the company to lay claim to an objective reality (Preston et al., 1996). There are several private houses visible in the edges of the field that may indicate the safety of pesticides, implicitly implying that it is benign to live next to a field that is being constantly sprayed with poison. Gillam (2017) indicates to the contrary, citing instances where farmers' wives fell ill after washing their husbands' clothes. Engel et al. (2005) suggest there is a causal link between pesticides and breast cancer. The strongest evidence of an increased breast cancer in farmers' wives risk was seen for the husbands' use of pesticide 2,4,5-TP or Fenoprop herbicide, as well as other organochlorine pesticides, such as DDT, chlordane, dieldrin, and toxaphene, showing hormonal activity in vivo or in vitro. Use of the herbicides 2,4,5-TP and 2,4,5-T, the insecticide dieldrin, and the fungicide captan is associated with an increased risk of breast cancer in the wives of agricultural farmers (Engel *et al.*, 2005: 133). Further evidence from Lebov et al. (2015) who investigate the relationships between end-stage renal disease (ESRD) among wives of licensed pesticide applicators find that there may in fact be an association with direct and/or indirect exposure to pesticides among farm women. Additionally, Pesticide Action Network UK (PAN, 2020) reports that about 44% of the global population working on farms, approximately 860 million farmers and agricultural workers – are poisoned every year.

The foreground in Image 1 highlights a field margin. The scene is pristine, accurate, the field meeting the margin in a perfect straight line. Spacious, healthy,

vibrant but also controlled, with the perfect weather, all vegetation growing at the same pace. The image is the opposite of wild. The field is also a monocrop. What seems like an idyllic countryside at the edges of the suburbs, is a factory where nature is subdued. Not a single living being apart from the trees and flowers can be seen. On a spring day like that portrayed, one might expect to see birds and insects.

The title anchors the image, suggesting Syngenta is mitigating and warding off a threat that the reader or viewer cannot yet see. *Securing better food* presupposes there will be a food shortage.

Better food is further anchored by the contents page:

> *"We play a vital role in the food chain to safely feed the world and take care of our planet"*
>
> *T2 2 "we will be the most collaborative and trusted team in agriculture, providing leading seeds and crop protection innovations to enhance the prosperity of farmers, wherever they are"*

The weak modality in the future mode *will* could relate to the context in which the report was written, during the merger with ChemChina, to assuage stockholders and gain their trust.

However, much like language itself, images are not a neutral representation of the company's product and personnel; "rather it appeals to a series of culturally determined meanings about the value of hi-tech manufacturing and scientific and technical experts" (Preston *et al.*, 1996: 121). Indeed, Image 2 in T1 depicts an expensive and expansive laboratory, recognisable by two men wearing lab coats, indexing scientists, captured in a position of explanation and demonstration. In this

representation, nature is not agentive, it is a passive concept to which things are done.

Image 2 depicts plants orderly arranged in what appears to be a massive quasi-dystopian laboratory of plant experiments, not unlike the field in image 1, reigned by order. Image 2 precedes clause 4 in which Syngenta refers to itself as a 'thought leader':

> *4 It was our first full year of operations under the ownership of ChemChina, during which we acquired several new businesses, delivered strong financial growth and strengthened our position as a thought leader.*

Firstly, the simile '*thought leader'*, denoting a firm who is recognised as an authority in a field and who share their knowledge and has a strategy that is widely disseminated. "[S]omewhat of an icky term. I don't know if I want someone to lead my thoughts. And I'm sort of just wondering why can't we just say expert? Why do we need this term 'thought leader'?" (Carmichael and Clark, 2015). Whether egomaniacal or not, the term exerts power and control. The image is anchored (Barthes, 1977) in the text, depicting the CEO engaged in thought. The discourse of science, discussed in section 8.4.1, is evident in all three images, through visual verbs such as sporting lab coats, carrying out measurements, taking notes and consulting charts. This claim is further strengthened by the CEO's gaze. In all images his gaze is directed at the activity, which could be interpreted as action-directed, busy and 'doing', productive corporate life.

Each image depicts the CEO in the centre, albeit surrounded by other people who are often backgrounded. While the CEO is not directly speaking, making eye

contact or engaging with the other people around him, he is positioned close to the participants, side by side, seemingly relinquishing hierarchy and demonstrating the unified goal the company that was mentioned in T1 *(45) 2018 has showed us what is possible when we align as one team with one plan.*

However, while the CEO is engaged, it can be observed that his attire is smart, indicating he is only an observer, not a 'lowly' worker. Nonetheless, he is in direct contact at all levels of the company, from the farmers in the fields, to the scientific divisions, positioning the company, and the CEO in particular, as responsible and accountable (in image 2 the participants are wearing white lab coats). Similarly, in V1 intangible qualities are suggested by the dress codes, interpersonal codes and the spatial codes of the setting (Davison, 2010). Always in medium shot (Kress and van Leeuwen, 1996), the CEO does not directly address the viewer. "The portrait is visual representation of identity par excellence and of the perceived characteristics of the individual and his or her place in society images (and indeed narrative and graphical forms of impression management) bear a greater relation to advertising than to accounting, and that where advertising aims to construct images, accounting is based on efforts, at least, to represent truths" (Davison, 2010: 167). He smiles at various points in the video, Leadership may, for example, be represented through smiles, shown to be emotionally contagious (Davison, 2010).

The CEO images in T1 and V1 are significant to meaning making because ''Presence and visibility are vital in order to build up that capital of trust" (Guthey and Jackson, 2005: 1058, in Davison, 2008: 166). The viewer is in 'offer' (Kress and Van Leeuwen, 1996) position, invited as an observer, to see all the activity and the company hard at work.

Image 6 and T2 are closely linked, as the text overlays the image. Image 6 in T2 once again depicts an idealised image of agriculture, presenting a romanticised lone farmer, tending his crops by hand under blue skies. Erasing the destruction of tractors, pesticide spraying, back-broken workers toiling the fields, and the lack of wildlife, the image does not present the technology Syngenta promises, nor any of the innovations it heralds. What is additionally absent are hedges, wildlife corridors, and an end in sight for what appears, once again, a monocrop field. This finding coheres with Fernández-Vázquez (2020) who finds technology to appears as the main participant in almost half of the images analysed. This contrasts with the representation of nature, which only appears in three images out of nine, a similar finding in Fernández-Vázquez (2020). A further investigation reveals that of the images in which people appear (nine in total), the CEO appears four times. This finding is consistent with previous research by Fernández-Vázquez (2020).

8.6 Conclusion

This chapter carried out a detailed analysis of Syngenta's 2018 annual report, as well as two videos relating to transparency and Operation Pollinator. Syngenta's current litigation and reputational risk, as discussed at the outset of this chapter, reveals that these matters, i.e. transparency of the safety of pesticides are urgent material ethical risks for Syngenta.

Syngenta is in the transparency register of the European Union as a registered lobbyist. For 2017, it declared a €1,500,000 - €1,750,000 expenditure of lobbying in European institutions (European Union, 2018). This radically highlights the power Syngenta holds over the construction of reality, the way agricultural schemes, such as the way in which MFFMs are approved and promoted. One of the most frequently quoted definitions states that greenwashing is 'the practice of promoting

environmentally friendly programs to deflect attention from an organization's environmentally unfriendly or less savoury activities' (Marquis and Toffel, 2011: 19, in Fernández-Vázquez, 2020: 4). The analysis demonstrated that Syngenta promotes their products through the discourse of benevolence bestowed for example, upon wildlife in field margins in the MFFMs schemes, which ironically, as the analysis proposes, creates ghettoisation.

Through the multimodal ecolinguistic analysis of Syngenta's 2018 annual report narrative and relevant texts and videos in this chapter, I have unravelled the ideological discourses that shape and reify the representation of pesticides and the promotion of agribusiness values. Syngenta wages war on nature through metaphors of movement and progress where technology, the military vehicle of advancement "*do not stand still".* The discourse of control of nature occurs throughout the images analysed. For example, the uniformity of the flowers and fields as in image 1, with their sunflower heads aligned like perfect tin soldiers.

Syngenta erases nature's agency when the company claims it plays a role in feeding the world and where 'growers' provide food, and actively grow it. Nature's role, all the animals, plants and ecosystems undergo void erasure. Additionally erased is farmer agency where Syngenta removes the decision making process from the farmers by providing them with the 'solutions' and answers through their developed 'science'. Removing the agency of farmers to continue their honed practices, places the locus of control onto Syngenta's tracking quasi-surveillance technology powered by politically driven lobbying, shapes the way in which farmers work and the way in which this imapcts of species.

Finally, Syngenta supports and promotes MFFMs in a context of 'sustainable' agricultural intensification that promotes business-as-usual. Respecting wild animal

sovereignty, the right of wild animals to lead automomous lives anchors the right of individuals to belong to specific territories and can stop and possibly reverse human destruction of wild animal habitats. "As such it would place significant constraints on human activity in areas of overlapping sovereignty, or in contexts of cross border effects to minimize inadvertent harms to wild animals, and to compensate animals whom we injure" (Donaldson and Kymlicka, 2011: 206).

Chapter 9: The discursive construction of deliberate omissions: spoken discourse analysis of interviews with agrochemical corporations

9.1 Introduction

During the Vietnam War, Pentagon's official (Hersh, 2019) statements were held face-to-face meetings, as opposed to telephone conversations, in order to keep disclosures above board where incomers, such as journalists were logged and accounted for. Similarly, the agrochemical corporations interviewed and examined in this chapter hold official interviews, conferences and meetings as the norm. Access to telephone interviews is limited and denial of the harmful effects of pesticides on civilians and the environment are vehemently denied à la McNamara[29].

This chapter analyses twelve interviews with two international leading agrochemical corporations and one chemical company that supplies adjuvants to the agrochemical companies. The aim of the analysis is to examine the identities as

[29] Robert Strange McNamara was the United States eight Secretary of Defence between 1961-1968, under presidents John F. Kennedy and Lyndon Johnson. He was involved in a series of denials of bombing of civilian areas in Hanoi and is implicated in the escalation of the war.

performed, positioned and co-constructed in interaction. As outlined in chapter 6, an ecolinguistic analysis undertaken here will explore are what kind of identity positions do the participants construct in the interaction? Are they ecological identities such as stewardship identity? Politician identities? Owner or consumer identities? (Stibbe, 2015). I draw on Goffman's concept of framing (1959) the notion of self-representation, with the assumption that in face-to-face interviews people construct a certain representation of themselves for the researcher, and how this may contrast company stance. (See sample interview questions in appendix A, although I followed the PCI method, see section 6.4.4).

The aim of the chapter is to demonstrate that corporations' interests lie with core business activity and always comes first, presenting an obstacle for this sector to adopt the extinction accounting framework.

The chapter begins with an exploration of current species protection practices company C, placing the individual animal at the conscious front, where they cannot be erased and ignored. The chapter then moves on to examine what is not there, the erased and deliberately omitted, examining issues of corporate responsibility, accountability and disclosure that, as the chapter will reveal, at certain moments in the interaction do not align with individuals' identities. Next the chapter analyses the attitudes and discourse of agrochemicals of NGOs. Moving from current company initiatives concerning bees to extending those to other species, the remainder of the chapter presents and analyses corporate factors for rejecting the need for the extinction accounting framework, and rejecting hedgehogs as an indicator species and vulnerable to pesticides. The chapter concludes with a frame analysis of hedgehogs as contextualisation cues for changing frames.

9.2 Endpoints or Endgame?

We walked over to a table at the back of the lab. The lab was quiet and peaceful, with green views of the immaculate campus gardens, trees and lake. On the desk was a plastic transparent box with dozens of bumble bees trapped, their buzzing muffled by the thick plastic walls of their prison. My heart ached for them. With only 30 days to live and experience the world. These individuals were unlucky, subjected to toxic fumes sprayed at them, and drip-fed to them from the moment they were born to the moment they were to die. For an animal whose main interest is to fly, collect pollen and see the beauty of the world through flowers, these individuals are sacrificed.

Despite it now being common to have guidelines addressing the well-being of animals across all vertebrate taxa, such practical implementations do not currently exist for invertebrates, in particular those providing essential ecosystem services (Straub, Strobl and Neumann, 2020).

Extract 1

(1) I: how do you feel about them being in the box how do you feel about the test

(2) C4: I personally ↑ I think it's necessary (.) to protect the bees

(3) I: yeah

(4) C4: or to know how um when we test our substance apply our substance how they (-) affect our bees

(5) I: %mm% (-) yeah

(6) C4: so I think it's very uh important

(7) I: yeah

(8) C4: %to test it before% (-) and to have a look on bumble bees and solitary bees and not only on uh honey bees

(9) I: and how do you feel (1) do you think that in terms of ecotoxicology do you think that other species apart from bees and all the different types of bees do

you think they would could be affected all kinds of biocides ↑ ↓ (2)

(10) C4: when we apply it on the field

(11) I: yeah (2)

(12) C4: I don't know if a species are on the top and somebody apply substance it could be

(13) I: yeah mm and=

*(14) C4: =so we test it um *checking in translation with colleagues* earthworms*

(15) I: yeah

(16) C4: and other species and um (-) I don't know it in English

(17) I: yeah

(18) C4: so we look on many species

(19) I: yeah

(20) C4: to have a good risk assessment because ecotoxicology

(21) I: and what abo::ut bioaccumulation in for example mammals so if I'm looking at hedgehogs do you think there is any chance that hedgehogs could be affected by all kinds of pesticides because of eating because insects are in contact

(22) C4: I don't know=

(23) I: through the food chain

(24) C4: I can't say anything to it

(25) I: yeah (3)

(26) C4: yeah that's our bee testing lab here

Company C may be looking at endpoints to determine toxicity, but it is the end of the game for the bees in the box and endgame for the all species now battling for survival globally. According to participant C4, the tests are important to protect the bees. However, if pesticides present a risk to bees, and the testing implies that they

do, and other ‘many species’ (18), what does taking the risk signify to the environment at large, and to society? As Beck (1992: 70) reminds us, “coping with risks compels a general view, a cooperation over and above all the carefully established and cultivated borders”. The risk assessment followed by company C, and indeed all agrochemicals, naturally means that they are operating narrowly and blindly, ignoring the general view of interconnectedness.

As Christian (2016) eloquently notes bees and bumblebees are stakeholders. All they would ask is be able to pursue their own life interests, and for humans to be considerate of them. The consideration of living beings as sentient and having the right to lead their own lives (Donaldson and Kymlicka, 2011) is ignored by C4. C4 is directly asked how they feel about the bumblebees crawling in the box, but does not make any direct reference to them as living beings, only to ‘have a good risk assessment’ (20).

In terms of pesticides, C4 refers to ‘substance’ (4), not toxins or pesticides, thus masking or erasing the risk inherent within the poison. Importantly, in these tests, the endpoint is to find the threshold where 50% of individuals die. Therefore, C4’s omission of the grave destiny of the individuals in the plastic death chamber contributes to the overall denial of the effect of pesticides on biodiversity. Further, clause (24) marks the start of a prevalent corporate discourse of deliberate omission on which I will expand in the following section.

9.3 Deliberate omission discourse: “that is what I'm wondering because Confidor is imidacloprid”

9.3.1 Adjuvants and formulations

As discussed in chapter 4, adjuvants have been found to be more toxic than 'active' ingredients, and to increase the toxicity of final formulations (Mullin *et al*., 2016; Mesnage and Antoniou, 2018). One chemical component identified relates to Confidor, an insecticide that kills aphids. Confidor is "at least 10 times more toxic than imidacloprid alone to placental, embryonic and hepatic human cell lines" (Mesnage *et al.*, 2018: 1488). In the following extract, participant C6, head of environment and sustainability at C, comments on the interviewer's question regarding the negative implications of Confidor on mammalian health. In the case of hedgehogs, this is an important factor, as they rely on their fat reserves and accumulation in the adipose tissue, similarly to bees, may increase toxicity of any pesticides consumed. "The farmers' cows can turn yellow next to the newly built chemical factory, but until that is 'scientifically proven' it is not questioned" (Beck, 1992: 61). In other words, even when scientific evidence of the harm of pesticides is clearly presented, agrochemical companies categorically deny it.

Extract 2

(1) *I: what about um confidor and I'm asking mostly from about mammalian toxicology more than the bees you know that I'm interested in the hedgehogs um what about confidor I read that confidor is potentially ten times more (.) uh toxic than imidacloprid (.)*

(2) *C6: that is what I'm wondering because confidor* ***is*** *imidacloprid so um confidor is the the um (1) yeah it's not scientific name imidacloprid is scientific name of um the active and confidor is=*

(3) *I: =is the formulation*

(4) *C6: formulation*

(5) *C6: all of the first tox studies are only done with the active because a long term tox study (1) um must be set up um right after the development decision of (.) scientific ingredient because in the lab more than two years um and with calculation it's it's it's quite more so the long term tox study is done with the active*

(6) *I: mmhm*

(7) *C6: with **confidor** you do mainly then acute tox studies*

(8) *I: does C produce its own adjuvants or does C buy adjuvants from somewhere else (2)*

(9) *C6: yeah we don't produce adjuvants*

(10) *I: no*

(11) *C6: we buy it from outside*

Clause (2) above may reveal that the company attempts at every turn to thwart any information and opportunity for transparency regarding the adverse effect of their products in a deliberate omission discourse. Symbolic management focuses on appearances (Goffman, 1959) and self-justification: ‘‘rather than actually change its ways, the organization might simply portray— or symbolically manage—them so as to appear consistent with social values and expectations’’ (Ashforth and Gibbs 1990: 180, in Boiral, 2016). Sustainability reporting, or biodiversity reporting, is shaped by the managerial and ideological capture of information (Milne and Gray, 2013) whose collection and release reflect the interests of organizations rather than those of the stakeholders (Milne *et al.*, 2009).

Not only are toxic substances that have an evidenced negative effect on mammalian health not openly discussed, other compounds such as biologics are used euphemistically. For example, they are referred to as *control agents* (C5). Specifically, C5 refers to natural compounds and likens them to biologics:

Extract 3

(1) *C5: what I'm doing is actually I'm one of the inventors here trying to find new insecticidal compounds yeah conventional chemistry compounds ↑ nature driven compounds so inspired by natural toxins as well and of course biologics ↓*

The danger in discussing chemical compounds as natural, and including biologics as a natural ‘pest control’ is that, similarly to C6 above, it detracts from

their risk and toxicity. “Acceptable values make possible a permanent ration of collective standardized poisoning. They also cause the poisoning they allow not to have occurred, by declaring the poisoning that did occur harmless” (Beck, 1992: 65-66). In other words, by deliberately omitting the harm caused by a formulation and the adjuvants within, and by framing toxins as ‘natural’, man-made chemical compounds are ‘nature driven’ becomes the norm of practice, because the poisoning is claimed to be non-existent, and choosing an organic, alternative way to grow food is rejected.

In a memorable moment in the interaction with participants S1 and S2 from agrochemical S, participants were asked about adjuvants in their products. The snap of the neck could have been heard as they quickly looked at each other, attempting to silently communicate through a glance like lovers.

Extract 4

(1) I: mmhm and (-) does ↑ S produce adjuvants (4) I tried looking but I couldn't find anything

(2) S1: ↑ I don't ↓ know ↑

(3) S2: [we've we've in the formulations it would be

(4) S1: =when you say produce ad adjuvants I mean that's

*(5) I: or do you **buy** them (1) from some someone[else*

(6) S1: [the the components of [formulations

(7) S2: [formulations

(8) I: yeah

(9) S1: that you would mix together

(10) I: yeah (2)

(11) S1: so (-) >yes< in terms of our end products (.) so all (2) all (.) products are held in some kind of suspension %yeah ↑ %

(12) I: yeah

(13) S1: including (.) shampoo o:r

(14) I: mm

(15) S1: washing up liquid o::r anything

(16) S2: while we may not te test the adjuvants directly

It takes 11 exchanges for participant S1 to acknowledge that all products 'are held in some kind of suspension'. The passive verb phrase 'are held' is a choice that erases the chemical interaction between the active ingredients and the adjuvants. Additionally, adjuvants are not named, instead 'suspension' is used, and quickly likened to everyday materials such as shampoo or washing up liquid to intimate their benign nature. As participant S2 discloses, the adjuvants are not tested by the agrochemical raises significant concerns for safety, as discussed in chapter 4.

9.3.2 Control and regulation of pesticides

While adjuvant toxicity is skirted by agrochemicals, a repeated claim the agroindustry interviewed makes is that the crop protection industry is being held to higher standards of proof of safety than any other industry. However, as discussed in chapter 4, regulation is incomplete and inadequate to provide a full understanding of the risks and effects of pesticides on the environment, wildlife and human health (The Bee Coalition, 2014; TFSP, 2015). "EU and national controls of pesticides as they currently stand are still far too little and far too late" (The Bee Coalition, 2014).

To highlight the safety of the products, participant S3 from company S, reveals that the use of pesticides cannot be as harmful as it may be perceived simply because:

Extract 5

> *S3: "… we can't destroy everything in the landscape just to produce food we've got to have a balance but there's a place for food and there's a place for biodiversity".*

One of the main discourses used by the company is that of metrics, counting, and numbers that creates demarcation; a place for food, a place for biodiversity (see section 9.7) which introduces the presupposition that trade-off is acceptable. However, as Gray (2013) emphasises, accounting for the environment does not need to be based on the foundation of conventional financial accounting. The use of metrics serves to demarcate between entities, creating definite boundaries. This is also supported by the multimodal findings in chapter 8 of the clearly demarcated boundaries of the fields and margins, the ghettos and the crops. In other words, by aligning themselves with corporate ideology, participant S3 reveals that company S positions itself as one that decides how the natural world is to be divided, and who is allowed to exist and where.

As discussed in section 9.3.1 above, the omission of the toxicity of adjuvants as well as their addition to the final formulation is neglected by participant C5, from company C who continues to focus solely on the active ingredients:

Extract 6

> *(1) C5: so of course we know these bad uh (-) yeah bad properties of compounds […] (?) we know this might be uh an active ingredient this might be a new active ingredient we already investigate whether this compound can be decomposed in nature*
>
> *(2) C5: we try to figure now out how this is working ↑ we have for example in our screening integrated right from the beginning ↑ […] the main goal*

of risk assessment to take that all under consideration and come up with the solution um at the end and with a clear recommendation how this compound should be used ↑ or the clear recommendation no we cannot uh uh um go with you with your company you want to register this compound no we cannot do that we would of course for us it would be a waste of money to promote these kinds of compounds to to the authorities so we (-) we have clear cut off criteria for this uh for these properties and they are vanishing from our pipeline

Discussing transparency and the safety of active ingredients, participant C6, head of environment and sustainability commented that while most data about the safety of products was available on the internet, the issue of corporate confidential information regarding the adjuvant formulations and pesticide final formulation prevents companies from revealing it to the public:

Extract 7

(1) C6: but you have always with big companies the discretion about secrecy agreement

(2) C6: of special recipes of ? recipes because um in these recipes there is many um internal know-how and that could be used by others and then you have a not protected patent

Thus, this emphasises the obscurity in which the registration process occurs, and the unknown outcome of the application of these compounds onto food, biodiversity and human health. Like in Beck's (1992) notion of second reality, this is reinforced by company D, a producer of adjuvants:

Extract 8

(1) *D3: yeah so it's it's all around intellectual property so the companies who make them can (.) can sort of um make more money from it so if you you make something that you patent then nobody else is allowed to make it*

(2) *I: ah ok mhm ok (-) ri:ght um there's has been recent um academic papers that were uh published about the fact that (-) uh adjuvants are not very well regulated ↑ (4) but uh:::: (2) yeah (-) d would you say that they are regulated as well as final products ↑ (3)*

(3) *D3: interesting question*

(4) *I: mm*

(5) *D3: obviously the (-) the regulation has go into a final product are the strictest because that stuff is going (.) out sort of out of onto the field the strictest use and the use of the adjuvants formulation would be assessed as* ***part*** *of that (-)*

As discussed in chapter 4 with regard to the risk presented in the registration process for adjuvants, that many aspects of pesticide application and registration are left unchecked. For example, as participant S3 notes, soils are checked for pesticide residues, nor are mammals centre-stage for government agricultural stewardship schemes for promoting biodiversity:

Extract 9

(1) *S3: um the soil ↑ check they're not the soils aren't checked for p(.)esticides in them I think within the: (-) stewardship schemes they're not* ***quite*** *so (.) focused on the the* ***mammal*** *side of things but some of the (1) mo:re complex schemes that pay for the the there certainly is o opportunities to think about mammals and some of them certainly do because the whole %food chain of the thing isn't it within the%*

(2) I: mm

(3) S3: landscape

According to participant S3, the onus of pesticide application and ultimate responsibility in the chain rests on farmers, reminiscent of what Atkins et al. (forthcoming) and found in their research on neonicotinoids in cat collars in which agrochemical corporations pass on responsibility and avoid accountability:

Extract 10

> *S3: mmhm *inhales* a: a (.) i a it's there's a lot of control until it gets actually into the >farmer's hand< and in their sprayers but the (.) is obviously regulation in place firstly from* ***our*** *si::de on the >labelling< and registration of the product*

Indeed, the discourse of responsibility and accountability prevalent in the interviews examined may reveal the degree to which agrochemical corporation hold themselves accountable, and whether they would be amenable to adopting the extinction accounting framework that was presented to them during the interview (see section 9.9).

9.4 Responsibility and accountability: "it's like being a light bulb manufacturer"

Participants S1 from agrochemical S likens the agrochemical to a light bulb manufacturer.

Extract 11

(1) S1: company S can do nothing […] it's like being a light bulb manufacturer and […] telling people how to wire the house […] we're not we're n we're not we're the light bulb producer we're not the wirers[of the system

Essentially, participant S1 using the simile of a light bulb manufacturer, hedges the company's actions as having no power over policy and legislation. However, as was demonstrated in chapter 4, companies like Syngenta have spent in 2017 between €1,500,000 - €1,750,000 on lobbying (European Union, 2018). In this way, participant S1 places the risk not on the company, but on the system in which the company operates, with the responsibility embedded within. The notion of risk is further revisited in the following interactions, in which participant C6 describes the pressure resulting from glyphosate related litigation and the way in which the company perceives the conceptualisation of risk by the 'wirers' of the system:

Extract 12

(1) I: what do you think about the whole glyphosate (.) thing

*(2) C6: as a scientist um uhh *blows air* […]I believe enough in our authorities *laughs* that I don't think that they can be influenced that way ↑ I've never experienced it to that extent and even almost say the contrary ↑ they're getting zero risk mentality minded because there's so much pressure on them that they *laughs* won't take a risk to indicate let's say if they think there's something fishy ↑*

(3) I: mm

(4) C6: that they would actually vote in favour

(5) I: yeah

(6) C6: so I absolutely do believe in the assessments done

(7) I: mm

(8) C6: um and I think (1) yeah I I I think again it's uh uh a compound is being attacked with a very broad use ↑ so hits the industry hard and it's basically a statement to say we want a pesticide free or chemical free world and that's where the pressure is on and of course as a big

multinational and especially the front runner now you get the wind yeah ↑ do I believe that glyphosate is the cause of of of these no I don't yeah ↑ is there a zero risk ↑ no there's not a ↑ zero risk ↓ I mean every chemical you use like your toilet uh detergent etcetera have a risk ↑

Once again, C6 dismisses any claims that governments could be influenced by any lobbying in clause (2), and in fact defensively, almost as if betrayed, positions the company as being attacked (8), and 'getting the wind' (8). C6 denies that glyphosate has any negative effects. Indeed, Boiral (2016) notes, "(W)hen they address stakeholders, they defend their social legitimacy and environmental responsiveness using one of the four techniques: they claim of a net positive or neutral impact on biodiversity, they deny that they have a significant impact, they distance themselves from the impact of their actions, and they play down their responsibilities". These rhetorical devices can be seen in the interaction but even more fiercely, as C6 does not deny the impact pesticides have on human health, but rather omits it entirely.

As Beck (1992: 62) emphasises, "the uncovered 'cheating tactics' of the scientists point to categorical differences between scientific and social rationality in their dealings with risks". This is evident in the interaction where company C, and C6 are holders of scientific knowledge that cannot possibly justify the public and authorities demanding a 'pesticide free world', as their conception of risk is preposterous, as 'every chemical you use […] have a risk'.

Denial of risk is discursively constructed by participants in this study by the discourse of insect decline, and the denial of species extinction (that will be elaborated further in section 9.9.2).

Extract 13

C5: yeah we are for example one things that we try to investigate why many of the that's because it's my expertise why many of the day flying butterfly

species are declining already since more than since 100 years […]counting back to 1850 for example

C5 discusses insect decline following Hallmann et al. (2017), arguing that the problem is not recent but has been a gradual issues dating 100 years, possibly alluding to the start of the industrial revolution. The reason for insect decline according to participant C6 is unknown:

C6: because that's the case no one knows why

However, Hallmann et al. (2017: 15) clearly state that "[A]gricultural intensification (e.g. pesticide usage, year- round tillage, increased use of fertilizers and frequency of agronomic measures) that we could not incorporate in our analyses, may form a plausible cause". Additionally, the Dasgupta Report (2021: 17) notes the destructive effect of pesticides on the environment and "pollut[ing] the rivers and ground waters and "destroy[ing] soil biodiversity". Additionally, participant C5 attributes insect decline to every factor except pesticides, repeatedly deflecting any responsibility from the company:

Extract 14

C5: it's a first analyses and interestingly species which are really um associated for for example with arable crops ↓ like oilseed rape the whitelings for example they're not declining at ↑ a:ll ↓ so they they stable so species where you (.) might think they are really um yeah they they (.) there is a big chance that they came in contact with pesticides are not affected at all

Thus pesticides are not affecting some species at all. Sometimes the different vegetation is a culprit:

Extract 15

(1) *C5: I'm talking about my pri:vet experience […] what we see here in the last decades is that the vegetation is in general uh (-) very different to former times we know that from the literature what plants were there what was the density of the vegetation*

Sometimes decline is attributed to air pollution:

(2) *C5: and of course we know the source one source is of course yeah (1) human made pollutions air pollutions*

Cow dung is also cited as a factor:

(3) *C5: and another source is that we we have much more cattle now the cattle the the cows*

And sometimes it's just a mystery:

(4) *C5: many other groups parasitic wasps and things like that are declining that's uh (-) a a big mystery in many cases*

However, what is certain is that pesticides are not the culprit. According to company 'C', toxins are found in everyday products and are virtually unavoidable, and are a matter of dose:

(5) *C5: many of these compounds do have ah effects on the endocrine system of mammals birds and other organisms reptiles you know maybe these examples where we have we have malformation in gender specific um properties in alligators in Florida and in fishes in rivers and so on this is coming from yeah many different chemical compounds we use daily*

Like slippery fish, Company C is difficult to pin to any responsibility. Company C attributes share drop to the company's turnover, although as discussed in chapter 7 in the example of Bayer, share drop occurred as a result of flawed

corporate governance, where lack of transparency caused share drop and shareholder voting:

Extract 16

(1) *C6: because what we often face that share drop is um yeah loosely linked to but um at least not 100% to the turnover or income of a company*

(2) *C6: but the question is why did um the glyphosate cases now dropped (.) um but not from legal point of view but um from the: uh trust of the shareholder*

(3) *I: mhm*

(4) *C6: that this could be managed in a sufficient way to (cause?) something that clear but um on a long term basis it will not harm the company but anyhow the question would be um and that is what I understand from the outside world um that the IPA is not sufficiently managed and it's not sufficiently calculated because um would expect it around I'm not sure but um but I've heard it's around 5 billion*

(5) *C6: um the that question would be I'm I'm not saying so much about the court cases because um that is from my opinion manageable and uh will come out with certain amount of course but um the question will be do we have (.) a real reputation loss no:w or we have still a high reputation and it is mainly dependent on single person now* ↑

(6) *C6: and the question now is it only um a temporary situation where share price mirrors not exactly the reputation or um do we have here a clear reputation loss and if it is the case of reputation loss is it (.) more um volatile now reputation of company or um so based on on um yeah on um volatile information or information changes or and that's the question on how to get the idea how share prices is connected to reputation of the company*

Participant C6 laments the heightened reputational risk that may result from the extensive litigation company C is under in relation to herbicides and their carcinogenicity. Additionally, concerns are raised in terms of the effect this may have on share prices, while the settlements amounting to 5 billion USD are no cause for concern: it is manageable and allotted. However, concern for the people who brought the cases forward and who are terminally ill with non-Hodgkin's lymphoma is not expressed by participant C6.

Discussing the effect of pesticides on bees, participant C3 hedges pesticide impact naming fragmentation, and, similarly to S3, places the onus of a possible impact on the incorrect use and application of pesticides by third party users, farmers.

Extract 17

(1) *I: such a huge problem and um how far would you say pesticides and crop protection measures play a part in this (-)*

(2) *C3: in in in bees ↑*

(3) *I: yeah*

(4) *C3: um (2)*

(5) *I: together with all the other factors=*

(6) *C3: =ye:s of course like all the factors we then then um within the agriculture practices uh in my opinion is in the literature is most uh is more related to the design of the ecosystem so the fragmentation and uh the connectivity*

(7) *I: mm*

(8) *C3: and so on so I would say to: the the pesticides ↑ um well we have seen that they have been uh used in a proper way ↑ so farmers have been adhering to the labels and so on and applying them in a correct way I would see it uh more in terms of that the landscapes need to be uh redesigned*

(9) *C3: =I believe that is more habitat fragmentation and loss and that* ***because*** *of this habitat fragmentation and loss and lack of say food*

resources nesting resources and so they then became more vulnerable to other stress factors including inappropriate or irresponsible or %overuse of pesticides% which is: %you know down to the farmers%

In the above interaction, participant C3 employs linguistic checking devices in order to appropriately hedge their answer in the face of what is a face-threatening question (1). Clause (2), and (3) reveal the participant's need to stall for time, while the interviewee's clause (5) provides slack or relief. This is evident because the participant latches on, hedging their 'opinion' onto 'the literature'.

Clause (9) attempts to wash the corporation's hands clean of any responsibility for pesticide adverse effects by firstly repeating their fragmentation argument, and sealing any remaining doubt by passing the responsibility down to farmers. Both company C and S separate themselves from 'the wirers of the system', i.e., the legislator and authority, and the 'inappropriate or irresponsible' users of pesticides. However, following this argumentation and tapping into the discourse of war discussed in chapter 8, if farmers are the 'gun users', agrochemicals are the bullet producers. Perhaps the legislator could enact more stringent 'bullet' control, but it is ultimately bullets that are used to harm others.

Finally, this section demonstrated that the main discourse participants draw on is that of avoiding responsibility and accepting that their activities and products have a direct and indirect impact on human health, wildlife and the environment. This may present the first and most important hurdle in the consideration to adopt the extinction accounting framework because this first step would signify an acceptance of that elusive responsibility. Further factors in the agrochemicals' resistance to the adoption of the framework will be explored in section 9.9. While this section concentrated on the corporate hard line in participants' discourse, it is not an opaque

discourse. Glimmers of interest and care for biodiversity can be gleaned in several interactions and will be explored next.

9.5 'Private' frame and 'Corporate' frame

Overall, participants in the interactions reinforced the corporate stance as shown above. However, it was observed that several participants switched between what I term a 'private' frame, denoting a private domain of their personal life and interests that strongly contrasted with their 'corporate' frame. Juxtaposed, the private frame shines through the nearly-air-tight corporate mantra, offering a glimpse into identities of participants through their discourses discussed below.

In company C, participant C5, an entomologist begins with a 'private' frame in which they share their background and personal passion for insects, and refer to a central corporate initiative as a PR exercise:

Extract 18

> *(1) C5: maybe first because I'm not working in the ---- [initiative] and not normally not uh involved in public relation or things like that*
>
> *(2) C5: but I'm also involved in in nature conservation projects here in X↓ I'm (.) very much interested in butterflies and and natural um environments here in […] so um yeah that's (.) my entomology background I would say from my private (.) point of view*
>
> *(3) C5 "I'm yeah entomologist I'm very much interested in insects* ***but*** *I'm also involved in nature conservation projects"*

For the participant, the discourse of care of the environment and insects in their private lives is divorced from the activities the company engages with to promote pollinator health, perceived by participant C5 as public relations, and not as a genuine centre for helping pollinator extinction. Additionally, in clause (3) participant C5 interestingly utilises the connector 'but', separating their corporate

interest in insects, from their conservation work in their private life, suggesting that the two are incongruent.

However, participant C5 switches to the corporate frame, in support of company ideology and concedes that media pressure prompted the company to create an insect decline group:

Extract 19

(1) *C5: so we have here an insect decline group because yeah due to the medial um um awareness um of um insect populations declining […]*

(2) *I: with um pesticides what about considering the food chain*

(3) *C5: yeah*

(4) *I: is it something (.) C is looking into ↑*

(5) *C5: yeah absolutely*

(6) *I: yeah ↑*

(7) *C5: so of course we know these bad uh (-) yeah bad properties of compounds we try to do everything directly from the beginning of our screening cascade you have to imagine that we are screening one hundred thousand compounds invivo each year and millions of compound*

In this corporate frame several instances of corporate discourse can be noted. Firstly, the participant does not use the noun *'pesticides'*, but carefully chooses other phrases, such as 'compounds'. This echoes the finding in chapters 7 and 8 where synonyms of pesticides were used in corporate annual reports, such as 'crop protection products'.

Another occurrence of the struggle between an inner 'personal' frame and a corporate frame of values can be gleaned in the following extract with participant C2, who heads a biodiversity corporate initiative.

Extract 20

> *C2: uh um it's not and this interesting I studied environmental sciences ↑ and we had our reunion and I %thought what are they going to say% and then actually even the most critical environmental uh students at the time said great ↑ you're doing something for bees in the company %it's great% so where you think oh:: ↑ ↓ what what are they thinking ↑ actually I got the support where I thought wow that's an open minded way of looking at it yeah*

In extract 20, C2 discusses the fear they had about revealing to classmates during a reunion, that they worked for C, an international agrochemical. C2 studied environmental science and, according to the extract, felt that their role in C contradicted or would be perceived as contradictory to her former classmates' values regarding the protection of the environment.

However, participant C2 'corrects' her inner conflict and returns to the corporate frame by revealing that in fact her classmates were supportive of her role, and perceived it as 'doing something for bees'.

9.6 NGOs and partnerships: "they're just it's just (.) flim flam"

Company C present a pseudo-dialogic accounting, by saying that they speak to many stakeholders in their conversations but in a way, they are using a monologic accounting that is "a neutral framework within which different stakeholders can pursue their interests. Accounting is thus claimed to serve pluralism" (Brown, 2009:

316). C2 describes in the following extract the futile attempts of company C to work with NGO Greenpeace:

Extract 21

(1) I: tell me more about Greenpeace cause I obviously I know that you deal with Greenpeace it doesn't say much

(2) C2: no because basically when we talk to Greenpeace in the […] history it happened um once but it's um between closed doors because it's not in their interest to uh to basically tell the world that they're having these discussion they're willing to have an open exchange but not to um to promote that yeah ↑

(3) I: really ↑

(4) C2: yeah yeah %Greenpeace doesn't want to really% collaborate at least not on bees

(5) I: ohh

(6) C2: they're but at least they want to listen ↑ from 6 year ago and uh and at that time there were some exchanges there was also there was an idea to have a panel debate with them never happened also not really very interested to really make it happen I think yeah so:: yeah with Greenpeace we (-) we've never really but we have talked

(7) I: yeah

(8) C2: and again you can agree to disagree and you can have an open debate %but they didn't want to do anything%

(9) C2: I respect the strategy is one that is not cooperative to the to the extreme I would say mm cause I mean I have a question to you probably is is cause I often I I'm a big believer that if it's not an integral part of

your business it becomes more difficult of course we can give money for the panda or whatever if there's no connection I'm finding it weak it's so easy to just give money you still need to get of course approval but generally I'm like but then where is your partnership where is your dialogue

(10) I: mm

(11) C2: and I I don't know I don't believe in that model I believe we need to work on it together

As the extract demonstrates, C2 positions themselves and the company as one that values partnership and dialogue, and open debate. C2 obliquely alludes to Greenpeace not being cooperative or sharing the values of company C. Greenpeace is willing to 'listen', positioning the NGO in a passive role where company C does all the talking, and hence engaging in a monologic accounting.

NGOs are negatively talked about by both companies C and S. Negative evaluation occurs through mimicry as in clause (1) (underlined) in the following extract:

Extract 22

*(1) C1: and started to be very um **an**tagonistic (2) um rather than rather than looking for (.) compromises pesticides companies are evil a::nd you know people should be very wary about working with um %you know%these nasty chemical companies (1) and uh *exhales* (-) you know I I've had a number of such either on a platform or face to face with people like R and invariably it starts off on on a relatively benign sometimes quite science-based discussion and rapidly turns uh deteriorates into name calling*

(2) C1: that's this is my perspective not necessarily company's perspective on

this particular issue (-) our our our objective always is to try and have dialogue try and find ways that we can move forward

(3) *C1: um which is a shame but as I said we recognise that (-) all of these organisation a::re fighting fighting for money in a in a space where people are* ***less*** *likely to give money and more likely to give money than they used to*

(4) *I: yeah*

(5) *C1: so um sometimes the rhetoric has to be more has to be louder has to be more shrill if you like*

While C1 describes NGOs as somewhat childish, aggressive, and unprofessional, S1 dismisses NGO knowledge as 'flim flam', producing unsubstantiated, and unscientific data:

Extract 23

(1) *S1: they're not[about practical action in the you know landscape or the farmed*

(2) *S2: [yeah*

(3) *S1: environment and they're definitely not getting to any sort of scale and you know often although they might be well intentioned they're also misguided not underpinned by any* ***actual*** *knowledge or scientific data ↑ ah they're not driven around any sort of measurement and now they're just it's just (.) flim flam and um and that's why you know so many of these biodiversity issues you know are falling apart is that the people that are dominating you know the discussion are the ones that haven't got the ability to take any practical action of any kind whatsoever ↑ and often*

without any knowledge ↑ ***either*** *↓*

(4) *S1: I mean there's no point doing anything this is this is what I'm saying between (1) i: in a way (.) it doesn't matter to us* ***really*** *that somebody wants to go off and you know they're Friends of the Earth and they're the protectors of the bees well (.) in a practical level (-) I don't I don't I've never seen any evidence of them doing anything whereas obviously […] we have we're much maligned as an insecticide producer our relationship is with our customers who are (-) farmers and [AS MUCH AS IT WOULD BE GREAT]*

(5) *S1: you know to be winning a gold medal from the public *laugh* as well ↑ that would be you know and do we aspire to do that it's* ***not*** *going to be you know in the end the public want also they demand quality and safe and very importantly to them >affordable food<*

Clause (5) evokes an image of martyrdom and parenthood and 'tough love', where S1 would rather be a provider of affordable food rather than be 'father of the year' and receive a medal. Bitterness that NGOs such as Friends of the Earth a positively perceived by the public, like a fun uncle, receive adulations while 'not doing anything', whereas company S, like a hard-working parent is the one that 'in the end' knows what the public need and want.

Animal protection is a multi-professional issue: Feger and Mermet (2017: 1513) concede that most accounting for biodiversity research today is based on existing accounting entities either organizational or national but, as the authors suggest, none of which are fit to address conservation issues. This is because the conservation of ecosystems or species depends on more than one organization and so

they state that “even an ambitious and relevant SEA scheme for a company can rarely suffice to inform and organize our collective accountability”. However, as the extract above demonstrate, agrochemicals, while positioning themselves as seekers of ‘open dialogue (9)’, partnership (9), open debate (8), and ‘much maligned as an insecticide producer’, they deny the vital roles played by NGOs.

Finally, NGOs are negatively characterised by the interviewees who position themselves and the companies they represent as peace-loving, dialogic, encouraging debate and open discussions. Through the discourse of science, the participants position themselves as holders of the ‘true’ knowledge, and the only valid form of knowledge: quantitative, scientific and metric.

9.7 Metrics discourse: “we're a metrics based organisation so everything goes through the prism of (.) you know measuring”

Expanding on the metric discourse constructed by S1 of who’s knowledge ‘counts’, another aspect of metric discourse is discursively constructed through another meaning of counting and measuring. However, as Hines (1991) reminds us that focusing on accountability and highlighting that we must be accountable, does not mean that living beings must be made quantifiable.

Extract 24

(1) *S1: cause iiii:: unlike (-) a campaign organisation we're a metrics based organisation so everything goes through the prism of (.) you know measuring*

(2) *S1: how do you have greatest beneficial impact and it might be things that if we looked at it >scientifically< we would think there are things that you can do it a more generalized sense that help (.) >a:ll small*

mammals<

(3) S1: what I'm saying is where we generate [enormous amounts of data]

(4) S2: [simultaneous speech] yeah

(5) S1: we're best able to help it's just[

(6) S2: [we've never done a hedgehog study (.) ever

(7) I: mm

*(8) S2: yeah we've never even looked at hedgehogs in fact you know (.) I've never even had a (?) report written a field study *laughs* so*

(9) S1: because (-) we're a very metrics driven organisation and before we put any statement out to say (.)why something was or wasn't happening we'd look at it in detail

Beck (1992: 62) warns that insisting on the purity of the scientific analysis leads to the pollution and contamination of air, foodstuffs, water, soil, plants, animals and people, results "is a covert coalition between strict scientific practice and the threats to life encouraged or tolerated by it". S1 dismisses the importance of hedgehogs as an indicator species simply because the company has never 'had a report written' (8). The notion of 'greatest beneficial impact' (2) is linked to the business case in which the biggest worth of investment to the largest proportion of 'small mammals' is the aim.

9.8 The business case: "we're giving you a fairly clear steer that in order to do that it has to be linked somehow to core business activity"

In tandem with rendering animals quantifiable and calculable is the notion that if they do not make 'business sense', and are not directly linked to core business strategy, then they do not merit attention and accountability. "Rather than moral or

ethical considerations around biodiversity and biodiversity loss, it is the economic implications of losing (or destroying) ecosystems and ecosystem services and a focus on corporate survival (and profitability) that clearly feature in the emerging corporate discourse" (Tregidga, 2013: 808). The findings support Tregidga's (2013) claim as participants repeatedly anchored their limited interest and investment in species in profitability and agricultural endeavours:

Extract 25

S1: "so we cannot lose pollinators and we cannot lose farmland birds […] because you start to have decreases in agricultural productivity"

Extract 26

(1) S1: uh uh uh of everythings so for us uh viable and uh you know thriving business will absolutely be based on (.) you know having good levels of biodiversity particularly across farmland

(2) S1: of which agriculture rides on the back of so um (1) it's not ***just*** *that we're interested in cerain things I think it might be better to look at it as (.) there are only certain ↑* ***areas*** *↓ where first of all we would even have any expertise and be able to develop any sorts of solu:tions ↑*

(3) I: mmhm

[…]

(4) S1: (1) we're giving you a fairly clear steer that in order to do that it has to be linked somehow to core business activity so

Core business activity is directly linked to deciding on biodiversity disclosures in terms of the materiality this presents to the business, an issue that has been identified in extant literature in various sectors, although the phrase in clasue (1) 'having good levels of biodiversity' is rather vague (Solomon and Maroun, 2012;

Atkins *et al.*, 2018; Mansoor and Maroun, 2016; van Liempd and Busch, 2013). In the agrochemical sector, similarly to that of the mining, and pharmaceuticals, the adoption of the extinction accounting framework is inhibited by materiality, narrowly conceived by the companies. However, as the BD Protocol (Endangered Wildlife Trust, 2020: 27) notes, materiality of hedgehogs to agrochemicals is evident for the following factors: firstly hedgehogs are a bioindicator species. Secondly, impacts on hedghogs are likely to result in a significant (negative) change on the population. Thirdly, hedgehogs are recognised as a priority/threatened species at a national level. It is evident from the extract above that the company is not knowledgable about hedgehogs and is therefore unable at this stage to turn away from considering hedgehogs. Additionally, the rising of double materiality will put further pressure on companies to report on species (Atkins and Macpherson, forthcoming). The next section will examine further constraints described by companies for the implementation of the extinction accounting framework.

9.9 Reasons for not taking up the extinction accounting framework and extinction denial

9.9.1 Extinction as terminology: "I don't believe that we necessarily using the words species extinction"

In order to begin discussing the extinction accounting framework, the interview began with exploring the subject of species extinction and the company's attitude to the ongoing 6th mass extinction. The first dismissal of the extinction accounting framework beings with a rejection of extinction as a common term in public discourse:

Extract 27

(1) I: uh so how how is C's um (1) current attitude to species extinction is it is it currently used is extinction preventions currently used in uh in C ↑ […] mmhm I suppose ap apart from the pollinator issue which is well taken care of um is is there any scope or any advancement that are going to be made to include (-) other species so for example you know I'm interested in hedgehog hedgehogs and hedgehog extinction do you think that there is any scope for extending the pollinator concern to other species ↑ (-)

(2) C1: ↓ absol ↑ utely ↓ um and and indeed the exact um um the exact concept is is very much in our thinking um

(3) I: mmhm

(4) C1: hoping that um by now our uh: our latest thoughts on this will be available um and certainly as they um as soon as they um as soon as they are published I'm very (-) you know I'm very happy to to to share that with you

*(5) C1: um but you know those things will will take time as we uh was we uh uh as we but yeah **absolutely um** there are a number of plans to uh extends that um that that initiaitve % I don't **think%** but I maybe **wrong** in this I don't believe that we um we %**ne:**cessarily% describe as um a: using the word species extinction*

*(6) C1: >I don't think (-) ye::t that it's been um um (-) that it's it's gone into um common parlance cause I I through this I was actually in a meeting with my European colleagues in Prague and I used the word species extinction just to see whether uh people um (2) recognised and of course people >**understand**< what it ↑ **means** ↓*

(7) I: mmhm

*(8) C1: um and ex and understand the um uh if you like the >**prin**::ciple< of it (1) but it i:: it still doesn't make that um something that people would use in um in normal conversation does that make sense ↑ […]*

(9) C1: so one of the things we've been trying to do is start using terminology that most people would recognise

(10) I: mmhm (1)

(11) C1: ok ↑ so for example we've got some interesting concept around zero carbon (-) agriculture

(12) I: yeah

*(13) C1: and zero agriculture people **auto**matically understand what we're talking about we're trying to reduce the um you know to become aa carbon neutral um a (1) way of doing agriculture it's a **remarkably** difficult thing to do but immediately when we say zero carbon agriculture*

people understand what we're talking about

(14) *C1: we're not talking about the um the uh the element carbon we are **of course** talking about CO2 but when we **ask** people they immediately get what %we're talking about % if we talk about species extinction (2) um people a um will understand >s::ort of< that we: (2) uh but (1) in in many **cases** (1) they wouldn't understa:nd that (.) um species extinction wouldn't be the only thing that (.) that we were concerned about*

(15) *I: when you say **people** ↑ what do you mean*

(16) *C1: um uh general public*

(17) *I: yeah*

(18) *C1: media*

(19) *I: mmhm*

(20) *C1: politicians*

(21) *I: yeah*

(22) *C1: stakeholders more generally*

(23) *I: yeah*

(24) *C1: and we would be able to have that conversation %with them% but the concept of species extinction as a **thing** to put in our **accounting** system would be a bit weird at this precise moment in time*

(25) *C1: we are um a as I said we are **just** in the process of trying to um (1) work out how(.) we (.) would (-) try and incorporate that our ↑ **problem** ↓ (1) is how do you measure it*

(26) *I: mmhm *inhales**

(27) *C1: and again my best example on it and I'm I apologise if I keep coming back to that but the cl climate change one (.) um we made some committments at the beginning (.) um that we would reduce our carbon emissions by x y and z but we also put a lot of money into **research** into how to reduce carbon emissions from everybody else as well and we found a way for example of incorporating **CO2** from the **air** yeah*

The extract introduces the concept of species extinction deemed problematic, according to participant C1, and inaccessible to the general public (18), the media (20), politicians (22), and other stakeholders (24). It may be that participant C1

believes *zero carbon agriculture* (15) is better understood because under UK law, carbon emission disclosures are statutory, effectively forcing corporations operating in the UK to 'carbonspeak', whereas biodiversity-related disclosures are voluntary. However, the participant also supplants glimmers of other issues that become more pronounced in later interactions. For example, in clause (26), participant C1 prepares the ground for rejecting the adoption of the extinction accounting framework because it 'would be a bit weird'. However, the introduction of double materiality may apply pressure on companies to disclose on biodiversity. Additionally, clause (27) suggests that the 6th mass extinction is a phenomenon that is difficult to measure, and therefore, could be doubted. Extinction denial will be discussed in the following section.

9.9.2 Extinction Denial: Biodiversity, extinction and species decline

The second repudiation of the extinction accounting framework can be seen in the denial that the 6th mass extinction is underway. Participants presented several occurrences in which the 6th mass extinction and biodiversity decline, insect decline and hedgehog extinction were doubted. For example, S1 questions when would be the appropriate year to begin marking the decline of biodiversity, and overlaps the interviewer dismissively in turn 3:

Extract 28

> *(1) S1: do we take nineteen eighty five or nineteen sixty one nineteen thirty seven↑ what measurement are we taking for biodiversity in fields*
>
> *(2) I: that's why I think looking at one endangered species as a starting point=*
>
> *(3) S1: =or do we take two thousand and three ↑ I %don't know%*

Another instance of denial relates to the absence of scientific tools with which to measure the decline at present:

Extract 29

(1) *C6: we have also discussion on biodiversity on on um science production sites where you have some area which not used or which is um had natural and you have also special yeah we have also um many many rabbits and so on um but the question is is that biodiversity on that what are the species on that so how to be sure and I'm a chemist so I'm not so much um of knowledge on that area but um I'm pretty sure that we are only at the beginning to have the right (.) measures ↑ to get a real scientific information on biodiversity and um (.) that is a problem at present for C because many people talk about biodiversity*

(2) *I: mmhm*

(3) *C6: um (.) the scientific measures to measure (.) um biodiversity is is not available at present so that that the pity on that*

[…]
(4) *I: what about the IPBES report (1) have you seen it ↓*

(5) *C6: what is that*

Interestingly, in turn 4, the interviewer asks C6, head of environment and sustainability at C, whether they have read the recent IPBES report (IPBES, 2019), an influential report that can be expected to be read by someone in C6's role. However, in turn 5 C6 relays they are unaware of it. As Wagner et al. (2021: 7) note, "Even without much-needed monitoring and demographic data, enough is already known, based on first principles and records for amphibians, birds, flowering plants, mammals, reptiles,

insects, and other taxa, to understand that a biodiversity crisis is accelerating".

9.9.2.1 Indicator species

An important term that gets conflated by the agrochemicals interviewed is 'indicator species'. For the companies indicator species denote the species that are chosen to be tested on, while in ecology, indicator species are species that indicate the health and state of the natural environment.

Extract 30

*(1) S1: I don't think we would **ever** look at it from the individual indicator species do you S2 ↑*

*(2) I: ok so apart from *exhales* […] does S report on any kind of extinction uh prevention species apart from %pollinators% (4)*

(3) S2: %I wouldn't have thought so% (very quiet, almost inaudible) (4)

Extinction denial occurs as a factor for not adopting the extinction accounting framework, but also when presenting hedgehogs, specifically, as an indicator species to the companies as demonstrated in the next section.

9.9.3 Hedgehogs and the extinction accounting framework

Could hedgehogs be a gateway into companies considering adopting the extinction accounting framework?

Hedgehogs are a contextualisation cue (Auer, 1992) (or keying, in Goffman's 1974 terms) that triggers a frame switch, providing a pleasant and relaxing cognitive image. After presenting the extinction accounting framework and the hedgehog account mockup to participants S1 and S2 move from the corporate frame in clause (1) into a personal, private frame (2-10) that is characterised by laughter (3), and positive emotions (5, 6).

Extract 31

(1) S1: why would we pick hedgehogs

(2) S1: not that I have anything against hedgehogs

*(3) S2: *laughs**

(4) I: yeah I know

*(5) S2: *cute**

*(6) S1: *they're lovely* they're not there's a wonderful tele television programme on them*

(7) S2: yeah

(8) I: yeah Channel 5 yeah

(9) S1: you know ↑ (.) called Saving Britiain's [hedgehogs

(10) S2: [hedgehogs

(11) S1: =so how do we know how many there are or not (-) whe:::re (-) you know there are:: lots of problems um a::n:d (-) i:: is definitely something where (1) intermittently we've taken (-) a pretty close look ↑

(12) S2: mm

(13) I: mhm

(14) S1: at some of the interactions that are happening in the environment ↑ so where you have in you know and again nothing against hedgehogs um (-) u::: i:::t's more about you know where there would be a (.) well a knowledge base

Introducing hedgehogs has allowed the participants to shift frame from a serious attitude to a joke. Clause (11) exemplifies extinction denial where participant S1 switches back into the corporate frame and suggests that there is no way of estimating exact numbers due to a lack of knowledge base. However, although hedgehog decline in the UK has been ongoing for some time, knowledge that is not produced by company S does not 'count'. Hedgehogs work as a contextualisation cue that turn the frame from 'serious' to a joking frame. The interviewees construct a hidden reality, and do not realise they are part of the problem.

9.9.4 Prickly feelings: "cute they're lovely"

While participant D1 from company D, acknowledges the importance of species protection and the colossal disaster of the 6th mass extinction, participants S1 and S2 dismiss hedgehogs for not being 'applicable' globally as a species. However, hedgehogs are present globally (see image 6), and it is only due to a lack of data that we are only aware of a severe decline in hedgehogs in the UK and Europe.

Extract 32

(1) S1: "not that I've got anything against hedgehogs"

(2) S2: cute

(3) S1: they're lovely

(4) S1: but they're hindered to some extent by the fact that they operate in a glo:bal structure

When the topic of hedgehogs is introduced in the interaction, it evokes a frame shift, from the corporate to the personal. For example, participant C1 moves from discussing why hedgehogs would not be adopted by the corporation as a species to examine under the extinction accounting framework and segues into a private frame in which they describe the hedgehogs in their garden, characterising the experience as nice:

Extract 33

(1) C1: as I said nobody in their right mind would not want to see uh more hedgehogs in my country um I particularly love hedgehogs and do my best for them

(2) C1: I'm I'm very lucky where I live in fact I have a resident hedgehog in my garden

*(3) I: ohhh really ↑ *high pitch* (1)*

(4) C1: must put pictures

(5) I: yeah

(6) C1: we don't see him or her or them um so often but um they raised a family uh: (1) last yeah it was last year I think they struggled or the year before they struggled a bit but last year they they raised certainly one litter that we're ↑ aware of ↑ so that was nice ↑

Extract 34

(1) S3: =I had a hedgehog in the garden the other night and it's so sad when you see them squashed on the road cause there are (-) we have a few round here

(2) I: uh huh

*(3) S3: when you see that they've been *inhales* hit by cars […] quite sad we don't have that many (hedgehogs)".*

In a way then, it could be said that hedgehogs, when introduced in the interaction provide an emotional and mental relief. Hedgehogs inspire cognitively a change in frame from a dry, constricted business-speak into a frame that can be characterised as calm, pleasant, personal and whimsical. Building on frame analysis, this section revealed that hedgehogs are used as contextualisation cues, or as an 'excuse' for the participants to segue into a jokey frame from what is a very serious, existential matter of extinction, the irreversible loss of lives, which may provide one possible explanation to the need for an emotional relief.

Image 6: International hedgehogs (BHPS, 2021)

9.9.4.1 Hedgehogs are greenwash

Both corporations rejected adopting hedgehogs as a bioindicator species due to the potential of the endeavour being seen as greenwash:

Extract 35

> *(1) S1 not just an **issue** it is the central dri:ver of a lot of agricultural particularly the horticultural productionso you you know the important in the context of moving a project that was based in and built around a reputational position*
>
> *(2) I: mmhm (2)*
>
> *(3) S1: to be if it were to be to demarcated it with an annual report it would have to be something that was a globally referenceable =*
>
> *(4) S2: it's not something that we have the right skills or expertise it's not a market we're actually working in ↑ so*

Extract 36

> *(1) C1: [..] I suspect that this isn't going to be the thing that Company C is gonna pin it's um biodiversity banner*
>
> *(2) I: mm what about the (.) uh the reputational aspect (-) so I mean it's not a secret that Company C has been bombarded with litigation and uh terrible burden of litigation and isn't trying to: to take on an initiative that (.) like this would be useful for that (1)*
>
> *(3) C1: or would it uh and I'm asking you a question*
>
> *(4) I: mm*
>
> *(5) C1: or would it be seen as greenwash*

Similarly to C1, participant S2 of agrochemical S expresses concern regarding the credibility of the company engaging with a species that they deem has no direct link to their operations:

Extract 37

> *S2: and you know most people who want to who were interested and and understanding view it as a positive thing but NGOs don't give us credibility for it very few of them do they say it's greenwash now if we can take something like pollinators which is a direct which we've got a **real** direct link*

*we've got expertise and we've done loads and loads of work implement programmes and they call it greenwash what are they gonna call a programme about hedgehogs what's hedgehogs got to do with S you know this is this there's going to be a big credibility issues that if it's that I think we've we've got *real potential to be a* greenwash seen as a greenwash thing or jumped on the band what's what's what's hedgehogs why why is S worried about hedgehogs*

This is an interesting example where participants S1 and S2 use impression management as a reason not to report on species. Another factor for not taking up the extinction accounting framework and including endangered species in disclosures is the reputational risk:

Extract 38

(1) I : […] so it's very similar with your ↑ palm oil you could do it with Orang-utans

(2) D1: mmhm

(3) I: um as well I was very surprised not to see that in the report

(4) D1: yea:h we do um (-) offset so we bu:y: offsets for our beauty business and personal one of our businesses which is um basically sort of three of our(.) manufacturing sites are carbon neutral

*(5) D1: [we do have a re::ally] cute picture of a baby orangutang in one of the report %I'm not sure why it didn't get in% (2) I think it was a bit <u>controversial</u> at the time you know because of the (.) I think it bourne what the bourne Orang Utangs they just literally been in the news that week about they're declining rapidly and things and I think *inhales* I think there was almost a feeling that we didn't want to highlight the fact that (2)*

(6) D1 : yeah yeah um (.) but yes you're right we should be making more of I suppose the species yeah (2) it's something that we're looking you know offsetting is something that is a bit %controversial subject%

Since adjuvants in company D are sourced from palm oil, it was surprising not to find any disclosures pertaining to orangutangs. As participant D1 relates, the decision not to include any information is that the topic was ‘a bit controversial’, and the company did not wish ‘to highlight the fact’. Company D is not a public facing

company and as a consequence is shielded from NGO and public pressures. Turn 6 is an important moment in which D1 signals a potential for changing attitudes.

9.9.5 I suspect at the both ends of the spectrum we're not massive contributors to that problem

Another obstacle for the adoption of the extinction accounting framework as discussed at the outset is the fact that in order to do so, agrochemicals would need to acknowledge the risk their products pose to hedgehogs, and biodiversity at large. However, participants have repeatedly as revealed throughout this chapter, deliberately omitted any such implication. Moreover, the participants emphasise that regulations are of the utmost severity, which exemplifies the safety of the products, and therefore, no need for biodiversity disclosures.

Extract 39

> *S1: the responsibility is the regulators' they have very stringent requirements so there's no need to worry about any species we don't need to put it under reporting*

Extract 40

> *C1: I suspect at the both ends of the spectrum we're not massive contributors to that problem but nevertheless we can be involved in a solution with* ***hedgehogs*** *we we still don't* ***know*** *why hedgehogs are um are disappearing in such large numbers we have some* ***ideas*** *don't we do we really* ***know*** *has there been much research on this* ↑

Finally, this section has brought us back to the start of our inquiry, revealing the thread of constraints for the agrochemicals in their decision not to implement the extinction accounting framework and acknowledging the risk their products pose to hedgehogs. Firstly, S1 in extract 41 notes that the risk assessment stipulated by regulators covers all eventualities and risks and therefore the products do not pose a risk. S1 positions company S as responsible and accountable, compliant with regulators. C1 in extract 42 dismisses pesticides as having a significant impact on

hedgehogs. Nevertheless, C1 expresses interest in helping solve the problem, thus appealing to the discourse of partnership and dialogue discussed in section 9.6.

9.10 Conclusion

This chapter analysed the discursive construction of accountability and transparency of three agrochemical corporations. The most notable finding concerns the adoption and implementation of the extinction accounting framework. All three companies rejected the need to report on species for a myriad of reasons. Primarily, materiality and the business case posed a concern that adopting hedgehogs as a species would be viewed as greenwash. The 6th mass extinction is a phenomenon that is denied by participants in the interaction, and the term itself is considered incommunicable to any audiences as of yet, according to one participant. The interviewees are either choosing to stay in Plato's Cave (Atkins *et al.*, 2020) or are simply choosing to ignore the crisis of the 6th mass extinction.

Challenges for not taking up the extinction accounting framework and extinction denial as summarised in the following chart:

	Extinction denial	**Biodiversity decline denial**	**Denial of risk presented by company products**	**Cooperation and stakeholder engagement**	**Policy and legislation of extinction disclosures: materiality and the business case**
Agrochemical corporations	Rejection extinction as a term	Denying the ability to quantify species loss	Deny link between pesticides and species extinction.	Dismiss NGOs as partners; dismissal of NGO knowledge as legitimate	Policy promotes prophylactic use of pesticides. Species-related reports are not statutory.

					Companies do not view hedgehog extinction or protection as part of their business case.
Hedgehog and Wildlife NGOs	Hedgehog extinction denial similarly to companies on the grounds that there is no clear metric evidence	Acknowledge that there is a species decline	Partially acknowledge the link between molluscicides, rodenticides and hedgehog extinction	Dismiss hedgehog rescuers' knowledge as legitimate; dismiss agrochemical corporations as holders of legitimate knowledge	Policy and authority regulation of pesticides are inadequate for protecting wildlife, the natural environment and human health.
Farmers	Believe hedgehog extinction is due to badgers	Denying the ability to quantify species los	deny the connection between pesticides and hedgehog extinction	Funded by agrochemical companies, cooperate with like-minded NGOs such as the the Countryside Alliance.	As long as the instructions on how to use and apply pesticides, there is no risk
local authority	Use the term extinction and do not deny hedgehog extinction	fully support species decline and biodiversity loss	No accountability for amounts of pesticides used on amenities	openly exhibit support for hedgehog rescuers.	no statutory requirement to report on hedgehogs, BAP is voluntary
Hedgehog rescuers	Vehemently urge that hedgehog extinction be acknowledged	no doubt that biodiversity loss is happening	Hold agrochemical corporations as holding a major role in hedgehog extinction	View HPBS as de-legitimated; do not liaise with corporations	care for hedgehogs out of their pocket and on their private time. Some hedgehog rescuers have

					poor accountability and transparency.

However, hedgehogs do seem to provide a respite, a positive contextualisation cue for moving between a 'serious' corporate frame, into a lighter, more emotional and friendly frame, which suggests that participants do not always toe the corporate line. Additionally, the chapter demonstrated in section 9.5 that the corporate frame clashes at times with participants' private frame, where, in fleeting moments, discourse of care for species and the environment prevail.

A further challenge for agrochemicals to advance any protection to hedgehogs and biodiversity at large is hampered by their unilateral dismissal of NGO knowledge, collaboration and a negative evaluation of their practices and perceived negative attitude towards the companies. Importantly, "ecological system conservation issues are generally characterised by the interplay of multiple managers and stakeholders who, intentionally or not, have positive or negative effects on the natural environment and act in a fragmented, divisive, competitive and often adversarial way. "The absence of an organizational 'centre' requires that we focus on the very serious agency problems that underlie most ecological issues – who has the capacity to act, with whom and in what form of coordination […] and what activities does that entail?" (Feger and Mermet, 2017: 1514-15) Hedgehog extinction, although importantly arising from pesticides and indirect poisoning, is an arena of many players. To protect hedgehogs effectively, collaboration is needed, and agrochemicals alone will not be able to do so.

Chapter 10: Co-construction of hedgehog reality in interaction: Spoken discourse analysis of stakeholders in the hedgehog protection arena

10.1 Introduction

Social movements and NGOs seek to make visible environmental destruction and provide 'other' knowledge (Berger and Luckmann, 1966) to the dominant knowledge presented by powerful corporations (Dey *et al.*, 2012). While it had been demonstrated in previous empirical chapters that companies do not favourably view

environmental and animal NGOs, it is important to explore whether these NGOs would make feasible partners in an imaginary, utopian scenario of collaboration, as well as whether the extinction accounting framework could be adopted by the various actors of the hedgehog protection arena.

This chapter explores the competing discourses in hedgehog conservation. The stakeholders involved in the hedgehog protection are varied: large UK wildlife and hedgehog NGOs, farmers, public sector and local government ecologists, academics working with pesticides and toxicology, and local government councillors. Importantly, the chapter examines the discourses in and around hedgehog rescuers, de-legitimised and marginalised activists and rehabilitators. The chapter analyses the attitudinal linguistic markers used by stakeholders to talk about hedgehog rescuers and their accountability.

The chapter begins with an analysis of the discourse used by NGOs to talk about hedgehog extinction, and the use of extinction denial, which has been discussed in chapter 9 as prevalent amongst companies. Nevertheless, hedgehogs are positively described, and the way in which hedgehogs are constructed is explored in section 10.3 where participants discuss their value. As a natural progression the chapter then explores the emotive language expressed by interviewees regarding hedgehogs. Although hedgehogs face many perils, pesticides are the ones that were focused on in this project and so the following section explores the attitudes of NGOs and hedgehog rescuers towards the role pesticides have in relation to hedgehog extinction. This is particularly important, as many NGOs do not campaign against amenity and agricultural use of pesticides, apart from slug pellets. The chapter then investigates hedgehog NGO accountability and attitudes to hedgehog rescuers and their marginality. Following is a section detailing and analysing the

discourse of accountability of other NGOs, the public sector both governmental and local accountability. The section concludes with NGOs' critique of corporate accountability and paints, in broad brush, their external accounts. The chapter concludes with an analysis of the discourse of legitimacy and knowledge construction of NGOs that contributes to the exclusion of hedgehog rescuers from the hedgehog protection arena.

10.2 Hedgehog decline vs. extinction frame: "to talk about extinction is quite alarmist"

One of the most surprising discourse that occurred in the interaction relates to the framing of hedgehogs survival.

Extract 1

> *(1) I: um (.) how how does NGO2 conceive of this situation would you characterise it as a as an extinction ↑ or an imminent threat ↑or:=*
>
> *(2) NGO2: =definitely an imminent threat I mean=*
>
> *(3) I: =yeah=*
>
> *(4) NGO2: =obviously in a literal sense if it carried on that trajectory they would go so yes it is an extinction threat but we wouldn't (.) portray it as that not least because it would take an incredibly long time for that to happen it would would break down and break down and become less and less sustainable and isolated populations so to talk about extinction is quite alarmist we're a science-based organisation we try not to overdo it having said that we have internal tussles like many NGOs about how (.) strident you are when you are %fundraising% […] we will talk about an alarming decline or even a catastrophic decline quite happily because it* ***is*** *um and it's extremely worrying and we use analogies that pack I hope powerful declining at the same rate as the tiger for example which they are technically so we can say that and everybody recognises tigers as having being on the edge or still on the edge so that can be quite effective and gets people's emotions running but to go out saying that they're going to be extinct in 10 years[…]*

In the extract, NGO2, a leading wildlife UK conservationist organisation positions itself as a 'science-based organisation' (4) that while recognising the decline of hedgehogs as an 'imminent threat' (2) is constrained by the need to appear

scientific. In other words, it could be argued that NGO2, by positioning the organisation as science-based, acquires legitimacy, or is perceived as legitimate. This is strengthened by the utterance 'internal tussles' (4), suggesting the lexical choice of 'extinction threat', 'alarming decline', or 'catastrophic decline' are a matter of legitimacy considerations and perception of the organisation rather than a 'scientific' or ecological basis. Indeed, this point is strengthened in the following extract, from NGO3, a leading organisation for heritage and conservation in the UK, who uses extinction in connection with hedgehogs:

Extract 2

> *NGO3: […] I think the only thing that's really gonna stop hedgehog extinction […] I think it needs to be a two pronged effect actually the general public needs to be aware and needs to be empowered to actually care about it*

Importantly, the language chosen by NGOs affects the way in which the public engages with hedgehog protection and the way in which possible solutions (or none) are imagined:

Extract 3

> *NGO4 "because the decline is so severe I think people struggle to think about how we're going to reverse it"*

In other words, extract 3 is instrumental in highlighting the need to use extinction, and not hide it because people may be subdued into inaction: on the contrary, it may compel the public to act in uproar, as local council ecologist E4 puts it: "we're in the middle of the anthropocentric extinction public awareness they should be running around screaming" (see section 10.4).

10.2.1 Extinction denial

In extract 4, a farmer, working with Syngenta and Bayer, echoes the discourse found to be used by companies in chapter 9 that constructs extinction as inaccurate, impossible to quantify and 'prove' and thus, questionable:

Extract 4

> *(1) E4: no no counting was ever done then*
>
> *(2) I: mmhm*
>
> *(3) E4: it's just that now all our comparisons of bird numbers are compared to the 1960s when they first started counting them*

Extract 5

> *NGO1: um eh in 2015 uh Michaela Strachan presenter of Springwatch and other programmes wrote a piece in the Radiotimes which stated that hedgehogs will become extinct in 10 years' time and I presumed that that wa::s a reference to piecemeal extinction localised extinction but she actually made drew a graph straight line hits zero in 10 years' time bullshit this is not ecologically correct*
>
> *I: mm*
>
> *NGO1: […] if you use the word extinction what you're doing is well you're saying well there are no more that is what it means um and so I would always be very careful using the word extinction because in ten years' time there will still be hedgehogs […] you undermind your capacity to present a good and truthful account of how things are so it's important I feel to maintain that level of um rigour*.

However, at the same time, NGO1 declares a dramatic figure:

> *NGO1: I don't think it's* ***unreasonable*** *to say we've had a 90-95% decline since the end of the second World War*

While hedgehog rescuer R1 expresses an existential crisis in the face of the colossal hedgehog decline:

Extract 6

> *my heart is breaking […]it's very hard to stay alive isn't it knowing what human beings […]*

This section demonstrates the confusion and lack of uniformity of NGOs in discursively constructing the loss of life. However, to hedgehog rescuers, the situation is clear. Hedgehogs are undergoing extinction, by humans: "it's got to come from you if you find yourself growing up in a world where you can't even find evidence of the creatures we're wiping out" (R1).

10.3 Value of hedgehogs: "a weird and magical thing"

Despite NGOs' uniformed front on hedgehog's crisis, hedgehogs are discursively constructed as "a weird magical thing" (NGO3), an animal that is 'more' than other animals, and a creature that is integral to childhood memories.

Extract 7

> *NGO2: hedgehogs lend themselves to doing something more than many other animals.*

Hedgehog's value is reported to be linked to childhood moments and opportunities of connecting with nature:

Extract 8

> *NGO3: I think it was more about childhood memories ↑ a lot of people (1) you know sort of reminisced about feeding hedgehogs and seeing hedgehogs in the garden and stuff ↑ […] a lot of people saw it as a way of like engaging their kids so we did like family events and people talked about how they loved putting out a dish of milk [..]*

To NGO3, hedgehogs represent a way for people to connect with nature, care for them and enjoy living alongside them. Even more so, to hedgehog rescuers, hedgehogs are family, sentient with feelings and uniqueness:

Extract 9

R2: they are like family to me […] they are my babies […] y:es I do you know they're one of the iconic British species a:nd (2) a lot of people just see the them as vermin or not important or just think of oh we'll just get rid of slugs and snails in the garden and that's the whole purpose of them but every single hedgehog I've had had a different personality and you know (1) some I'll never forget cause they're such cute characters but I think they need to be regarded more as cats and dogs are they do actually have feelings

10.4 Emotive language

Council ecologist E2 discusses the reasons for the vigorous use of pesticides in amenity areas in a city in the north of the UK.

Extract 10

E2: […] in terms of the priorities its public health and safety that beats all protected species legislation everything you know and then it's protected species it's always public health and safety first

I: and from your personal perspective is it difficult for you cause I imagine that the biodiversity is higher priority for you than people would you say ↑

*E2: I personally yeah I'd rather get rid of the public *laughs* just get rid of them all *laughs**

I: so you would you say it's quite challenging=

E2: =absolutely […] now if we identify as a habitat and we keep mowing then we're not doing our duty which is to conserve it um so you know our argument is this is a priority habitat that's why we're leaving it long um but you know again you've got this wildlife corridor going but you're continuously up against people it looks messy when is it getting cut but it's what you're up against you're trying to do it for wildlife people don't give a monkeys about wildlife they're unaware we're in the middle of the anthropocentric extinction public awareness they should be running around screaming you know but it's alright weather looks ok today nothing's changed

In this poignant extract E2 relates the emotional difficulty, as well as a pragmatic difficulty, to account for biodiversity loss in the public sector. Importantly, participant E2 alludes to the invisibility of extinction, where the disappearance of hedgehogs as well as climate change is unnoticed. E2 evokes a discourse of unawareness, coupled with lack of care. The lack of care is evident in the application of pesticide.

Extract 11

> *R1: but obviously with poisons I picked one up on Saturday night and all I could do for her was bring her home put her in an incubator to die she was completely emaciated she was in agony she was hypersalivating and her breath smelled of formaldehyde um so I DON'T KNOW WHAT particularly she had consumed but I do know it was an AGONIZING death um and it and she'd beed dying for quite a long time I'm sure because she was very emaciated and it is definitely a poison %definitely a poison% (2) so I'm afraid I haven't got your expertise on the range of nasty chemicals they are using *laughs* I can't tell you much about=*

Participant R1, a hedgehog rescuer uses the personal pronouns ‘her’, ‘she’, to talk about a hedgehog that was in distress. R1 painfully describes the tortured death from poison and the suffering the hedgehog was going though. The pain the participant felt can be acknowledged, through the rise in volume (letters in caps). Additionally, it can be seen through the vocabulary domain that hedgehog rescuers’ knowledge is scientific, for example the lexis from the above extract is from the domain of medicine ‘hypersalivating’, ‘formaldehyde’, ‘emaciated’, ‘incubator’. However, sadly, R1 does not feel they have legitimate expertise when they note that “I’m afraid I haven’t got your expertise on the range of nasty chemicals...”. The

legitimacy of hedgehog rescuers and their perception by other wildlife and hedgehog NGOs will be discussed in further detail in sections 10.6 and 10.7.1.

The intimate and familial emotional relationship forged by hedgehog rescuers towards their hedgehogs can be seen through the naming and description of hedgehogs in care in R2's hedgehog rescue:

Extract 12

> *R2:[…]the one I've got in the garden at the minute who I've just introduced is called Marla and she came to me over a year ago and she had a really really bad breathing and she had been kept at a vets for three days without receiving proper treatment then she came to me and she had treatment for lungworm roundworm um and she also had pneumonia and needed nebulisers but her breathing has never recovered it has scarred her lungs ↑ so she sounds like mini steam train ↑ so *raspy breathing* she can't be released cause she's in danger if she from predators and the other one is called Tookame and she came to me last year in July as a tiny little hoglet […]*

The safety and concern for hedgehogs spans various aspects of hedgehog conservation, such as dog attacks following a recent BHPS campaign, whether hedgehogs should be kept in secured gardens, and whether efforts to tackle hedgehog decline in rural areas are worthwhile or should urban populations be the focus of campaigns. It is important to note that pesticide effects on hedgehog populations in rural and arable settings, apart from rodenticides (Dowding *et al.,* 2010), are not discussed by NGOs interviewed here, but are often evoked by hedgehog rescuers.

The danger of accepting and supporting hedgehogs as urban dwellers means that they will become liminal animals, animals that live amongst us, even in the heart of the city such a squirrels, rats, mice etc. They are non-domesticated species who have adapted to life amongst humans, they are liminal, neither completely wild

animals, nor domesticated. “The invisibility of liminal animals does not just lead to indifference or neglect. Much worse, it often leads to a de-legitimization of their very presence” (Donaldson and Kymlicka, 2011: 211). While hedgehogs now enjoy a positive status in the general public eye, that sentiment can quickly change to one in which they are viewed as pests, much like rats or when conflict with people arises. Since they do not belong in our space, “we feel entitled to eliminate these so-called pests in the animal equivalent of ethnic cleansing”.

However, the recent IPBES (2020: 20) report highlights the risks involved in living in close proximity to wildlife: “In northern latitudes vertebrate reservoirs in city parks and gardens such as hedgehogs, rats and squirrels usually live in high densities in close proximity to people and present known zoonotic disease or other health risks”.

Extract 13

> *NGO4: and (.) I: have done some I mean I work with one farmer to do some hedge laying um on his land ↓ oh a couple actually yeah generally I try to (.) so in our hedgehog projects we focus on X and Y which are urban and rural respectively and make sure we do both I know there are some hedgehog people out there who say we should just give up on the rural situation entirely and it's some very well respected who say it's just a lost cause we need to focus our efforts on urban (.) hegdehogs*

“Environmental groups relieved themselves of the responsibility of protecting non-pristine areas and of critiquing the practices of industrialism that de-graded the general environment. In exchange for pockets of wilderness, environmental groups ignored industrialism's progressive plundering of the planet. The conceptual blinder of nature as pristine wilderness prevented these groups from focusing on pollution as a major environmental issue” (DeLuca and Demo, 2000: 257). Indeed, NGOs

interviewed focus on urban hedgehogs and overlook the need for research that tackles the underlying cause for hedgehogs' migration to urban settings.

10.5 Attitude to pesticides: "pesticide treadmill"

While several NGOs express concern regarding pesticides, these are not related specifically to hedgehogs and the detrimental effect these have on populations and individuals.

Extract 14

> *NGO5: pesticide treadmill […] it's hard to break out of and […] we keep seeing the same pattern […] companies KNOWING the same thing happened with tobacco […] that's a really interesting parallel*

Rodenticides have been almost exclusively identified as a poison that makes its way up the food chain, and evidence of hedgehogs poisoned with rodenticides has been established (Dowding *et al.*, 2010).

Extract 15

> *NGO4: personally I am quite concerned about our use of rodenticides and their potential links with hedgehog decline*

Other pesticides, such as neonicotinoid insecticides, are marginally worrisome to NGO4, but does not seem to be researched further nor does it become focal to future campaigns:

Extract 16

> *NGO4: I mean neonicotinoids go into the soil and then for crops grow from the soil and then things like caterpillars will eat the crops […] and then hedgehogs will go and eat the caterpillars so you know like you say it's a problem that you think we would have learnt from DDT and other compounds*

Molluscicides, carried in slug pellets are another group of pesticides participants have expressed concern over, but this concern is restricted to council ecologists and

hedgehog rescuers:

Extract 17

> *E2: no no no they've co existed with badgers for millennia so it's clearly not the badgers um but my main suspicious is slug pellets slug pellets […] (-) it's going to get into their digestive system and build up in the same way you know (.) mercury builds up in fish populations you know what I mean accumulative I have no scientific literature to back that up that's just my instinct but you know it seems that's the way the chemicals are designed to work why (.) shouldn't work up the trophic levels I was going to say I think it's interesting with the slug pellet angle is the fact that various organisation and uh:: (1) people and institute have been banging on about not using slug pellets but I would say a good forty years now ever since I was a teenager they should be banned I don't understand it you've got the option of nematodes now you have a a guaranteed way of treating them maybe slightly more expensive I believe the cost will come down over time but nematodes are effective they work I use them every year on my garden*
>
> *R1: and sometimes there are little slug pellets in it um it's another thing that leads to hypersalivation and a very very painful death so I think the anecdotal if you talk to rescues (.) evidence it seems to contradict the official evidence*

Timidly, participant R1, although hedging the statement with 'I think', notes that hedgehog rescues encounter slug pellet poisoning more often than what R1 refers to as 'official evidence', referring to 'scientific knowledge' disseminated by hedgehog NGOs such as the BHPS. However, as noted at the outset of this section, there is no extant research to suggest slug pellets do not cause hedgehog poisoning. In fact, peak concentrations of metaldehyde often exceed the European Union regulatory for any pesticide (Castle *et al.*, 2017).

NGOs concede that pesticides contribute to hedgehog decline by eliminating hedgehogs' main food sources, invertebrates:

Extract 18

> *NGO5: so I think in a similar vein you can think about what the impacts are on major prey species and and abundance and think about you know (1) obviously it's hard to tie that together causally but you know in terms of general population declines and impacts hedgehog population through their prey abundance so I think that that is most likely*

> *NGO2: there is very clear evidence about hedgehogs getting sick directly from the actual pesticide it's more the fact that the pesticides are taking out things that they eat so of course they might eat something that was poisoned with it and depending on how* ***much*** *the thing they've eaten has itself consumed they might take a dose that might affect them that's plausible but the main issue seems to be thought to be at the moment the fact that it's just (.) wiping out the invertebrate population and that some of the behaviour of hedgehogs in the rural landscape where they stick to the edges and won't go into the middle of the arable field is because there's nothing to eat there it's it's quite simple you know that's the reason um and it's also potentially the reason for (1) conflict with badgers because they both eat the same things and if the badgers are hungry they're more likely to attack hedgehogs than they would otherwise because there's no way a badger's going to go for a hedgehog other than the last resort because they're not exactly easy to tackle*

However, the only evidence of poisoning that is reported is from hedgehog rescuers, who make the connection between species decline, anecdotally:

Extract 19

> *R1: not only does it get into the invertebrates obviously but it gets into the water system […] I think the correlation between the decline in the thrush population and the hedgehog population given that they eat very *similar things* (laughs)*

> *R2: um last year around this time of year beginning of May I had probably*

four or five suspected poisonings

This section demonstrates a discrepancy between experience of hedgehog rescuers at grassroots level and top-down knowledge disseminated from hedgehog and wildlife NGOs. Hedgehog rescuers interviewed employ linguistic structures such as hedging, referring to their own experience as 'anecdotal', and describing NGO opinion as 'official'. Hedgehog rescuers position themselves as illegitimate, and with knowledge that is not taken seriously, and does not 'count' as much. Thus, the issue of hedgehog rescuers' legitimacy will be discussed next.

10.6 Legitimacy and accountability of hedgehog NGOs "making sure hedgehog carers are aren't idiots"

Hedgehog NGOs face challenges in reaching a united front in working together to protect hedgehogs.

Extract 20

> *NGO1: so the challenges of the BHPS I think are going to be working with two populations the hedgehog carers and wide population and to meet the needs of the hedgehog carers whist at the same time making sure hedgehog carers are are aren't idiots and to not disenfranchise some of the that would be a very big challenge for them um it's always a challenge working with an organisation another organisation which has a slightly different perspective on everything but so far the conservation work with the People's Trust and the sort of more welfare based work with the Hedgehog Society seems to be managing to work ok*

This is highlighted further in the following extract in which NGO1 discredits a leading wildlife hospital and a central locus for hedgehog rescuers that also provides training courses for hedgehog rescuers.

Extract 21

NGO1: say for example mealworms is a really interesting one we've got Caroline Gould at Vale spread the word to everybody that if a hedgehog sees a mealworm it will drop down dead I exaggerate slightly um (2) and (-) there's is some evidence from other species that a diet high in mealworms can lead to metabolic bone disease and uh differential uptake of of of phosphorus over calcium leads to bone density loss

While NGOs do not see eye to eye, the most discredited stakeholders in the hedgehog protection arena are the hedgehog rescuers.

Extract 22

R6: as rescues if I use the word (2) um (2) %not legitimate rescues% but (-) reputable rescues if I use that word then so rescues that follow strict guidelines similar some of the guidelines from the RSPCA and the BHPS so hedgehogs for example that don't take them to events we won't do that we release where they were found we keep strict records you know and follow what we class to be the guidelines that should be set out but so if you've got those reputable rescues then there should be some the HBPS is working with them to say ok how many hedgehogs do you get in what are you doing ^ how are you doing it ^ how are you dealing with it um the same way we need the guidelines to be set in stone that says right if you are a rescue you follow these protocols you give this medication you don't take them to events you don't um (1) release them when they're blind and I don't think we're ever going to get it to be honest

Hedgehog rescuer R6 describes the need for a set of guidelines and clear protocols for hedgehog rescuers. R6 notes that there needs to be a governing body that would enforce and regulate this, such as the BHPS or the RSPCA. However, R6 notes that they do not believe this will be achieved. Some of the reasons for this will be explored in the next section.

10.6.1 Hedgehog rescuers: “Rehabilitators!” or Save the fluffy thing people?

The role hedgehog rescuers play in caring for injured and sick hedgehogs is largely unwelcomed, unappreciated, and de-legitimised by many actors in the hedgehog protection arena. For example, participant E2, an ecologist in the environmental department of a council in the north of the UK expresses the fruitlessness of their work:

Extract 23

> *E2: =for me it's the save the fluffy thing people they have no place or role in the kind of what we do they they need to go back to school learn learn learn it properly then come back with a qualification because there's far too many people who go *oh I like fluffy things* (mushy voice)(2)[…] useless from a conservation perspective […] I mean there are some that are very good that picked up that naturally but the majority of them just want to work with animals*

> *NGO4: it's always hard to know how many there are we build good relationships with them traditionally there are some bad feelings between different hedgehog sectors which I found quite frustrating*

The feeling that hegdehog rescuers do not like people and 'just want to work with animals' is echoed by participant NGO2:

Extract 24

> *NGO2: there is at least a proportion of them who like animals a whole lot more than people […] they can be quite (1) dismissive of of fellow human kind so that sort of brush off don't come to my house I don't want you interfering*

NGO2 expresses concern in terms of accountability of hedgehog rescuers. Since most hedgehog rescuers operate from their home, they can be seen as secretive and private, limiting visitors and thus, to an extent, limiting accountability.

However, some hedgehog rescuers are aware of the need to discharge accountability

and open their house and practice to others' scrutiny:

Extract 25

> *R6: that's why I do the open days because people can come in and SEE what we're doing they can see that the hospital environment and I almost well I do know what the top ten questions are going to be asked*

Currently, there is no legal requirement for hedgehog rescuers to hold a relevant qualification in wildlife rehabilitation, nor are they subject to regulatory and audit inspections.

Extract 26

> *NGO1: […] I think I think it's absolutely vital that hedgehog rescues uh come under some sort of regulation because of the wide variability and quality of care offered to hedgehogs but actually it's not hedgehogs it's wildlife rescues so I would say in this instance every reference I mean wildlife rescue ok because all species that get taken into care need (2) to be looked after with some degree of common sense uum it's just that the hedgehogs are the easiest animal to take into care because they don't have the fight or flight response um and so (2) the magic everyone gets the hedgehogs purely because it doesn't bite them or run away it's based around that simple physiological reaction to stress um and uh ? who shouldn't necessarily take them in I've talked to a number of hedeghog rescues who really really really would love to see um Mrs Miggins with 79 hedgehogs in her kitchen uum made up miggins but not far off the truth keeping them in cat boxes getting fatter and fatter and fatter over winter so they are released obese in spring lose loads of weight then possibly die um (2) so yeah I'm very very keen to see some sort of (.) also the problem we've got is there's not agree::d vision as to how best to look after hedgehogs and this is where fights happen and where people who shouldn't probably shouldn't be using the Internet are using the Internet but they're doing so with crayons whilst wearing tinfoil hats just droobling in bits going *retarded voice* "you're just na::sty" *switch back to normal voice* A::nd and just really really really thick fuckers who are shouting at their*

computers because they have nothing better to do with their lives yeah that's maybe just right

Hedgehog NGOs are portrayed as technologically-challenged, incapable and gendered:

Extract 27

*NGO1: […] the simple issue is how to get the data to them (-) do you expect all 800 people including Mrs Miggins with her poo stained bits of card inputting data to that system (-) that in itself is quite a block um quite a few people don't use any form of computer at all to do their work um so if somebody else inputting bits of poo stained card *muttering* you know*

As mentioned above, hedgehog rescuers and their knowledge is de-legitimised by hedgehog and wildlife NGOs. In the following extract, I relate that hedgehog rescuers interviewed raised concern of an increase in dog attacks following the BHPS's campaign to link gardens and allow hedgehog access in a campaign called 'Hedgehog Highways' (Hedgehog Street, no date), where one particular town in the UK created easy passages for their local hedgehogs (Weston, 2020). This observation has been dismissed by participants from official hedgehog NGOs. However, Reeve and Huijser (1999: 19) study reports dog bites to be well known causes of injuries of hedgehogs, and quote 2.1% of death.

Extract 28

(1) I: um thinking about this the hedgehog highways though I'm also interviewing rescuers and hedgehog rescuers they've seen a really high rise in dog attacks so what about (.) the risk uh in implied in doing these %connections%=

(2) NGO2: =show me the evidence ↓ (.)

(3) I: it's what they say

*(4) NGO2: mm exactly (.) they say a lot of things (.) *laughs* (1)*

nothing else I'm afraid=

NGO2 dismisses hedgehog rescuers' experience in two ways. Firstly, in clause (2) NGO2 suggests that hedgehog rescuers do not rely on any evidence, implying that their experience is not valid. Secondly, clause (4) reiterates that their observations are nothing but words and that 'they say a lot of things' that amount to 'nothing'.

Moreover, hedgehog rescuers are accused of having an impact on hedgehog population through what is perceived is an inadequate treatment and understanding of hedgehog ecology and health.

Extract 29

> *NGO2: it's not a big deal whereas if you're on the animal welfare end of it it's an almost it's gets into an animal rights issue where everything has got to be preserved no matter what so (1) it is quite a thorning issue and people feel very strongly about it um but nevertheless if they're taking in a lot of hedgehogs because they perceive them to be under weight and there isn't any scientific evidence at the moment to dictate what that weight should be (.) um (1) then if in in the situation now where the numbers are so depleted they easily could be having an impact themSELVES on the *decline of hedgehogs* which would be super ironic they probably aren't but we don't know that for sure and we do hear stories of the sheer numbers (.) which are probably in well over 10,000 probably quite a lot more than that that are taken in each year*
>
> *NGO1: but (2) […] there is absolutely no evidence that they on a bigger level actually have an impact a positive impact*

NGO1 and NGO2 unequivocally dismiss hedgehog rescuers as having a positive impact on hedgehog population and welfare. So why are they not acting as a regulatory and governing body for all the hedgehog rescuers?

Extract 30

(1) I: mm (-) so with that in mind (1) how (-) I know that the BHPS and the PTES work together with academics to try and build some kind of centralised framework or some centralised database that would have all the information from rescues feed into it

(2) NGO1: some distance with the RSPCA and then they too much so there are practical things we have one university um had stepped in to say they would host the data because actually we need to find a server which can host the data coming in we need to also find a way of for Mrs Miggins who currently has got a loads of littel cutouts little bits of cardboard from packets of tea boxes um which are smeared in poo with little weights written on them and they have a name more attention has been given to the names than the data collection and how do we get that transferred into a system that we don't know how many hedgehogs are taken into care each year

10.6.1.1 Representing the Earth itself: Hedgehog rehabilitators and rescuers

Hedgehogs appear to be the most commonly admitted mammal to wildlife rescue centres, representing 54% of mammals, and 16% of all wildlife admissions in the UK (Kirkwood, 2003 in Jones and Chapman, 2020). Grogan and Kelly (2013, in Jones and Chapman, 2020) estimated more than 71,000 wildlife casualties were admitted to wildlife rehabilitators in 2011; however, as Kirkwood (2003) points out, in the absence of a comprehensive wildlife rescue directory, any figure quoted will underestimate the real number (Jones and Chapman, 2020). "The whole vast subject of pollution … is of the utmost interest and concern to everybody. It starts in the kitchen and extends to Jupiter and Mars. Always some special group or interest is represented, never the Earth itself" (Graham 18-19 in Stein 2012: 62). In this way, hedgehog rescuers can be said to be representing the Earth itself. They are one with the hedgehogs, carrying out their voices:

Extract 31

R1 I do what I do now because it's the most important thing I've ever done in my life […] it's something I believe for me to be important

While hedgehog rescuers are demonised and excluded, Reeve and Huijser (1999: 10) note that wildlife rescues into which hedgehogs are admitted are "the only practical source of substantial data" for assessing and collating anthropogenic effects on hedgehog population trends, and survival. Importantly, the authors note the inherent biases of such data samples, and of course admitted hedgehogs will normally be from urban settings.

For decades, development projects aiming to augment productivity or environmental conditions "have dismissed the 'peasant reason' of local populations, imposing instead the wisdom of an itinerant techno-scientific expertise" (Berglund, 2001: 842). Berglund, in her examination of forest conservation in Finland notes how local populations' knowledge and incremental expertise is dismissed as non-scientific and not valid, their experience and validity taken over by technocracy and 'science'. Hedgehog rescuers relate the degree to which they find themselves marginalised:

Extract 32

R1: cause nobody listens to (2) um scruffy old people

This is reinforced by hedgehog rescuer R6 who relates an event where hedgehog rescuers' knowledge and experience has been marginalised and dismissed. In a hedgehog conference an NGO was giving a talk, illustrating a pyramid of knowledge.

Extract 33

R6: where she done a pyramid of um (-) knowledge and at the bottom was um basically experience so people who have been doing rescues from the bottom

and thenand then you came up and as it went up your PhD your research and your papers blah blah blah and he sat there and he sa:id that (.) um (1) the (3) %I can't remember what word he used% (whispers) but basically the bottom one shouldn't be there so the EXperience gained by rescues should not be there cause it does not count as (1) factual information

Extract 34

NGO4: they can learn from each other and they're quite keen to attend like there's been a couple of conferences and gatherings of hedgehog carer recently they're quite keen to attend things like that and learn from each other which is really nice

NGO4: and I think (.) it's a very difficult relationship and you can you know some of the carers I meet are just are just lovely people who really want to do (.) good stuff for wildlife and for them they would like to know what's best you know they want their hedgehogs to survive so they want to know what they should do you know what is right way what's going to get the best result so if the science was there it would be great but like you said at the moment we don't (.) know ↑ %we don't know%

In turn, hedgehog rescuers express lack of trust in hedgehog NGOs such as the BHPS, citing the BHPS as a body that should be conducting audits of hedgehog rescues, that is 'wishy washy', and as distributing unreliable and inaccurate information:

Extract 35

R1: BHPS funding research where glued tags prevent hedgehogs from curling up
R7: they're very good about information but I just don't think they've got the resources to do anything I mean's it's nation wide isn't it but anyone can be a hedgehog rescue without any (1) knowledge or anything

R7: a bit wishy washy organisation they're meant to represent (2) uh the hedgehog world but I find them very wishy washy and some of their advice I question not sure that's what we need to be telling people
R2: I don't find the BHPS are very good at raising awareness […] they raised their advice that hedgehogs below 650g shouldn't be allowed to hibernate they do seem very much behind everybody else
R1: most people left them as a result […] me included

Finally, Reeve and Huijser (2008: 21) highlight that despite likely biases of hedgehog rescue centres, the data they provide is useful, as it provides all-year round data of both sexes and age groups. The authors recommend that "researchers and carers work together to develop a more standardised and somewhat more detailed scheme of casualty records for hedgehogs, while Sobkowiak et al. (2020: 24) advise that a potentially more useful approach would be to seek to build up the capacity of non-governmental actors on the ground for undertaking biodiversity action, which includes the collection of data that can then be brought into national accounts.

10.7 Discourse of accounting and accountability

10.7.1 NGO accountability

The way in which NGOs and their accountability are viewed by companies has been explicated in chapters 7 and 8. However, growers often caught between the agrochemicals and government policies and their own economic pressures may not view certain NGO efforts to curb pesticide use positively. For example, participant E2, a grower in northern UK, supported by Syngenta and Bayer[30] comments on their views of NGO activities.

[30] E4 absolutely and I I I you know I declare work with both C and S […] yeah we we work with them again on

Extract 36

> *E4: […] you talked about the lobbying power of Company S and C but you didn't mention the lobbying power of the NGOs which is my view is even greater than the big [multinationals][…] they they very often uh drive the problem you know they do create this defensive attitude among I will give you a very good example*

Participant E4 gives an example of NGO 'manipulation' in an event in which E4 organised a discussion at parliament. E4 asked for both companies and NGO presentation slides in advance.

Extract 37

> *E4: both sides going to turn up even better than that I said right (1) I want your presentations be sha::red a week ahead so everybody knows ↑ what is coming before them (.) and do you know what (2) the NGO changed their presentation I could put up something that was completely new at the debate to try and ambush yeah ↑ and so although I'd done my* ***very*** *best to make sure both sides were in the room that everybody was sharing information fairly so that we could have a a debate based on facts somebody still broke the rules and produced some data which was* ***shoddy*** *(.) ah scientifically invalid but se:nsa:tional and as might you imagine that created the atmosphere in the audience that they wanted to do which turned the audience against the pesticide people and (.) you know what ↑ (.) they didn't make any ↑ progress ↓ they didn't make any progress but we could have made some progress and it exemplified by one of the best MPs I know Angela Smith who got up at the end of it and she said well she said I came here today hoping that I would have some clarity around this subject of neonicotinoids she said I'm leaving this room even more confused that I was when I walked in*

that so we **work** with them but %I'll make something clear% *inhales* we're an independent charity and uh so we (.) we we speak as we find we are not under their control in any way

E4 portrays environmental NGOs attending the event as unfair, presenting invalid information, and creating confusion. However, E4 also represents the power that agrochemical companies wield over organisations.

10.7.2 Public sector accountability

10.7.2.1 Government accountability: "I'm not suggesting there's overt corruption but there is certainly an inbuilt uh imbalance"

Accounts and accounting technologies are constitutive of the activity of government (Dey *et al.,* 2012: 4) where "(a)cts of social quantification are politicized" (Rose, 1991: 673). In the following extract, participants E4, NGO8 and NGO6 agree that transparency of pesticide risk assessment in the regulatory process are questionable, as the company that performs this assessment is privatised, working essentially for both government bodies, as well as private companies, such as agrochemical corporations.

Extract 38

> *E4: that's what happened with neonicotinoids and we can we can argue about neonicotinoids cause cause they're a group which have some great advantages advantages to them […] but also some disadvantages and it was those disadvantages that I mentioned that the the the regulatory process did not pick up*
>
> *NGO8: I'm not suggesting there's overt corruption but there is certainly an inbuilt uh imbalance *inhales* uh there've been some issues with some (2) Fera scientists in the pa:st who revolving doors thing have gone on to work for pesticide companies uh neonicotinoids was a really good case I can't remember her name but um (1) Fera produced a report that was appalling about safety of neonics um and it was rubbished by everyone even the government […] there is a huge (.) a HUGE problem with the reliance on*

*industry *inhales* industry generated studies on toxicology*

NGO6: a complete imbalance in the system um that makes risk assessment incredibly difficult because on one side the environment prove that it's getting harmed whereas the pesticide industry doesn't have to prove that its pesticides are working ↑ ↓

*NGO8: and also there's issues of transparency cause you can't see what the industry's supplying in terms of study toxicology and the results and that sort of thing *inhales* um and also I think the product there's no requirement to label what the adjuvants are […] there are several things wrong with the regulatory system as well […] the neonics were a perfect example […] there are issues with the regulatory system that we have some are banned under the pesticide can still be used as a vet medicine or a biocide so again there's a lack of joined up linking there […] actually seed treatments were a wonderful example of the failure of the regulatory system*

While participant NGO6 holds pesticide companies accountable by commenting that the fact that they do not need to provide evidence that their products cause harm, the participant hinges this discrepancy as a result of the system in which agrochemical companies are absolved of the burden of proving no harm is caused by their products. Other slips in the system, as NGO8 notes, concern seed treatment, veterinary products such as flea treatments, and adjuvants (Carrington, 2020a).

10.7.2.2 Local government accountability

Whilst corporations are being encouraged to engage with the SDGs (UN, 2018) it is acknowledged within the 2030 agenda that "primary responsibility" (UN, 2015: 10, in Sobkowiak *et al.*, 2020) for addressing the challenges of sustainable development lies with national governments. ["C]ountries are expected to take ownership and establish a national framework for achieving the 17 goals. Implementation and

success will rely on countries' own sustainable development policies, plans and programmes" (UN, 2018). Those producing the national biodiversity report are not able to collect the data they require (Sobkowiak, Cuckston and Thomson, 2020). As Weir (2018b) notes, biodiversity accounting in the UK is a "multi-professional" sector "involving ecologists, chartered environmentalists and accountants". Reporting on biodiversity from UK local authorities, academia and surveyors is coordinated by the Society for the Environment and is fed into DEFRA whose guidelines have two main aims: to monitor the threats to biodiversity and to promote governance and increase public awareness using abundance levels as indicators for vulnerable species. However, accounting in this context is battling contradictory factors such as financial benefits that might lead to social support, but go against ecological goals.

Accountability in the public sector is more complicated than in the corporate sector. It embraces a complex web of interrelationships between government and heterogeneous stakeholders including residents, landowners, visitors, commerce and industry, government departments, non-governmental organisations, volunteers, community-based groups, future generations of human beings and the environment itself (Gaia and Jones, 2017: 1617).

10.7.2.3 Sustainability and the extinction accounting gap

This notion of sustainability as important for the protection of future generations, also repeated in the written data examined (e.g. see Appendix D, 13.4.1) and is the commonly acceptable go-to definition of sustainability in a way that it "meets the needs of the present withoutcompromising the ability of future generations to meet their own needs' (WCED, 1987: 43). But sustainability is often

divorced from biodiver sity, and even more so, from extinction (Cielemęcka and Daigle, 2019). We need to revisit the notion of sustainability, because that is wholly antrhopocentic and unethical, as it excludes nonhuman animals, and only considers them as so far as a resource. “the concept of posthuman sustainability that decenters the human, re-positions it in its ecosystem and, while remaining attentive to difference, fosters the thriving of all instances of life” (Cielemęcka and Daigle, 2019: 67).

However anthropocentric the notion of sustainability is, Sze et al. (2018: 7, in Cielemęcka and Daigle, 2019) optimistically note that “sustainability and its closely linked cousin, sustainable development, are both simultaneously radical and reformist. environmental limits to economic growth but reformist in that they presuppose the existing capitalist system”. It is the radical strand I would like to emphasise as it could be read as emancipatory. To be truly emapnciaptory for species protection, the notion of sustainability needs to be inclusive, taking into account future generations of both human and nonhuman animals, where we “the use of ‘resources’ to refer to nonhuman others, be they nonhuman animals, plants, ecosystems, minerals or the earth system as a whole” (Cielemęcka and Daigle, 2019: 72).

More critical is the possibility that, even when stakeholders are fully aware of the importance of biodiversity issues, short-term economic focus continues to be the dominant factor (Mansoor and Maroun, 2016). The following extract demonstrates the financial factors overriding biodiversity protection, as related by participant E2, an ecologist in a local council.

Extract 39

(1) E2: we recommend what they would do so we've got ↑ nearly 300 wildlife sites that we look out across the city

(2) I: = and you're a very small team

(3) E2: =six of us

(4) I: = crazy

*(5) E2: I know but that's what the funding's like *laughs* so um we we survey every one of those every five years um try to *laughs* we do of course we do*

*(6) E2: um but (.) as the head of parks said you can either go a hundred thousand pounds for spraying ↑ for the whole city or quarter of a million *laughs* half a million if you want to strim everything in terms of the priorities its public health and safety that beats all protected species legislation everything you know and then it's protected species it's always public health and safety first*

(7) I: if you were to focus on hedgehogs how would you balance that they're on the list but they're not protected by law (1) in your work

(8) E2: well you would um I would change my management to include things like using incisors instead of strimmers or only strimming once the temperature has dropped below you know two degrees minus two

Participant E2 relates several issues constraining protection of species and mitigating biodiversity loss in the public sector. Firstly, budgetary limits dictate a small team that reduces the scope of accounting for biodiversity, and the taking up of extinction accounting. This is because the audits are then converted into maintaining what is, rather than enhancing, or accounting what is not there. In terms of use of pesticides in the public sector, the spraying of weeds is deemed to be for the benefit

of public health and safety. However, it could be argued that the spraying, contrary to strimming or incisors, presents a public health risk. Additionally, as a councillor in the south west of the UK admits, accountability of pesticide spraying, specifically, glyphosate in amenities is virtually absent.

Extract 40

> *E3: […] so we've got really no way of knowing how many litres of glyphosate are being sprayed in the county per year on behalf of the local authority […] so really complicated picture and in terms of there's seems to be very limited au::dit*

Similarly to the findings in Weir (2018: 16), there is a concern that biodiversity accounting is not enough to mitigate human impact and prevent species loss, especially when the financial and economic consideration prevails over ecological ones.

Extract 41

> *E2: […] that contributes to the mass extinction we are currently facing is appalling management practices it's too little too late we knew it in the 70s we're fighting a billion dollar industry B&Q and all these guys that are going mow your lawns put your weed killers down you know here's us at the bottom going by the way you're killing everything it's appalling we're battling a multibillion dollar industry it's just a couple of hippies*

Additionally, reducing the complex web of human-nature interactions to a number of generic indicators is difficult and can "intensify underlying issues as indicators can distort measurements because certain species, either not captured or prioritised by metrics, remain invisible; this leads to a narrow and metric-led approximation of impact that limits the potentiality for establishing accountability"

(Weir, 2018: 16). This echoes the notion discussed previously that only following IUCN and species that are deemed vulnerable ignores co-extinction, localised extinction, and the ensuing reduction of abundance locally.

10.7.3 Corporate accountability: external accounts

There is little research in SEA literature that explores partnerships between the business world and NGOs (Atkins *et al.*, Forthcoming). NGOs engage increasingly with companies in order to find solutions to biodiversity loss. For example, participant NGO7, an ecotoxicologist and expert on bee health, visited the Bayer Bee Care centre reporting devastating conditions.

Extract 42

> *NGO7: I was not going to start talking about the technicalities and actually when you go to see the (.) the apiary themselves and the colonies that are there they were super super weak I mean*

NGO7 witnessed weak bee colonies at Bayer but did not engage in activism because she went there "as a bee keeper" not as an eco-toxicologist", assuming different identities at different points in the visit. In this way, NGOs can provide external accounts, made systemic through reports (Pesticide Action Network UK (PAN), 2019a).

10.7.3.1 Counter information and counter knowledge

The medium of the internet made it possible for NGOs and social movements to provide and disseminate counter-information and mobilise grassroots action. The development of these new tools enables the creation of new forms of visibility (Vinnari and Laine, 2017; Dey, Russell and Thomson, 2012).

PAN engage with the production of systemic external accounts attempting to improve existing policy and processes in the agrochemical sector and providing scientific evidence to counter-knowledge of the harm caused by agrochemicals. Additionally, PAN produce partisan external accounts (e.g., PAN, 2019) that attempt to debunk agrochemical discourse pertaining to the safety of agrochemicals by providing new evidence to counter safety arguments. PAN also engage in producing dialogic external accounts and engagement by exposing the oppression of citizens and their silenced right to have pesticide-free parks (Dey *et al.,* 2012). "If some might find problematic that counter accounting is explicitly biased, all accounting is biased in actuality" (Gallhofer *et al.*, 2006: 682). Counter accounting is here also ostensibly an emancipatory practice.

Similarly to Action on Smoking and Health campaign, PAN is adopting a watchdog identity (Dey *et al*., 2012: 15) compared to the scientific expert identity adopted by the agrochemicals. They use a combination of external accounts, media, campaigning and activism. PAN compile reports that identify problems with regulations, making use of different levels of transformation and approaches using moral outrage, customer and civic pressure. "The published research in this area would suggest that if shadow accounting is to promote emancipatory social change, then it should be educative, promote debate, change collective knowledge of contested situations, identify feasible alternative actions and create space to enable action" (Dey, Russell and Thomson, 2011:9). PAN's engagements are clearly linked to its vision of a world free from the negative consequences of pesticides, and are underpinned by a consistent discourse of harm intended to de-legitimate pesticide use (Thomson, Dey and Russell, 2015). PAN's accounts can be seen as exemplifying the

transformative potential of external accounting when combined with a comprehensive activist strategy.

Returning to the discussion on bee accountability at Bayer, NGO1 comments on the reasons for Bayer to have a Bee Care Centre, and the way in which a leading hedgehog NGO in the UK perceives their activities.

Extract 43

> *NGO1: =it's a sort of bullshit because they're accounting for impact on on domesticated bees and that's not the issue um actually what we want to do is to see how the wild bee population is doing and we know they're fucked over […] the* ***immediate*** *assumption is that this is utter bullshit (.) on their part it is greenwash it is doing the minimum to: cover up the maximum it is allowing trying to find a way of allowing business as usual to continue uh when we have way way way gone beyond thepoint of allowing business as usual to continue […] until they're made to be interested in externalities and that can only come through either the change in law or costly visited on the corporations in other ways through protest and direct action […] because if they're seen not to be doing anything so they choose the easy thing which is to cuddle a few domesticated bees [...] yeah you've got your your your uh low hanging fruit (?) and you can just fight and fight and fight o::ka:y (nasal sound) you can have that but we're going to continue doing everything else it you know*

NGO1 views Bayer's Bee Care Centre as greenwash, targeting low hanging fruit in domesticated bees, when wild bees are undergoing a severe decline. For NGO1, business as usual is enabled by greenwash initiatives such as the Bee Care Centre.

As Gray et al. (1996: 19) note, while companies are to a certain extent under pressure to gain social legitimacy for their operations (e.g., Zappettini and Unerman, 2016: 538), companies and multinational corporations exercise unelected global

power, constituting an undemocratic force in society. The relationship between the state-society-company illustrates that while at times the state controls companies, companies can control the state by, for example, threatening to move overseas (Gray, Owen and Adams, 1996: 44).

Companies exercise power over citizens, as participant O1, an academic in toxicology comments on their fear of agrochemical companies.

Extract 44

> *O1: yeah yeah I tried to protect myself and I don't want to attack pesticide companies without any reason I have no problem talking about what happened in the past but I try not to make it interfere with what I'm doing here*

Linguistically and politically, the agrochemical sector attempts to change the names of neonicotinoid-based insecticides and thus change their toxicity classification, as NGO6 relates:

Extract 45

> *NGO6 the industry is trying to re-define what is a neonicotinoid pesticides that were previously classed as neonicotinoids are no longer classed […] they're manipulated the term […] that's what happened with sulfoxaflor*

Agrochemical companies not only attempt to redefine pesticides, they also dominate the discourse and definition of multifunctional field margins in the context of IPM, which will be discussed in the following section.

10.7.3.2 Hedges and MFFMs: Hedges are more important than flower strips

In chapters 7,8, and 9 agrochemical corporations position themselves as the figureheads of biodiversity protectors, investing in promoting MFFMs and practicing and training growers in IPM. However, hedges are more beneficial to hedgehogs and

wildlife in general as it provides habitat for all wildlife. However, allotting space for wildlife takes away from financial gains of a larger field.

Extract 46

> *NGO4: it's been shown that hedgerows can improve the overall quality of their overall land because it does provide habitat and connecting habitat and landscape for all sorts of wildlife so that will also include pollinators particularly if they've got a strip of land you know buffer by their hedge it's brilliant for all kinds of wildlife*

Extract 47

> *(1) NGO1: the vast majority of all biodiversity on many farmlands is in the hedgerows*
> *(2) I: mmhm*
> *(3) NGO1: the rest of it it's all fucked off I mean it's it's been killed*
> *(4) I: yeah*
> *(5) NGO1: so if we're going to concentrate our efforts on one thing we've concentrated on the margins also hedgehogs are hedge specialists they're woodland edge specialists and the analog for that is the hedgerow um so concentrate the efforts at looking at the margins*

However, as participant E4 relates, hedges are protected and farmers may avoid planting them for financial reasons.

Extract 48

> *E4: we couldn't persuade farmers to (-) plant hedges again because hedges are protected and if you plant a hedge you can't then decide twenty years later I want to pull that out now because **I** planted it*

Finally, just as fragmented as the hedgehog protection arena, and pesticide registration, so is the farming sector.

Extract 49

NGO5: so I think a lot of people talking about agriculture today think that you know it's sort of like one old guy and his 60 years running this whole farm but that's so not the case in a lot of situations so like you've got your seed guys who are doing the planting you've got like contract guys doing harvesting you've got folks that are you know farm workers coming through so it's not necessarily one person who's paying attention to everything and managing it um I think

These fragmentations yield a playing field in which competing interests obstruct an effective and wildlife-friendly agriculture.

10.8 Discourse of legitimacy and knowledge through scientific discourse

In chapters 7 and 8 I argued that corporations rely on scientific discourse to advance their ideology of the management of nature and the technocratic use of pesticides. I argued that they position themselves as holders of knowledge that, together with the usurpation of science, empowers companies as the only legitimate source of knowledge. However, in the analysis of this chapter, we can see NGOs drawing on the same discourse. "Democracy, in its modem mass liberal forms, requires numerate and calculating citizens, numericized civic discourse and a numericized programmatics of government" (Rose, 1991: 673). Thus, the current political system, reified by governments and corporations, the only way to 'tap' into legitimacy is through scientific discourse. This is evident in the following extract in which NGO4 positions themselves as a scientist first and foremost.

Extract 50

*NGO4: and you know inherently I'm a scientist […] so I like to do evidence based conservation […] yeh *laughs* I try and speak the science what the science says *laughs**

Interestingly, NGO5 discussing biologicals and the risk inherent in their development and use, relates the danger where dialogue between NGOs, companies and government take place.

Extract 51

> *NGO5: I think it all breaks down is where there's no conversation based in fact and reality*
> *NGO3: they have their targets […] like income generation membership engagement where my subconscious targets are efficient data collection I'm quite science-y*

The scientific discourse drawn on by both NGO5 and NGO3 markedly constructs not only their own identity (I'm quite science-y), but the way in which science is seen to be 'fact and reality', and not the construct it is.

The discourse of metrics, similarly to scientific discourse presupposes that "counting create commensurability and facilitate appropriation of the values" (Sullivan and Hannis, 2017: 1459).

The important role of legitimacy in organisational life in general is widely acknowledged (Joutsenvirta, 2011). Conflicts and discourse of legitimation is evident in the data between firms and nongovernmental organisations (NGOs), with a mixture of rational and moral struggles as a key features in the discourse. Legitimation refers to creating a sense of positive, beneficial, or otherwise acceptable picture, and delegitimation to creating a sense of negative, unbeneficial, or otherwise unacceptable picture of a certain action or issue (van Leeuwen and Wodak, 1999).

The data reveals the way in which the companies try to defend themselves against activists' accusations, and vice versa, NGOs, as well as hedgehog rescuers do the same. In other words, there is a merry-go-round of each organisation de-legitimising the other, with the exception of hedgehog rescuers who, in many instances in the

data, de-legitimise themselves in the discourse and refer to themselves as non-holders of legitimate knowledge, which is a position of disempowerment (see chart below). The issue of de-legitimacy stems from power relations. For example, Joutsenvirta (2011) examines the discursive strategies used to legitimise or delegitimize controversial issues between firms and NGOs and finds that providing socially legitimate arguments to defend the forest industry required that the company produces itself as an environmentally conscious and socially concerned actor even though it sometimes meant that the given arguments – or confessions – were inconsistent with the main legitimation attempts based on scientific arguments. Similarly, the data reveals that companies and wildlife NGOs relied on scientific and metric arguments to de-legitimise the other.

Denedo et al. (2017) explore how and why international advocacy NGOs use counter accounting as part of their campaigns against oil companies operating in the Niger Delta to reform problematic regulatory systems and make visible corporate practices that exploit governance and accountability gaps in relation to human rights violations and environmental damage. The authors reveal an inability of vulnerable communities to engage in relevant governance systems, due to unequal power relationships, corporate actions and ineffective governance practices. NGOs used counter accounts as part of their campaigns to change corporate practices, reform governance systems and address power imbalances. These findings echo those in the empirical chapters, particularly in relation to PAN, who use counter accounts as part of their campaigns to influence government policy in relation to agrochemical usage.

The hedgehog rescuers are aware of their potential ability to reframe conflict

through their counter accounts (Denedo et al., 2017). The NGOs interviewed support the drive for corporations to become globally accountable for their environmental impact.

However, as the figure demonstrates, neither organisation cooperates with the other. The figure revels the de-legitimation of the three main actors: the corporations, wildlife NGOs and hedgehog rescuers. The corporations interviewed dismiss NGOs and thus do not collaborate, while the NGOs dismiss hedgehog rescuers and agrochemical corporations. Hedgehog rescuers who are holders of a bounty of vital information about hedgehogs, their survival rates, condition, diseases and threats are not viewed as legitimate partners which leads to the loss of this vital information. Their knowledge is not collated by powerful NGOs who can then use it to influence policy. A pertinent example concerns hedgehog dog bites. Many hedgehog rescuer interviewees discussed an increase in hedgehog being brought in with dog bites. This is in tandem with the BHPS' campaign to link private gardens via a hedgehog highway. The hedgehog rescuers believe that the increase is due to an increased contact between hedgehog visiting gardens populated by dogs. However, because BHPS do not collaborate with hedgehog rescuers, the organisation dismisses this knowledge and does not amend their campaign to reflect this threat.

10.9 Conclusion

The chapter's findings suggest that the adoption of the extinction accounting framework by hedgehog and wildlife NGOs would encounter many constraints. The hedgehog protection arena has been demonstrated in this analysis to have various points of incongruence. For example, the optimal weight for hedgehogs to be released is a point of contention, hedgehog rescuers do not view the BHPS as authority, nor does the BHPS discharge accountability towards hedgehog rescuers. In

fact, the BHPS and other NGOs interviewed do not view hedgehog rescuers as legitimate partners in hedgehog conservation and an example has demonstrated that hedgehog rescuers are thought to be even detrimental to bringing hedgehogs from the brink.

"The complexity of biodiversity issues, the large number of uncoordinated players involved, and inadequate resources may explain this lack of convincing evidence of effective actions. From this perspective, the release of more reliable information on biodiversity issues through sustainability reporting is essential to reinforce corporate accountability and transparency" (Boiral, 2016: 752). The chapter revealed the degree to which lack of cooperation and de-legitimacy inhibit potential improved protection of hedgehogs. For example, the lack of centralised data collection from valuable sources such as hedgehog rescuers, mostly due to their exclusion as silly old ladies that use poo stained pieces of card and cannot use modern technology, as NGO1 commented, inhibits collaboration and hedgehog protection.

Accountability in the public sector both at government level as well as locally in terms of pesticide use and application in amenity areas is severely lacking. Additionally, biodiversity priorities are secondary to economic and financial considerations, leaving the ecology team unable to audit local biodiversity loss or monitor species effectively. This results in a silence that never gets reported to higher echelons, such as DEFRA and thus feed into a national BAP towards SDG 15.

The expanded animal rights theory discussed in chapter 6 can address fundamental issues of habitat and ecosystem flourishing while maintaining the commitment to inviolability of rights. Just as ecologists would not recommend culling of human beings to protect a vulnerable ecosystem. "Our past manipulation

of ecosystems – introduction of invasive species, or destruction of keystone species, for example – should make us humble about the complexity of ecosystems and cautious regarding our ability to understand the relevant variables for any particular act of intervention" (Palmer, 2010 in Donaldson Kymlicka, 2011: 164). However, this argument opens up the notion that if we just had more information, we would be able to manipulate and engineer the natural world. Thus the chapter ends with an analysis of the discourse of legitimacy, that rests upon the construction (and control) of knowledge, that is only seemingly valid through a scientific discourse. In this way, many NGOs interviewed are able to dismiss and de-legitimise hedgehog rescuers as only operating anecdotally.

Placing hedgehogs in the centre, the chapter will conclude with their voice. When asked how they viewed the future of hedgehogs on the UK, hedgehog rescuers comment:

> *R7: as a species I think we're too greedy to care enough really [...] or get seduced by (1) stuff *laughs* I don't like to be fatalistic but I am a bit where hedgehogs are concerned I'm pretty sure that they won't survive*

The dedication of hedgehog rescuers to hedgehogs has not been expressed by any other NGO interviewed. The words of R1, echoed by many other hedgehog rescuers embodies their selfishness and their dedication.

> *R1 "looking after wildlife is twenty four seven […] every hour of your life every cell in your heart"*

Chapter 11: Silent night: 6th mass extinction deniers - Empirical chapters findings and discussion

11.1 Introduction

This chapter compares and contrasts the four empirical chapters and their main findings, focusing on the following emerging issues: (1) extinction denial and (2) other factors that inhibit the adoption and implementation of the extinction accounting framework by agrochemical corporations, (3) cooperation and stakeholder engagement, (4) NGOs and their engagement with hedgehog rescuers, and (5) hedgehog rescuers accountability and as holders of local knowledge themselves. These five areas are the strongest discourses that emerged in the analysis and contribute to the understanding of the importance of and the need to implement the extinction accounting framework in the agrochemical sector. The areas highlight the complexity in addressing hedgehog extinction by the various stakeholders in the arena.

The chapter traces the commonalities and divergences between corporate discourses, revealing the shadow reality they construct through erasure and denial of extinction and biodiversity decline. The analysis reveals Beck's (1992) experts and counter-experts positioning of different stakeholders in a hierarchical manner: the

company interviewees, the NGOs and the hedgehog rescuers, although hedgehog rescuers have expressed certain hedgehog NGOs as illegitimate as well.

The chapter brings the theoretical strands of the thesis together. Through a Becksian theoretical framework drawing from Plato's 'Allegory of the Cave' I demonstrate the invisible nature of ecological risks arising from scientific and industrial development.

The four empirical chapters were analysed through the lens of a self-reflective methodology, in which the researcher was present, my values were explained through an ecosophy and shape the way in which the discourses were judged. The adoption of an ecolinguistic framework to analyse the data also extended itself to a form of PDA. Although not analysing texts through a positive discourse analysis, I created a positive discourse mock-up imaginary and utopian hedgehog shadow account, that builds on emerging utopian extinction accounting literature.
Finally, the chapter concludes with a discussion of the holocaust and the way in which strands of it manifest throughout the thesis, in connection with the researcher's axiology.

The following diagram maps the main findings from the four empirical chapters. The first section outlines the main findings from corporate textual, multimodal and spoken analysis corresponding to section 11.2 and 11.3 below, and the commonalities or divergences with NGOs. Section (2) outlines the main findings from the spoken analysis with NGOs corresponding to section 11.3, while Section (3) present findings from interviews with local authorities with regard to the use of pesticides in amenities. Finally, section (4) concludes with the findings from spoken analysis with hedgehog rescuers, corresponding to section 11.3.

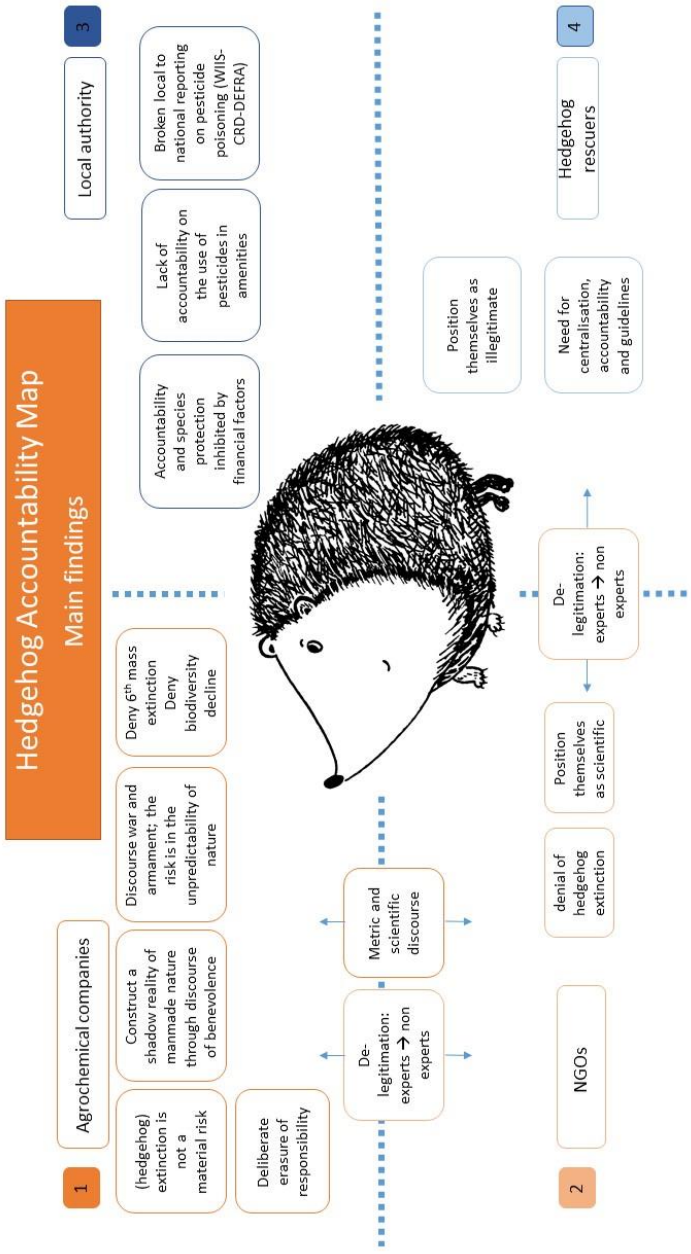


Fig. 20: Hedgehog accountability map: main findings (author's own)

11.2 Findings from chapters 7 and 8: the discursive construction of a shadow reality through deliberate omission

This section presents the main findings in chapters 7 and 8, by comparing and contrasting the discourses found. The findings are interpreted through a Becksian theoretical framework drawing from Plato's 'Allegory of the Cave' to show the invisible nature of ecological risks arising from scientific and industrial development. The first two empirical chapters multimodally examine the 2018 integrated reports of Bayer and Syngenta. While both companies address biodiversity in their reports, those remain superficial, 'unemancipatory' and perfunctory. Both companies share similarities in their market share: Bayer just acquired Monsanto, and Syngenta has been absorbed by Chem China. Their litigation onus is remarkably similar as well, with Syngenta facing about $475.6 million (Neeley, 2020) and Bayer $8.8 billion to $9.6 billion (Gillam, 2020a) although Bayer survived a shareholder vote of no confidence the scars of which are evident in the report, particularly through the absence of images.

The financial and reputational context of the two companies also leads to a marked difference in the issues Syngenta and Bayer focus on. Bayer focuses mainly (and perhaps naturally) on trust and confidence, while Syngenta emphasises technology and control of nature, discussed further below. Bayer's analysed images of the CEO attempt to construct trust and level the playing field. Trust and judgment are two recurring discourses found in Bayer's reports, as the company attempts to restore trust that has been breached following the acquisition of Monsanto and the ever-mounting litigation that ensued. Bayer deflects responsibility for under-performance on external factors such as share price and supply chain issues.

Both companies employ discourses of benevolence (Syngenta) and 'the common good' (Bayer). While Syngenta's benevolence and the common good discourse are achieved through naming and labelling pesticides from the domain of medicine positions pesticides as a cure, evoking a frame of safety of use and mundanity, Bayer bestows its benevolence through positioning itself as a world leader. Bayer's stance as a governing body visible also in the multimodal analysis in which the viewer is positioned under Bayer's flags, and Bayer promise to test and protect, reminiscent of police authority. Authoritativeness is visible within the *common interest* frame in which the *elite governance* frame is nested. The elite governance frame holds that political power is consolidated in the hands of elites. People cannot be trusted to solve their own problems through deliberative means: strong leaders must take control and act on their behalf. Bayer's ideology centres largely on control of people and stakeholders, while Syngenta's is on nature evident, for example, in the uniformity of fields and flowers in images.

While Bayer names and labels its products differently to Syngenta, they share the use of the discourse of war. Bayer employs the metaphor of war in the naming of pesticides, for example RoundUp, a discourse that Bayer shares with Syngenta. RoundUp is a metaphorical name for the pesticide, borrowed from the military domain or hunting. Syngenta similarly wages a war on nature, promoting an ideology of a unified power against nature. The discourse of 'armament' through metaphors of movement and progress are employed in structures of presupposition in which society expects 'progress' in farming technology enabling: *Operation Pollinator*, metaphorical of war. Discourse of war through metaphors and verbs is evident throughout the texts examined, where nature is positioned as the enemy and in which the risk is borne – not human activities. Both corporations use person metaphors

BAYER IS A PERSON, Syngenta is represented as a living entity that behaves, interacts and shapes the world, who is able to feel, think and sense through Mental and Sensor verbs.

Syngenta employs a discourse of technocracy as the military vehicle that carry out surveillance of farmers and users. Syngenta's representation of the environment is that of a highly technologized and ecologically enhanced nature. Beck (1992) reminds us that this discourse runs the risk of entering a discussion of nature without people.

Similarly, Bayer perpetuates a version of reality in which nature is manmade to be controlled by humans, for the benefit of (certain privileged) people. Framing nature as a 'capital' and equating it with a monetary measure runs the risk of subordinating it to financial or economic considerations (Maroun and Atkins, 2020) or misleading ourselves into believing that nature, somehow, needs humanity (Gray and Milne, 2018).

In Syngenta's technocratic discourse, technology is given agency which removes the doer that much further from responsibility and 'clarity' of events through ergative verbs. Visually, the drone makes 'eye' contact with the reader, the textual lexis conveying movement, rapidity and accelerating 'innovation'. However, the images of nature examined in Syngenta's report convey quite the contrary: a slow pace of life.

The concept of a shadow reality, or the 'clarity of events', perceived by people effectively shrouded in ignorance inspired Ulrich Beck in discussing the invisible anthropogenic ecological threats such as pollution and toxins:

> "In Plato's 'Allegory of the Cave', the visible world becomes a mere shadow, a reflection of a reality that by nature escapes our possible knowledge" (Beck, 1992, p.73).The notion of 'harmless façades" (Beck, 1992: 72) mean that humanity is labouring under a false perception of the world around them and

that individuals' collective consciousness is not raised high enough to allow them to see beyond the shadows presented to them as 'everyday reality'".

The shadow reality is that both companies do not acknowledge extinction as a risk, and evade their responsibility through erasure. Bayer displays repeated instances of avoiding and displacing responsibility through nominalisation, where risk is only mentioned in terms of risk to investment or shareholders and we can see that in instances where Bayer distances itself from the Monsanto's acquisition: When the risk is mentioned, Monsanto is not, and when Monsanto is mentioned, Bayer is not.

Displacement of responsibility is a trait of Syngenta as well, who not only fail acknowledgment of its own products' impact on biodiversity, cites farming as the main cause of soil infertility and the ensuing biodiversity decline.

Bayer dismisses the role pesticides may play in adversely affecting insects and claims insect decline is multifactorial caused by other human activities by saying that everything humans do leaves a footprint, not a destruction. Company interviews reveal extinction is completely denied, much like earlier version of climate change deniers. If companies do engage in biodiversity conservation they view it as an opportunity rather than a risk.

The safety of the products discussed in both Bayer and Syngenta are represented differently. Bayer treats glyphosate as a *(14) nonselective herbicide*, but as chapter 4 illuminated, glyphosate is not a herbicide, but only one ingredient of a final product. As Beck (1992: 26) correctly notes "What may seem 'insignificant' for a single product, is perhaps extremely significant when collected in the 'consumer reservoirs'". Conversely, Syngenta promotes a sort of 'safety in numbers' of users

implicitly implying that if so many countries are using their products, the products must be safe.

While deflecting responsibility on other stakeholders, both companies herald themselves as relying on their stakeholders. Bayer's video depicts the expert versus counter-expert, also visible we see this later in corporate interviews where there is a cascade of hierarchical knowledge holders: NGOs are portrayed by companies as non-experts, NGOs position themselves as counter-experts, the hedgehog rescuers are perceived as non-experts and do not consider themselves as counter-experts.

Like Syngenta, Bayer presents itself as a scientific institution. In Bayer's world, activists and professional critics of agriculture (T1 29) are not part of the collective 'we'. The company depicts itself as being involved with stakeholders through "wide consultations". 'We' connotes collective agency which links back to the common interest frame, expresses both solidarity and repression of individuality. Bayer suggests that activists are not professionals, nor do they have the 'right' knowledge. This is another instance in which scientific discourse is evoked and who has the right to be an expert. The video analysed also does not credit the average Joe with the ability to access the right knowledge or holding valid 'fact' until they are provided by Bayer. Like other stakeholders in the report, those are not given agency or a voice.

As in Bayer's videos, Syngenta's videos also do not award other people with a voice. NGOs, academics and farmers are mentioned, yet none are represented, except the farmers and scientists of Syngenta.

Bayer heavily relies on presuppositions, particularly in the CEO address in their report, to convey that resources can be managed sustainably and that sustainability is a concept that is agreed upon that is understood similarly by all,

when in fact, sustainability is a go-to concept used to justify business-as-usual. Syngenta shares in this discourse putting forward the presupposition that intensive farming can be done sustainably. Sustainability is entangled with business growth in a blatant oxymoron, suggesting that sustainability and its derived lemmas allow for reframing biodiversity investment as the allocation of field margins to 'biodiversity' as a pathway for maintaining business-as-usual.

Ghettoisation of fields results from MFFMS, the allocation of field margins to 'biodiversity' as a pathway for maintaining business-as-usual non-human animals are essentially quarantined to specific areas in which they are allowed to 'flourish'.

A point of difference between the companies can be seen in the employment of two different discourses. While Bayer employs pseudo-ecological discourse motivated by financial factors, where target organisms are labelled as evil, not Bayer or pesticides. People and their lack of knowledge are accused of simplifying environmental degradation, Syngenta control the weather. Like in V1, the simplistic cartoon depicts perfect idyllic weather, with blue skies, white fluffy clouds, sunshine and green rolling hills, reminiscent of the cover of the annual report. This discourse of perfection and sameness, of control of nature, is presented as the ideal à la Syngenta, a shadow reality, and an ideal that is possible to achieve and should be fabricated.

The environment is represented as the toxic sublime and relates to Beck's (1992) theorisation of the risk of the invisible, are based on causal interpretations, and thus initially only exist in terms of the (scientific or anti- scientific) knowledge about them. The natural environment is decontextualized resulting in a disconnect between concrete environmental problems, food production, the political and financial. Living beings are commodified, Syngenta is largely uncommitted to

promoting the flourishing of species, let alone protect them from the adverse effects of their products.

Worse than that, absence is meaningful. Erasure of living beings occurs in the entire of Bayer's integrated report a total of 11 times. The term is not lexically linked with a particular species, nor does Bayer provide a clear definition to the concept. Thus Bayer displays an inadequate approach to biodiversity management and integrated reporting. Disgustedly, Bayer's video makes light of an insidious, abstract and invisible cultural, social, environmental disaster.

Erasure of nature's agency and erasure of corporate responsibility V2 is replete with lexis from the domain of ecology. Nature's role undergoes void erasure where it is represented as being acted upon as plants, animals and fungi are turned into 'food', essentially 'phaged' into a noun. In Syngenta The environmental degradation visually represented returns to the idyllic utopian image does it address degradation, such as extinction is irreversible.

Images and videos depict ideology of control and domination of humans, or in this case, Syngenta, over nature. Similarly, in V2, while 'pollinators' are addressed, they are referred to as 'threatened', and 'decline'. Void erasure No other species are mentioned. There is a silence regarding the catastrophe of the 6th mass extinction.

11.2.1 Risk and double materiality

The empirical chapters find that financial materiality is the main factor in the agrochemical companies' rejection of the extinction accounting framework. In other words, the companies do not acknowledge that species decline and extinction are material to their operation, and that extinction presents a risk. Importantly, the extinction accounting framework implicitly includes risk management and

anticipation of high consequence risks such as pandemics and Covid-19 Atkins et al. (2020).

However, with the onset and take up of double materiality corporations will be faced with pressure to account for species. Although not a legal requirement as carbon emissions are in the UK for example, double materiality is being rolled out through the EU Green Deal and is becoming entrenched across financial sectors. Indeed, it is not just about climate-related impacts anymore: Mark Carney, former Chair of the FSB, is now, as UN Special Envoy for Climate Action and Finance, pushing for worldwide mandatory climate disclosure ahead of the COP26 climate summit, elevating the concept of double materiality to a matter of global concern.

The financial materiality of biodiversity and species loss arises from: "interdependencies between nature and business; legal fines for adverse impacts of business activities on species; rehabilitation of land; unavailability of natural capital and ecosystem services (such as pollination); reputational damage due to accidents or incidents" (Atkins and Macpherson, forthcoming). These criteria thus determine the situations in which companies must consider materiality.

Simply, companies are going to be increasingly pressurised to report on any species they have a direct impact on. Companies have to report on ESG issues that are financially material but the 'double' part in the concept of 'double materiality' means that companies additionally have to report on ESG issues that they impact through their operations. Thus, the rise of double materiality presents a firm basis for proposing agrochemical corporations to adopt the extinction accounting framework, as well as begin to practise hedgehog accounting.

"Any material financial risk requires risk management tools, disclosure, audit, accountability and monitoring. Any part of the financial system that does not

incorporate biodiversity, natural habitat, species protection and extinction prevention into the heart of its risk management, mitigation, and adaptation strategy, is failing to acknowledge the massive potential financial losses that could arise were certain species to go extinct" (Atkins and Macpherson, forthcoming).

The latest 'KPMG Survey of Sustainability Reporting 2020' (discussed in Atkins and Macpherson, forthcoming) explores corporate reporting on risks from biodiversity loss for the first time in the history of these important reports. The Survey finds that less than a quarter of companies deemed 'at risk' from biodiversity loss were reporting, with mining being the only at risk sector where most companies were accounting for biodiversity"… reporting on biodiversity risk will follow the climate trend – with initial use of the framework [TNFD] being voluntary, followed by disclosure mandates and regulation by governments to protect and replenish nature".

As an abstract concept, double materiality still needs to be animated. Its implementation will most likely remain contested for a while. Whether its weak or its strong conception will guide accounting standard-setting in the future is critical for halting the 6th mass extinction.

11.3 Findings from chapter 9 and 10: Agrochemical companies' deliberate omission and the hedgehog protection arena

The interviews with company participants reveal similar discourses to those found in the multimodal and textual analysis, with views of individual interview participants' congruent with and upholding company ideology.

A key finding in the textual analysis relates to the avoidance of responsibility. In interviews, company interviewees deliberately omit evidence suggesting pesticide cause harm, even when scientific evidence is clearly presented. Agrochemical company interviewees categorically deny it. Denial of harm caused by pesticides is a

prevalent corporate discourse, which has been found in extant literature on impression management. However, the analysis reveals the companies go beyond impression management, to form a new concept of deliberate omission. Much like the agrochemical corporations who do not disclose the negative effects of their products Corvino, Bianchi Martini and Doni (2021) state that in the tissue industry the companies do not report on the negative effects of their activities on forests, only positive things are reported and that the reporting is not genuine and not emancipatory. In both the Bayer multimodal text and Syngenta's V2 are both infantile and make the reader feel small. Company interviewees attempts to present themselves (Goffman, 1959) in the interaction as 'good', leaving out any information and opportunity for transparency regarding the adverse effect of their products in a deliberate omission discourse.

Hand in hand with deliberate omission, the company interviewees deny the risk involved with species decline. The risk is discursively constructed by participants through the discourse of insect decline, and the denial of species extinction, reminiscent of holocaust deniers. Company interviewees reject extinction as being a common term in public discourse; the 6th mass extinction is a phenomenon that is difficult to measure due to, according to them, the absence of scientific tools with which to measure the decline. In other words, if we cannot measure it, it does not exist. This recalls Beck's (1992) shadow reality. According to the company interviewees the onus of pesticide application and ultimate responsibility in the chain rests on farmers. Additionally, the interviewees state that the risk assessment stipulated by regulators covers all eventualities and risks and therefore the products do not pose a risk.

Likewise, several NGO interviewees refuse to frame hedgehog decline as extinction. The findings suggest that there is confusion and lack of uniformity of NGOs in discursively constructing the loss of life, as well as pressure to appear 'metric' and 'scientific'. Although NGOs do acknowledge pesticide harm to hedgehogs, particularly in an indirect manner, that is, that pesticides eliminate their food sources, and that transparency of pesticide risk assessment in the regulatory process are questionable, they nevertheless remain focused in their conservation efforts on urban hedgehogs and overlook the need for research that and tackles the underlying cause for hedgehogs' migration to urban settings. However, some NGOs, such as PAN, do have an emancipatory potential through the shadow accounts and partisan accounts that they produce.

Pesticide effects on hedgehog populations in rural and arable settings, apart from rodenticides (Dowding *et al*., 2010), are not discussed by NGOs interviewed, but are often evoked by hedgehog rescuers. For example, hedgehog rescuers discuss molluscicides as a threat to hedgehogs, as one hedgehog rescuer interviewee describes their encounters with slug pellet poisoning more often than what they refers to as 'official evidence', referring to 'scientific knowledge' disseminated by hedgehog NGOs such as the BHPS, who one hedgehog rescuer interviewee said is a 'wishy washy' organisation.

Hedgehog NGOs face challenges in reaching a united front, discrediting other organisations such as a leading wildlife rescue that also trains hedgehog rescuers, but the most discredited and unacknowledged are hedgehog rescuers. NGOs deem their work fruitless, or even detrimental to the cause. Hedgehog rescuers, largely operating from their private homes and on their own dime, are viewed as secretive and private with limited, if not questionable, accountability as a result. They are portrayed as

technologically-challenged, incapable, and gendered ‘cat ladies’. However, the hedgehog rescuers are the first to highlight the need for uniformity and accountability. Hedgehog rescuer R6 describes the need for a set of guidelines and clear protocols for hedgehog rescuers.

When it comes to their own experience, hedgehog rescuers interviewed employ linguistic structures such as hedging, referring to their own experience as ‘anecdotal’, and describing NGO opinion as ‘official’. Hedgehog rescuers position themselves as illegitimate, which is not surprising when one NGO interviewee suggested that hedgehog rescuers do not rely on any evidence, implying that their experience is not valid. Local populations’ knowledge and incremental expertise is dismissed as non-scientific and not valid, their experience and validity taken over by technocracy and ‘science’ (Berglund, 2001).

In the parade of knowledge de-legitimation, company interviewees are up front twirling the flaming baton, dismissing NGOs as ‘flim flam’, in a pseudo-dialogic accounting positioning the NGOs in a passive role where their knowledge, as was seen in Bayer’s video for example, does not count. Just as NGOs view hedgehog rescuers, so are they viewed by company interviewees NGOs as somewhat childish, aggressive, and unprofessional producing unsubstantiated, and unscientific data. The paternal, common good frame found in the textual analysis returns in the interviews where the companies lament that NGOs ‘get all the credit’, while not ‘doing anything’ and where the companies know best what the people need and want. The companies deny the NGOs the vital role they play in the complex network of species protection.

NGOs are dismissed because their knowledge is not deemed scientific, quantitative and metric. Metric discourse discursively constructed through another

meaning of counting and measuring. The adage that 'what gets measured gets counted' painfully introduces quantification and monetisation. For Beck (1992) the notion of the purity of scientific analysis because it creates a shadow reality in which scientific practice acts a veil. For companies and NGOs alike, however, if the science isn't there, it does not exist. Additionally, through metrics discourse, company interviewees highlight the safety of the products, counting, and numbers that creates demarcation; a place for food, a place for biodiversity, in tune with the idea of ghettoization creating definitive boundaries the natural world is divided by the corporations, divide and conquer. However, the reputational risk, evoked in one interview does suggest that companies are not only under pressure from the public, but also increasingly so with the growing support of double materiality.

The metrics and scientific discourse is echoed by NGOs the only way to 'tap' into legitimacy is through scientific discourse. However, the findings demonstrate that NGOs can provide counter-knowledge, seek to make visible environmental destruction and provide 'other' knowledge (Berger and Luckmann, 1966) For example, PAN engage with the production of systemic external accounts adopting a watchdog identity.

Both corporations' interviewee participants reject adopting hedgehogs as a bioindicator species due to the potential of the endeavour being seen as greenwash and enchaining a reputational risk. However, it could be argued that indeed *is* a reason to report according to the BD protocol. Conversely, NGOs describe corporate biodiversity initiatives as greenwash.

To the corporate interviewees, individual animals do not count. However, cracks in the corporate mantra are visible when participants switch between the private frame and the corporate frame. Hedgehogs are a contextualisation cue (Auer, 1992) (or

keying, in Goffman's 1974 terms) that triggers a frame switch, shifting frame from a serious attitude to a joke, and hedgehogs only 'exist' in this frame, as a source of amusement.

The invisibility of extinction, where the disappearance of hedgehogs as well as climate change are characterised by a deliberate discourse of unawareness, coupled with lack of care exemplifies Beck's shadow reality. Hedgehogs are invisible because they are not counted, and to the corporate interviewees do not make a business case, although with the rise of the concept of double materiality, this may change.

Contrarily to the NGO interviewees, hedgehogs represent a way for people to connect with nature, care for them and enjoy living alongside them. Starkly differing to the NGOs are hedgehog rescuers who view hedgehogs as family and as individuals. Hedgehog rescuers represent hedgehogs themselves. Hedgehogs are family, sentient with feelings and uniqueness, inspiring familial emotional relationship through naming and description personal pronouns 'her', 'she', to talk about a hedgehog in care.

Finally, accounting for species today is based on entities (organisational, national, private, public), but none of which are fit to address conservation issues (Feger and Mermet, 2017). This is why the normative political theory of animal rights is a way forward that would legalise the positive rights of animals, and hedgehogs. Rendering extinction accounting mandatory and statutory is in the same spirit. As Beck (1992: 70) reminds us, "coping with risks compels a general view, a cooperation over and above all the carefully established and cultivated borders".

However, "the complexity of biodiversity issues, the large number of uncoordinated players involved, and inadequate resources may explain this lack of

convincing evidence of effective actions. From this perspective, the release of more reliable information on biodiversity issues through sustainability reporting is essential to reinforce corporate accountability and transparency" (Boiral, 2016: 752). Albeit the issue with corporations as discussed is not simply that they are uncoordinated, or they're unwilling to work together and in the case of companies, they actively engineer a particular reality, or are unable to acknowledge the grim and horrific reality of the 6th mass extinction, and the role within which they play.

11.4 What does this mean for the project of extinction accounting?

Extinction accounting is starting to gain traction with the investment community (Atkins *et al.*, 2020). A recent study by Hassan et al. (2020a) finds that biodiversity- and extinction-related disclosures have been increasing and that organisations are becoming more aware of the need for urgent action to protect flora and fauna. Similarly, studies on local authorities reveal, at least, some efforts to explain the importance of biodiversity from both an instrumental and deep ecological perspective (Samkin *et al.*, 2014; Gaia and Jones, 2017). In 2020 a Biodiversity Protocol for corporate reporting on biodiversity and natural capital provides detailed stages and a framework for reporting in this area (Endangered Wildlife Trust, 2021).

An important development in the extinction accounting framework is to consider the reporting of species absence by organisations, in other words, disclosing which species have disappeared as a direct (or indirect) result of their activities and operations from the habitats affected by their actions (Atkins and Macpherson, forthcoming).

As Arundhati Roy (2020) notes, "historically, pandemics have forced humans to break with the past and imagine their world anew. This one is no different. It is a

portal, a gateway between one world and the next". And we must imagine a new world.

11.5 Utopian Methods of Accounting and Imaginary Utopian Accounts

> *"… the step to cultural risk consciousness is everyday thought and imagination removed from its moorings in the world of the visible" (Beck, 1992: 73)*

An emerging field of inquiry that has a significant emancipatory potential for promoting a sustainable future is represented by exploration and power of utopian accounts that critique current practices in environmental reporting and provide a narrative vision for the telling of new stories to live by (Atkins and Maroun, no date; Atkins *et al.*, 2015).

There has been an increasing trend in environmental accounting to explore new stories to live by, supported by an epistemology that views nature as possessing intrinsic value (Atkins *et al.*, 2015; Atkins and Atkins, 2016; Maroun and Atkins, 2018). Through the characters *Thought Woman* and *Green Owl*, Dillard and Reynolds (2011) and Dillard and Reynolds (2008) call for an emergent integration of both what the authors term 'the masculine rationale' and the 'emotional/spiritual feminine'. They argue for a more inclusive, emancipatory "path towards wholeness and unity, being shaped through becoming, recognizing the *interrelated* way of life wherein humankind can flourish" (ibid.: 492, my emphasis). Dillard and Reynolds' purpose is to create a space for social change and new stories. They argue for a need to change the Newtonian perspectives that create a hierarchical value set for living beings, and thus further entrench an anthropocentric dominant ideology. In addition, there is a need to reimagine new stories and ways to view the world through "integrated systemic perspectives". Dillard and Reynolds (2011: 495) view the social

accounting project as a way to ensure the continuation of all beings on Earth, emphasising the importance of acknowledging the systemic problem and the need to "explicitly recognise the interdependence and interconnectedness of the social and natural systems".

Language that tells these new stories is capable of transcending the reality of everyday life altogether, as discussed earlier. It can refer to “experiences pertaining to finite provinces of meaning, and it can span discrete spheres of reality” (Berger and Luckmann, 1966: 54). An analysis of governance mechanisms and technologies therefore attempts to remove the taken-for-granted character of how things are done and reveal the possibility of doing things differently. Beck (2015) views the unseen emancipatory side effects of global risk, which already have altered our being in the world, as an emancipatory process of seeing the world and imagining and doing politics differently. While global risk is a dystopian vision, it has a significant power of mobilization because it is about the survival of all living beings. As discussed earlier, global risk has unintended side effects beyond ideologies and political programmes. The key to the ideas of global risk, as Beck (2015) argues, is that negative and destructive behaviour eventually produce normative horizons of common goods.

In relation to the participants’ extinction denial, *zero species extinction* (Atkins, 2021, personal communication) could be set as a target could be set up by corporations. As related in section 10.7.2.3, we require new modes of theorizing that would abandon human exceptionalism and anthropocentrism and instead focus on developing ethical ways of being.

11.5.1 Utopian imaginary shadow account: hedgehogs flourishing

PDA searches for texts outside the mainstream, "which are not yet pervasive" (Stibbe, 2018: 176) and which could offer new, more positive discourses for building better relationships with animals based on equality, respect and protection. In this way, PDA can focus on a more detailed analysis of smaller numbers of texts to reveal positive features, because, unlike CDA, it does not need to establish if these patterns are widespread and form the dominant discourse (Stibbe, 2018). Therefore, PDA can be emancipatory for more marginalized groups who produce texts, such as those written by NGOs and animal rights organisations.

I would argue that producing utopian imaginary accounts of hedgehogs, including multimodal text, can shape and carve out a positive discourse, thus PDA should not only be limited to searching for texts and analysing them, but actively producing utopian texts.

One question that could be asked in relation to this thesis is, why hedgehogs? Why should hedgehogs be expected to be represented on the world's leading agrochemicals' annual reports? Hedgehogs are a unique group of nonhuman animals from the animal rights perspective. They are not hunted, exploited in any specific industries in the UK, they are loved by the public but they are ignored. This concept of indifference within Beck's work in the face of catastrophic ecological risks relates to the absence of hedgehogs from agrochemical discourse, they and their extinction is invisible (Atkins *et al*., 2020).

In the following section, I consider what a positive discourse of accounting for hedgehogs, if agrochemical corporations produced an extinction accounting report by implementing the extinction accounting framework would look like.

11.5.2 A mock-up utopian imaginary hedgehog account

Below is a mock-up hedgehog extinction account that was modelled after Bayer's section in their integrated report. The same format and layout and corporate colours were used, but the visuals were borrowed from the author's private images taken at various hedgehog rescuers during the course of the project.

The mock-up attempts to employ the corporate genre (lexis, grammatical and clause structures) so that the discourse is easily identified in the stakeholder community.

Adopting 'Bayer's' voice, the account follows the extinction accounting framework as adapted from Maroun and Atkins (2018) and begins by explaining the ecological importance of hedgehogs, or their absence, in the ecosystem. Not only does the report explain the materiality of protecting hedgehogs to the company, it does so with emotive language that demonstrates (1) a genuine care for the species, (2) that the company goes beyond anthropocentric considerations, and (3) that the company understand the absence of hedgehogs as a material risk for their operations. As hedgehogs are classified as vulnerable to extinction on the UK Red List, Bayer follows the first stipulation of the framework. By doing so, Bayer demonstrates it is diversifying from only focusing on bees, and in this way acknowledges that their products affect other species.

Bayer, in this mock-up imaginary account address three planes of actions: (1) considering hedgehog food sources, (2) habitat, and consequently (3) the way in which agricultural practices affect hedgehogs. In all three areas, Bayer implements a true IPM together with farmers, leading to the abandonment of monocropping. This leads to a diversity in insects and molluscs that take into consideration hedgehogs' food sources. True IPM where MFFMS are no longer needed means that wildlife and hedgehogs are free to roam the fields, with enough cover, hedge systems and thus

can forage freely. Bayer also undertakes research, as part of the Bayer Hedgehog Care Program, into further understanding hedgehog ecology and the rise in internal parasites, with the deep understanding that in order to address environmental degradation, it is important to understand the interconnectedness between species. This means Bayer no longer engages with pseudo-ecology and practises a genuine holistic approach to farming. Additionally, implementing a true IPM means that Bayer changes the way in which it markets pesticides and engages with farmers. In this way, pesticides are used as a 'last resort' and where the natural environment and species are left to manage 'pests', as hedgehogs are natural pest control, eating the slugs.

An important emphasis in the imaginary disclosure is on a multi-stakeholder collaboration. Bayer partners with a UK leading hedgehog rescuer, Wild Hogs, that also centralises all of hedgehog carers' data, and helps monitor hedgehog populations. Crucially, a partnership between hedgehog rescuers, Bayer and farmers is formed so that farmers can continue to account for hedgehog needs in their fields and monitor them.

The Care Program also provides vital information to the public as well as local authorities in terms of urban hedgehogs, although the overarching aim of the initiative is to re-focus hedgehog population in the rural setting.

The disclosure is numbered along the way with points that correspond to the adapted extinction accounting framework. The disclosure acknowledges the risk and liability caused by the Monsanto acquisition and transparently lays out the plan to rectify deliberate omissions of harm and risks posed by pesticides. Finally, the report is accompanied by pictorial evidence of the success of the initiative.

The Bayer Bee Care Program (GRI)

We are the world's leading company in accounting for bee health and bee care. At Bayer, we have been caring for bees since 2011. Our Bee Care Centre researches the best ways to protect crop while making sure bees are not negatively affected. The program encourages dialogue and partnership between stakeholders who care about bees, and enhances farmers' ability to supply the best crop and food—in a world where food security is a main concern. However, bees are not the only species that biocides may affect.

Hedgehogs are a material issue

Hedgehogs are nocturnal generalist feeders, feeding largely on invertebrates such as slugs, worms, caterpillars and beetles.

They travel over 2 kilometres a night, foraging, and looking for mates. Because of land fragmentation and the way cities are built, this is a challenge for hedgehogs.

Our approach to disclosure: transparency

By producing an Integrated Report, we follow the IIRC's and GRI guidelines. This means we see sustainability and the need to protect the environment as part of our strategy, bringing long-term value creation to our investors and stakeholders.

We take the six capitals approach as central to our operations, placing value on all the resources on which our operations depend. But with the IPBES' (2019) latest report, we recognise we must play a part in making sure our products don't negatively affect the environment, and contribute to species extinction.

We care about all living beings and understand how all life depends on the health of the ecosystem.

Our Bee Care Centre makes sure farmers know how to use crop protection products safely and effectively both to ensure high yields and without harming non-target species, which has been a concern for many of our stakeholders, raised in recent listening session we held.

Why does Bayer care for Hedgehogs? (1)

At Bayer, transparency and actively taking responsibility is a key ethos. At Bayer, we are not satisfied with philanthropic gestures alone. That's why, together with the Bee Care Centre, we have launched the Hedgehog Care Centre in the UK.

Hedgehogs and indeed most living being on Earth are facing extinction in our modern world. Protecting them is a shared responsibility for us all, and this includes the crop protection industry.

Hedgehogs (1) are a priority species in the UK, and have been decreasing dramatically in the last decade. This decline is attributed to human activity, in particular resulting from car accidents, habitat destruction and land conversion to development and agriculture, and parasites, such as nematodes, flystrike, lungworm and many others. Poisoning from biocides is thought to be a risk for hedgehogs as well, as it is claimed to be killing off their food sources.

The Bayer Hedgehog Care Program (2 and 3) focuses on three key areas: 'Feed a Hedgehog', 'Healthy Habitat' and 'Sustainable Agriculture' in order to mitigate hedgehog decline.

Feed a hedgehog aims to expand hedgehogs' foraging and nesting habitats to meet the nutritional and reproductive needs. This means we continue research into the effect of neonicotinoids insecticides on non-target insects and small mammals. Working with individuals and organisations, farmers and local councils, we aim to increase food and habitat availability to hedgehogs.

Healthy Habitats is geared to research and raise awareness of correct practices of maintaining green spaces and private gardens to combat pesticide incorrect and over-use.

Sustainable Agriculture promotes the responsible use of crop protection products to ensure safety for hedgehogs in agricultural and urban landscapes, working to bring hedgehog rescuers, wildlife rescue centres and farmers , through our Forward Farms, close together to find innovative ways to optimize crop yield while providing hedges and verges for hedgehogs to thrive in.

Our partnerships (3)

Hedgehog Care Centre houses a hedgehog and wildlife hospital, a research lab and an educational visitors' centre. Bayer invites schools, educators, NGOs, and hedgehog carers to visit our centre. We have also set up a partnership with Wild Hogs Hedgehog Rescue in to develop a cross-country database for collecting data on hedgehogs admitted into care. This way, the data can be shared so that we can learn how best to help hedgehogs and other small mammals.

The hedgehog Care Program works to support farmers to provide habitats to hedgehogs, bringing back hedgerows and wildlife corridors in fields, checking for hedgehog nests in spring and summertime, minimizing crop protection use and correct application.

The program monitors known hedgehog populations in various areas, in collaboration with our partner NGOs across the UK and worldwide.

The Bayer Hedgehog Care Centre (2, 6, 10)

Our Hedgehog Care centre engages with the public in raising awareness of hedgehog decline, and what everyone can do to help hedgehogs.

We set up a hedgehog and wildlife hospital, a research lab and an educational visitors' centre. We invite schools, educators, NGOs, hedgehog carers to visit our centre and see what Bayer is doing to help halt hedgehog decline.

We have also set up a partnership with Wild Hogs Hedgehog Rescue in Gloucestershire to develop a cross-country database for collecting data on hedgehogs admitted into care. This way, the data can be shared with academics, conservationists, NGOs so that we can learn how best to help hedgehogs.

Protecting hedgehogs and other endangered species is part of our long-term strategy (7 and 9)

Accounting for hedgehogs and the action we have taken to monitor our products and ensure their safety and correct application is part of our long-term strategy and policy. We would like to assure our investors and stakeholders that we are constantly monitoring our Hedgehog Care program and audit other species that may be affected by our products and activities.

We will continuously be assessing whether our Hedgehog Care Plan is effective in mitigating hedgehog decline. (8 and 9)

(8) The acquisition of Monsanto brought with it a torrent of legal liability and risk. To combat this and regain the trust of our investors and stakeholders we have developed the hedgehog program.

Stages of reporting on hedgehogs, as adapted from the Extinction Accounting Framework (Atkins and Maroun, 2018):

(1) Record a list of plant and animal species, identified as endangered by the IUCN Red List, whose habitats are affected by the company's activities or products

1.1 Report full details (narrative as well as financial figures) relating to any fines or ongoing claims relating to endangered species legislation including the names of species and a summary of losses suffered with causes identified

(2) Report actions/initiatives taken by the company to avoid harm to, and to prevent extinction of, endangered plant and animal species

(3) Report partnerships between wildlife/nature/conservation organisations and the company which aim to address corporate impacts on endangered species and report the outcome/impact of engagement/ partnerships on endangered species as well as the outcome of engagement with the responsible investment community (respecting investor confidentiality where appropriate)

(4) Report assessment and reflection on outcome/impact of engagement/partnerships and decisions taken about necessary changes to policy/initiatives going forward

(5) Report regular assessments (audit) of species populations in areas affected by corporate operations

(6) Report assessment of whether or not corporate initiatives/actions are assisting in prevention of species extinction

(7) Report strategy for the future development and improvement of actions/initiatives: an iterative process. Ensure that the whole process of "extinction accounting" is integrated into corporate strategy and is incorporated into the company's integrated report, not resigned to separate sustainability reports or websites, including species specific information

(8) Report potential liabilities relating to future possible legal fines/claims relating to endangered species impacts

(9) Include a discussion of ways in which the company is working to prevent future liabilities related to harming endangered species

(10) Provide pictorial representation of success in conservation

Fig. 21: A utopian imaginary mock-up hedgehog account with stages of reporting (Author's own with the extinction accounting framework based on Atkins and Maroun (2018)).

It is important to emphasise once more that utopia is not only reserved to the natural world, as the issue of pesticides affects social stratification. In fact, all animal rights-related issue are not reserved strictly to nonhuman animals. Positive rights of women, the differently abled, children, and workers are all part and parcel of citizenship and human rights. Chapter 4 touches on the effects of pesticides on human health, but scarcely discusses the social ramification that access to pesticide-free food and water entails, which is beyond the scope of this project. Nevertheless, Beck discusses the risk of the globalisation noting that, "poverty is hierarchic, smog

is democratic. With the expansion of modernization risks – with the endangering of nature, health, nutrition and so on, - the social differences and limits are relativized" (Beck, 1992: 36). In other words, there is a material risk inherent in the degradation of the natural environment, where the interconnectedness of ecosystems and their prosperity are key. Pesticides poison all living beings to the point where the social stratification does not 'protect' the privileged any longer. Pesticides are a far-reaching poison and an equaliser at that.

Chapter 6 began with the quote by Ella Wheeler Wilcox who said that "To sin by silence, when we should protest makes cowards out of men". This thesis discussed various instanced of silence and erasure. From the agrochemical companies who erase the harmful effects pesticides, their own role in the poisoning of the environment, humans and nonhuman animals, and the knowledge of NGOs, to hedgehog NGOs who silence group of women who care deeply about hedgehogs and de-legitimise their knowledge. Even more crucial is that the erasure of the sixth mass extinction itself by company interviewees. Extinction in itself is an invisible and silent catastrophe that should be, as one interviewee said, screamed about. Over 619 million people have been killed in wars throughout history. The same number of farmed animals are killed every 5 days screaming behind opaque walls of slaughterhouses (Animal Clock UK, 2021). Just this year, 2,913,723,656 animals were killed in the UK alone. Over a million species are threatened with extinction and we are plagued by Covid-19. It is high time social consciousness is raised to make the link that human actions are wreaking havoc on others' lives where they should be protected, cherished, and loved.

11.6 Concluding thoughts

The multimodal and spoken discourse analysis reveal that extinction considerations are non-existent in the agrochemical sector's companies examined. In fact, accounting for biodiversity and conservation are marginal in agrochemicals' reporting, even though both companies have dedicated biodiversity initiatives (Bayer has the Bee Care Centre, and Syngenta runs Operation Pollinator). The agrochemical corporations examined here display an inadequate awareness, understanding and genuine care to hedgehogs, and the larger natural environment.

Although the companies are experiencing external pressures from NGOs and the public via extensive litigation, they remain steadfast in their denial of (1) the 6th mass extinction and the decline of biodiversity, especially insects, and (2) that the company, or its products have any negative effect on wildlife (or human health for that matter).

When biodiversity disclosures are mentioned in the reports, they are wholly divorced from other environmental disclosures such as those concerning water usage or carbon emissions. Regardless, the companies are sure to highlight key performances exceeding biodiversity targets and an overall positive development.

The aim of the thesis and its crux in the theoretical framework is to argue for risk management as an *explicit* element of the existing extinction accounting, and the species protection plan (Atkins and Macpherson, 2019) and extinction as a very material risk. Covid-19 reminds us that upsetting the balance of nature and interfering directly with wild animal species can threaten the very existence of humans on the planet (Atkins *et al*., 2020). "It is now time to enhance human consciousness of high consequence risks such as pandemics and make them visible

and explicit throughout society and the economic and financial systems around the world" (Atkins *et al*., 2020).

With the risk of sounding like a conspiracy theorist, and I do not suggest that Covid-19 has been released as a biological warfare pathogen, the threat of agrochemicals has a long and chequered history as warfare, which has been demonstrated in the thesis to continue with biologics used euphemistically natural compounds and likens them to biologics framing toxins as 'natural'. The threat of agrochemicals not only on the biodiversity and human health front continues to loom large. Today, the British government operates an extensive and sophisticated defensive program that includes research on potentially offensive pathogens, a task that could be carried out by agrochemicals.

Like warfare pathogens, hedgehog extinction does not have visuals. You cannot see their absence through a pile of shoes, as you do in holocaust museums. The night will gradually become quieter and quieter as the hedgehog snuffles and is snuffed out, the owls disappear after being poisoned by rodenticides, and foxes will be hunted to extinction and the last badger culled, are we to have another book on the subject called 'Silent Night'? Have we not learnt enough?

Extinction accounting and analysis through ecolinguistics attempts to reveal the reality of these risks by making the second reality visible through their frameworks and calls for emancipatory public and private reporting.

Finally, this thesis is about loss, profound and irreversible loss of life and the future annihilation of others. It is important to remember that extinction is not only about nonhuman animals, it is also about plant species precisely because of the interlinked web of life, as Cielemęcka and Daigle (2019: 69) note, "When one species goes extinct, the entire web of ecological dependencies is compromised. For

example, the disappearance of large animals entails the loss of seed-spreading mechanisms for plants, contributing to a decline in plant populations". Derrida (1994 in Cielemęcka and Daigle, 2019) in relation to the question of human-centred sustainability asks, "Whose future does sustainability sustain? Are we bound with responsibilities not only towards future generations of humans, but also past ones? And what about our obligations towards generations of nonhumans?"

It is also about persecution, not directly of hedgehogs, but of nature and of life that is sacred to the individuals that live them. In some ways, it is not about biodiversity or species, but about greed, ignorance, and abuse of power. Throughout the thesis, the thread of the holocaust ran through. From myself, as a researcher and third generation to holocaust survivors, as a vegan who abhors the holocaust that farmed animals experience, the loss of lives, of hedgehogs but of all other species looms large in my consciousness. The holocaust is still within living memory but human animals have still not learnt the lessons and are unable to work together. However, the extinction accounting framework, with its strong emancipatory pillar and increasing application and support from the financial community, coupled with a normative positive animal rights agenda can begin to make a difference in the lives of those voice we must sound through the shadow reality we live in.

Chapter 12: Discussion, reflection and conclusion

12.1 Conclusion and summary

The thesis is titled ‘The hedgehog in the coal mine’ because hedgehogs are a bioindicator species whose absence or presence is indicative of the state of the ecosystem (Morris, 2018). Like the canary in the coal mine indicating the danger of carbon monoxide, hedgehog absence from arable land may indicate the condition of the ecosystem that sustains life is in danger of collapse. However, unlike the canary, hedgehogs are not readily accepted as markers of environmental degradations by agrochemical corporations.

The thesis presented the story of hedgehogs and their valuable, emblematic cultural heritage not only to the British countryside, but as a friend that accompanies’ many childhoods and forged a tangible and positive link between people and nonhuman animals (NGO3). The use of hedgehogs as a case study is illustrative (Davison, 2008). Earlier this year at the time of writing, hedgehogs were classified as vulnerable to extinction on the UK red list for mammals (BBC News, 2021). Hedgehog numbers have fallen by up to 50% in rural areas since 2000 and they are registered as vulnerable to extinction on the Red List for Britain's mammals (Williams *et al.*, 2018).

The thesis offers extensive evidence to suggest that pesticides cause harm that extends those reported and discussed previously regarding bees (Atkins and Atkins, 2016). The evidence presented in chapter 4 indicates that while agrochemicals are producing harmful chemicals, they only follow regulations for authorisation dossiers stipulated by policy of HSE, which suggests that those must be made more stringent to account for the cocktail effect, adjuvant toxicity (Mesnage and Antoniou, 2018;

Mesnage, Benbrook and Antoniou, 2019; Pesticide Action Network UK (PAN), 2019b).

However, agrochemical corporations must discharge their accountability and be transparent regarding this harm. We have seen this before where Tobacco companies hid research and tilted evidence of their own research scientists that revealed the negative health impacts of cigarettes. Agrochemical companies have been implicated in unleashing dangerous and toxic chemicals on people and the environment, under partial and incomplete knowledge of their properties, such as Agent Orange, PCBs and others (Gillam, 2017, 2020a; Thomson, Dey and Russell, 2015).

We had a whistle stop tour of the development of biodiversity reporting in research as well as in practice through reporting frameworks such as the GRI and the IIRC that gave rise to the notion of integrated thinking and 'natural capital' being an integral part of an organisation's operations (Global Reporting Initiative, 2017; Pei-Chi Kelly, Maroun and de Villiers, 2020). However, as argued here following Gallhofer and Haslam's concept of emancipatory accounting potential, the currently available systems are insufficient to effectuate radical change (Deegan, 2020; Gibassier, Rodrigue and Arjaliès, 2018; Jones and Solomon, 2013). Hassan et al. (2021) suggest that integrated reporting is a key tool for incorporating the more-than-human and considering ways to halt extinction, albeit they locate the solution in the adoption of circular economy.

The way in which agrochemicals can discharge their accountability and begin to halt hedgehog extinction is by adopting the extinction accounting framework, a framework that asks for detail both visual and narrative, and demands a true overhaul

of the way in which biodiversity is positioned (Atkins and Maroun, 2018; Maroun and Atkins, 2018).

The methodology for examining the way in which Bayer and Syngenta account for biodiversity took a social constructivist approach. By applying an ecolinguistic framework to the multimodal data, the thesis unearthed a better understanding of the symbolic representation of extinction, the social ideologies that are embedded in the discursive construction of knowledge and the way in which this is played out by agrochemical corporations (Stibbe, 2015, 2012).

By examining texts and videos, the thesis is able to demonstrate that language and discourse 'do' things: "they constructs social categories, it gives orders it persuades us, it justifies, it explains, gives reasons, excuses. It constructs reality. It moves people against other people" (Lawrence, 1994: 181, in Stibbe, 2001). Language moves people against other animals too. Clearly, how we think about animals informs the way we behave towards them or, as Lawrence (1994: 182, in Stibbe, 2001) puts it, "social constructs determine the fate of animals". We have seen this not only in the way agrochemicals do not account for hedgehogs and other animals, but also with NGOs who denied that hedgehog extinction is underway in the UK, despite positioning themselves as a 'scientific, data-driven' organisation, drawing on the same discourse companies have. As Feger and Mermet (2017) note, biodiversity accountability is a collective endeavour, depending on more than one organisation. With hedgehog NGOs supporting research into hedgehog decline that focuses on roadkill as a principle cause and neglect the more insidious and long-term effect of pesticides, the COVID-19 pandemic may be telling of whether the reduced human car activity has made an impact (Wilson and Wembridge, 2018; BHPS, 2021).

However, although hedgehogs were the centre of the enquiry, they, and their earthly, human advocate voices through hedgehog carers was silenced by NGOs and agrochemicals. As one agrochemical participant so dismissively comments on an NGO

(1) S1: […]they're not driven around any sort of measurement and now they're just it's just (.) flim flam ↓

Hedgehogs and their carers are erased from consciousness, their knowledge, care, love, and unique relationship with hedgehogs and the daily sacrifice, both financial (to most), as well as temporal are not acknowledged by hedgehog NGOS.

*E2: =for me it's the save the fluffy thing people they have no place or role in the kind of what we do they they need to go back to school learn learn learn it properly then come back with a qualification because there's far too many people who go *oh I like fluffy things* (mushy voice)(2)[…] useless from a conservation perspective*

NGO 1: Mrs Miggins with her poo stained bits of card

Hedgehog rescuers are 'save the fluffy thing' who are 'useless' because they do not have a formal qualification (although most of the hedgehog carers interviewed have completed the Vale hedgehog course, and some send their volunteers to take the course). They are useless to 'real' conservationist organisations because their data collection is done on 'poo stained bits of card'. In other words, they are portrayed as a group of unreasonable, uneducated, gendered 'hedgehog ladies' that are not granted entry to the scientific, data-driven 'official' NGOs. This lack of cooperation and mutual respect results in an ineffective conservation efforts at the expense of the plight of hedgehogs.

12.2 Ecosophy: discussion

As the thesis is normative, the discourses identified in the analysis are judged against the chosen ecosophy in this thesis (Naess, 1989; Stibbe, 2015, 2020). Are the discourses identified in the empirical chapters positively constructing a healthy relationship with nature? In other words, are they conducive to halting the 6th mass extinction? The ecological philosophy and axiological paradigm applied in the thesis concern the political theory of animal rights (Donaldson and Kymlicka, 2011). The thesis identified the metaphors used by agrochemicals such as war on nature through a technocratic discourse and reject these as not encouraging the companies to alter their behaviour, and ultimately acknowledge their role in hedgehog extinction. Motivated almost solely by extrinsic values, the companies lack of transparency and accountability vis-à-vis biodiversity does not correlate with pro-animal rights or even pro-environmentalism. Earlier in chapter 7 I presented evidence that revealed that Bayer their own apparent statements about intrinsic value are still focused on minimising real responsibility. The lack of transparency is naturally interlinked with the omission of responsibility, as the trials ongoing for Syngenta and Bayer reveal.

The thesis also demonstrated that there is an element of contradiction between some participants' environmental and animal rights' values of the organisation that they work for (e.g., section 9.5). In tandem with NGOs and company scientific and anthropocentric discourses and their rejection of hedgehog carers, the carers employ a non-anthropocentric, eco-centric discourse, albeit speciesist.

Finally, the ecosophy espoused here aims to normatively encourage the redistribution of resources in agriculture as a way to assure wellbeing for human and nonhuman animals. The ecosophy calls for the formal recognition of the personhood

and positive rights of hedgehogs so that they, their homes and their rights as individual, sentient beings is protected.

12.3 Research contribution

I set out on this research journey with the aim to investigate how accounting as a practice could be transformed to halt the extinction of hedgehogs in the UK. In this way, the research I have undertaken is action-led and seeks to positively impact the natural environment as well as business activity. The thesis offers contributions on several levels in addressing hedgehog extinction, and biodiversity loss at large, by primarily focusing on the agrochemical sector. However, the research locates hedgehogs and their voices in the UK through hedgehog rescuers at the centre, with various actors participating in conservation efforts on one end, and others denying their role on the other. However, hedgehog rescuers are not visible to NGOs or companies, with NGOs focusing on hedgehogs, marginalising hedgehog rescuers and discounting their knowledge. Thus, NGOs, academics, local councils and governmental bodies as well as hedgehog rescuers have participated in the project.

The research surveyed the current accountability practices of agrochemical corporations and stakeholders in the hedgehog arena. In practice what this research turned out to be doing is aiming for a new landscape for accounting, in which power and respect flow mutually between companies, NGOs, hedgehog rescuers and the hedgehogs in their care.

Extinction is no longer a scientific enquiry, but a tangible risk of destabilising capital markets that will have a knock on effect on societies (Maroun and Atkins, 2020). Contributions to theory have been made through the application of Beck's (1992) risk society theory on the construction of reality. The normative theory I have adopted in Donaldson and Kymlicka's (2011) political theory of animals rights takes

Beck's risk society and claims that without affording all animals, and in particular in this thesis, hedgehogs and wildlife, personhood and positive rights, the risk of extinction will not be mitigated. In this way, this will also force agrochemicals and other companies to account for biodiversity in a more robust manner. Taking this normative framework seriously shapes the kind of responsible accounting research that can be done in a utopian accounting, as exemplified in chapter 11.

Practically, this research contributes on ongoing efforts in hedgehog conservation in attempts to reverse the decline.

The research provides a significant contribution to visual and multimodal analysis in social and environmental accounting research (see section 6.6.2.1). Additionally, the research contributes to ecolinguistic enquiry by further developing the ecolinguistic framework and applying it in a truly interdisciplinary research project.

12.4 Research limitations and future avenues

The thesis, both methodologically and scope-wise presents several limitation. With regard to data scope and size, the thesis selected the largest leading agrochemicals, when in fact there are other companies that produce agrochemicals. This limitation is also extended to adjuvant companies, where only one was examined in the thesis. This narrow selection is not representative of the entirety of the sector, although it gives a good indication of 'best practice' as led by the big agrochemicals.

An additional limitation regards the setting on which the thesis focused, namely, the UK. Although hedgehogs are found across Europe, Asia, the Middle East, and Africa, due to the scope of the research, especially wishing to examine policy and the authorisation process, it was necessary to focus on one locus for the study.

Circumstances, cultural implications, as well as geo-political considerations vary across continents and addressing more than one area would not allow for a close analysis.

Further studies would be necessary to compare the UK hedgehog conservation arena with other settings. Importantly, this study not only investigated hedgehog extinction, but attempted to make a link between hedgehog decline and pesticides, beyond rodenticides, as previous research found (Dowding *et al.,* 2010).
In terms of spoken data, the interviews are based in large part in the UK, and may skew representativeness of other cultural influences. Additionally, the thesis, particularly in the interview empirical chapters and analysis did not address Indexicalities of race, while only lightly touching on gender. It is my aim to develop this further in future papers, but future studies might address the gendered and racial bias of the actors in the NGO and companies, vis-à-vis hedgehog rescuers. The ecolinguistic methodology that draws on sociolinguistic analysis, particularly Interactional Sociolinguistics, would be innovative in applying in a research on private reporting on extinction.

Suggestions for further study include exploring the implementation of the extinction accounting framework in local councils, specifically by addressing stakeholders such as the ecology teams, as well as on a higher echelon such as DEFRA. These studies can focus on their accountability, and the loop of transparency and reporting. As we have seen with the WIIS and reporting on wildlife poisoning, this chain of reporting does not seem to be reaching policy level. Thus, studies focusing on governmental organisation should investigate and scrutinize reporting mechanisms.

Another avenue that I was hoping to explore was the attitude of investors to extinction in the agrochemical sector. The role of institutional investors in enhancing governance and accountability is important and investor engagement can contribute significantly to species protection and extinction prevention (Atkins and Macpherson, forthcoming).

An important avenue for further studies should examine accountability and transparency of hedgehog carers. Although to some extent this was attempted in this thesis, the scope was limited. A closer look at the way in which they communicate both online, with each other and with other stakeholders, record, and measure (or not) their care would be an important step towards debunking or confirming some of the attitudes found in the thesis towards hedgehog carers.

Another important research could also investigate the way in which agrochemicals integrate biodiversity considerations into management accounting rather than financial accounting. There is an urgent need to examine non-anthropocentric considerations of sustainability and biodiversity in accounting and reporting, particularly in relation to pandemics, wildlife and the ongoing exploitation of farmed animals.

13. Appendices

13.1 Appendix A: Interview questions

13.1.1 Questions for companies

- How is species/bee extinction prevention currently used?
- What advancement in biodiversity protections have been made?
- How do you provide information for decision making?
- How do your biodiversity initiatives promote recovery and protection to bees? Has this been extended to other species?
- What organisations do you liaise and partner with? How are your practices different to those organisations?
- What are your attitudes towards reporting frameworks?
- What main issues and constrains does the company face in reporting on biodiversity?
- What are the main barriers or difficulties for the company in taking part in biodiversity conservation activities and disclosures?
- What are the most affected species? Could your biodiversity initiatives be extended to other beings?
- Does the company see extinction as part of its sustainability ratings?
- Has the 2016 neonicotinoid ban
- Do you think pesticide could affect other species in the food chain?
- Do you believe your company has an obligation for biodiversity conservation?
- How could pesticides affect biodiversity? Is that a risk that should be reported?
- There is mounting evidence that hedgehogs are indirectly affected by pesticides. Would you like to comment on this?
- What drives you to work on biodiversity related issues?
- Do you think some species have more priorities than others in terms of conservation?
- Would the extinction accounting framework be something the company be interested in implementing? Why yes/no? What are the constraints and challenges?
- What are your personal attitudes towards hedgehogs?
- Do you have a broader interest in conservation and animal rights?

13.1.2 Questions for NGOs

- How are terrestrial wildlife monitored? Does this feed into any national conservation strategies?
- Are any extinction threatened species accounted for?
- What partnerships does the organisation foster?
- What drives you to work on biodiversity related issues?
- How does the organisation perceive hedgehog decline? Would you characterise it as an extinction?
- Do you have a broader interest in conservation and animal rights?
- What are your attitudes towards pesticides and the role that they play in hedgehog extinction in the UK?
- What relationship have you fostered, if at all, with hedgehog rescuers? What are your attitudes towards them?
- How can your organization render communication with other stakeholders more effective for biodiversity conservation and reporting?
- Could you talk me through the way adjuvants get registered and what is the UK's national competency?
- How are adjuvants accounted for?

13.1.3 Questions for Hedgehog Rescuers

- What drives you to work on biodiversity related issues?
- How do you record and monitor the hedgehogs that come in to your rescue?
- How did you train and learn to rehabilitate hedgehogs?
- What is your personal journey to hedgehog rescuing?
- How do you refer to your work (hedgehog rescuer/rehabilitator, etc)?
- Do you have a broader interest in conservation and animal rights?
- How do you promote the rescue?
- Do you communicate and liaise with other hedgehog rescuers and other organisations? Tell me about some of your experiences.
- What are your views on hedgehog poisoning with pesticides and rodenticides? Do you have any experience with poisoned hedgehogs?
- In your experience, would you say poisoning and specifically pesticides, play an important role in hedgehog extinction?
- What is your view on using the term extinction in relation to hedgehogs' decline?

13.1.4 Questions for academics

- What is the risk assessment with regard to adjuvants?

- What is the relationship between the agrochemicals and the adjuvant companies in terms of CBI?
- Could you explain the synergistic effect of cocktail mixtures?
- What are your views on your institution being funded by agrochemicals?
- Do you believe companies should be preforming the regulatory authorization tests?
- Is it possible to generalize the findings of pesticide effects on mammals across the board?

13.1.5 Questions for local councils and governmental bodies

- How does the council account for use of pesticides?
- How much glyphosate is sprayed in amenity areas? How is pesticide use accounted for?
- What biodiversity campaigns have your local council been involved with?
- What other stakeholders and partnerships does the council cultivate?
  - (For council ecologists):
    - does you work feed into any local government biodiversity reporting and accounting? Does that feed into a national BAP or something similar?
  - (for HSE):
    - why have the annual reports written until 2006 and are now only available in an Excel spreadsheet?
    - Do Natural England or CRD analyse the information in the spreadsheet and present it to DEFRA?
    - Can you confirm the tissue analysis of the cadavers of wildlife that has been submitted for analysis tests for only the active ingredients of pesticides? Are heavy metals, co-formulations also tested for? Are metabolites of pesticides being tested for as well?
    - Could you comment on the categories used for classification of poisoning? Are those stipulated by CRD? If so, why have these changed since 2006?
    - Is there any ongoing work trying to include heavy metals and adjuvant testing at WIIS/FERA on wildlife cadavers?

13.2 Appendix B: WIIS report analysis 2018 (WIIS, 2019)

13.2.1. Cause of death was determined in:

1.1 Trauma: 99
Of which are associated with background pesticides: 8
1.2 Disease: 14 total
Of which associated with pesticides: 7
1.3 Lead poisoning: 1
1.4 Pesticide poisoning:
Bendiocarb: 12 (raven, red kite, honey bee)
Rodenticides: 17 (dog, fox, red kite, buzzard)
Alphacloralose: 1
Isofenphos: 1
Carbofuran: 8 (buzzrd, peregrine)
Carbaryl: 2 (red kite)
Aldicarb: 4
Methiocarb: 1
Diazinon: 1
Mixture:
chlorpyrifos, diazinon, fipronil, imidacloprid, thiamethoxam: 1
Lambda-cyhalothrin: 1
Pirimiphos methyl: 1
Trauma and high levels of rodenticides: 2 (red kites)
Trauma and mixture of brodifacoum, bromadiolone, coumatetralyl, difenacoum, difethialone: 2
Total: 54
1.5 Starvation
No pesticide association: 15
Associated with background pesticides: 21
Total: 36
Total identified causes of death: 204

13.2.2 Incidents tested positive for pesticides and other chemicals:

Anticoagulant rodenticides (brodifacoum, bromadiolone, difenacoum): 117

Flea treatment chemicals:3

Diazinon: 1

Alphachloralose Non-anticoagulant rodenticide: 1

Aldicarb: 1 (raven)

DDD+DDE: 8

Metaldehyde: 1

Fenbendazole and oxfendazole: 1

Bendiocarb: 1

Cyproconazole: 1

Chlorophacinone: 1

Prothioconazole: 1

Tebuconazole and boscalid: 1

Total: 138

13.2.3. Animal victims:

Total: 459 (not accurate because is some cases it states multiple).
Number of species: 58
The original excel spreadsheet compiled by WIIS does not specify the species found and analysed. In many cases, there are more than one specie possible. Where possible, the native specie in the UK was selected to determine the conservation status.

13.2.4 Analysis of the WIIS poisoned victims excel with latin names of species and their conservation status in the UK and IUCN

Common name	Latin* name (for species common in the UK)	Number	UK conservation status	Global status (IUCN)	Notes
Badger	meles meles	12	LC	LC stable	
Barn owl	Tyto alba	13	Green	Global LC stable	
Black backed gull	Larus Marinus	1	Amber	LC unkown	
Bumble bees	Bombus terrestris	4 incidents comprising masses		IUCN LC increasing	the fact that the species is not mentioned and identified in the report makes it impossible to link this to the conservation status of the bumble bees.
Buzzard	there are different species of buzzards in the UK buzzard	107	green	LC	
	Rough-legged buzzard		rare visitor	LC	
	honey buzzard		amber		
Capercaillie	Tetrao urogallus	1	Red	LC decreasing	
Cat		13			
Chicken		Many			
Corvids		1			types of crows are not specified so there is no way to link this to conservation

					status
Crow: Hooded Crow Carrion Crow	Corvus cornix Corvus corone	13	Green	N/A LC increasing	there are different species of crow in the UK,
Dog		16			
Fox	Vulpes vulpes	25		LC	Not protected by law except hunting with dogs
Golden eagle	Aquila chrysaetos	7	Green	LC	
Goldfish	Carassius auratus	19		LC	Non-native species in the UK
Goshawk	Accipiter gentilis	1	Green	LC unknown	
Great crested grebe	Podiceps cristatus	N/A	Green	LC unknown	
Hedgehog	Erinaceus europaeus	1	VU	LC Stable	
Hen harrier	Circus cyaneus	7	Red	LC decreasing	
Hen		1			
Herring gull	Larus argentatus	51	Red	LC decreasing	
Honey bees	Apis mellifera	12 incidents comprising masses		DD	No wild bees in the UK
Kestrel	Falco tinnuculus	4	Amber	LC decreasing	
Lesser horseshoe bats	Rhinolophus hipposideros	22+large quantity	Native, rare and endangered	LC decreasing	It is a priority species in the UK Biodiversity Action Plan
Long eared owl	Asio otus	2	Green	LC decreasing	
Merlin	Falco columbarius	1	Red	LC Stable	
Moorhen	Gallinula chloropus	2	Green	LC Stable	
Mouse		2			not enough information
Osprey	Pandion haliaetus	2	Amber	LC increasing	
Otter	Lutra lutra	2	Priority species list	NT decreasing	Protected under Article 5
Ovine		1			
Partridge	Perdix perdix	9	Red	LC decreasing	
Peregrine falcon	Falco peregrinus	9	Green	LC stable	
Pheasant	Phasianus colchicus	4	introduced	LC decreasing	

Pig		1			
Pigeon	Columba livia	4	Green	LC decreasing	
Pine marten	Martes martes	1	LC	LC stable	*but Critical in England
Rabbit	Oryctolagus cuniculus	13+ numerous	NT	NT	
Rat	Rattus rattus	3	CR	LC stable	naturalised
Raven	Corvus corax	12	Green	LC increasing	
Red kite	Milvus milvus	30	Green	NT decreasing	
Rook	Corvus frugilegus	1	Green	LC decreasing	
**Sea eagle chick	Haliaeetus albicilla	2	Red	LC increasing	
**Sea eagle	Haliaeetus albicilla	3	Red	LC increasing	
Seal	Phoca vitulina	1	Priority Species under the UK Post-2010 Biodiversity Framework	LC unknown	
Sheep		5			
Short eared owl	Asio flammeus	1	Amber	LC decreasing	
Sparrowhawk	Accipiter nisus	8	Green	LC stable	
Roe deer	Capreolus capreolus	1	LC	LC increasing	
Squirrel	(Red) Sciurus vulgaris (Gray) Sciurus carolinensis	2	EN NA	LC decreasing LC increasing	Again, there is no mention of the species in the report
Starling	Sturnus vulgaris	1	Red	LC decreasing	
Stoat	Mustela erminea	2	LC	LC stable	
Swan	Cygnus Cygnus or Cygnus columbianus bewickii	5	Amber	LC unknown	
Tawny owl	Strix aluco	5	Amber	LC stable	
**White tailed eagle	Haliaeetus albicilla	2	Red	LC increasing	
Wildcat	Felis silvestris	1	Not present in the UK	LC decreasing	Native and critically **endan gered**; extinct in **England** and Wales. The Scottish **wildcat** is a priority species under

					the **UK** Biodiversity Action Plan (listed as such in 2007). It is protected under **UK** and European law and the Convention on International Trade in **Endangered** Species (CITES).
Woodpigeon	Columba palumbus	multiple	Green	LC increasing	

** In the original WIIS spreadsheet, both terms are used: sea eagle and white tailed eagle but there are other eagles in the family of Accipitridae, so there's no way of knowing if the same species is referred to so I kept the entries separate

13.3 Appendix C: Bayer Annual report texts for analysis

13.3.1. Text 1: Chairman's Letter (p.6-10)

Key:
Actor ; goal; circumstance
Process (Pr): material, mental, existential, verbal, relational
[]] - embedded clause
S – subject
O- object
C- complement

1

The safety of our products	*is*	*our top priority*
S	*V*	*C*
Token	*relational*	*value*

Dear stockholders and friends of Bayer:

2

Dear stockholders	*and*	*friends of Bayer*
Noun phrase	*connector*	*Noun phrase*
Participant		*participant*

3

I	'm	pleased	[to present [our new Annual Report] , [which looks back on a particularly eventful year [that was not an easy one]].

S	V	C	Embedded clause with relative clause
token	Pr: relational	value	Resultative attribute

4

In 2018,	we	completed	the biggest acquisition in Bayer's history, advancing to the number one position in the agriculture sector.
	S	V past finite	O
Circ:time	Actor	Pr: material	goal

5

With that,	we	have stringently focused	our businesses [on the growth markets of health and nutrition, [[where we are among the best companies in the world with our know-how and innovation capabilities.]]]
Preposition with demonstrative pronoun, acting as connector	S	V	O with embedded clause
Circ: purpose	Actor	Pr: material	Goal [with circ:location]

6

Nevertheless,	the performance of our stock [in 2018]	was	very disappointing.
Conjunctive adv	S	V	C
Circ: manner	Token [with circ:time]	Pr: relational	value

While the DAX was down 18 percent on the year,	our share price	dropped	by about 40 percent.
Subordinate clause	independent clause S	V - passive	
	Actor	Pr: material	Circ:manner

7

[After	we	had to	accept a ruling	[[–which	we	consider	to be incorrect –]]	by a court of first instance in the United	the strategic progress [we made] and the	were overshadowed	by the u outcome product litigatio concerning glyphosate.]

Commented [ML1]: Uncertain – a court found them liable: https://www.theguardian.com/business/2019/mar/27/monsanto-trial-verdict-cancer-jury

Subsequent cases so far are being settled for up to 10 billion dollars: https://usrtk.org/monsanto-roundup-trial-tracker-index/

								States,]	company ’s solid operational performance		
	S	Modal V	O	Relative pronoun	S	V	O	Circumstance of the subordinate clause	S	V passive	O
Subordinate clause				Embedded Relative clause							
Circ: time	Actor	Pr: material	goal	Circ:	senser	Pr: mental	phenomenon	Circ: behalf	senser	Pr: mental metaphor	phenomenon

8

Although it <u>was</u> these topics [that dominated the headlines],	I	believe	it’s important [to emphasize [that last year we again <u>kept</u> our company’s main promise] – “Science for a better life” – millions of times over.
Subordinate clause	S	V finite	Ellipted that-clause, with embedded clause and metaphor
	senser	Pr: mental	Resultative attribute

9

Our products	have helped	[to improve] the lives of our customers – patients, consumers and farmers.
S	V aux+finite	O
Actor	Pr: material	Resultative attribute

10

That is [what defines us],	and	that is [what <u>drives</u> our actions.]
wh-dependent demonstrative cleft clause with demonstrative pronoun that as subject	coordinator	wh-dependent demonstrative cleft clause with demonstrative pronoun that as subject

11  **(Image 2)**

12

Our employees throughout the world	are	key	[to making this possible.]
S	V	C	Embedded clause
Token	Pr: relational	Value	Resultative attribute

13

In 2018,	they	again put	their skills and their passion into their commitment to Bayer
Preposition of time	S	V+adv	C
Circ: time	Actor	Pr: *material v as I interpret it as 'worked hard'	goal

14

On behalf of the Board of Management,	I	would like[to sincerely thank]	them for that commitment
	S	V finite	O
Circ: behalf	Senser and sayer	Pr: mental and verbal	
, and	I	also would like to thank	you, dear stockholders, for your support and trust.
connector	S	V finite	O
	Senser and sayer	Pr: mental and verbal	

15

Operationally,	we	experienced	a difficult market	in 2018, [with significant negative

			environment	currency effects and growing uncertainty caused by global trade disputes.
		A mental verb for a material process (loss of money)		Circumstance with embedded clause

16

On top of that,	we	were	unable [to fully exploit our growth potential] because of [production bottlenecks in the Pharmaceuticals Division and structural problems at Consumer Health.]
	S	V	C
Circumstance	Token	Pr: relational	value

17

We	nevertheless	increased	our Group sales by 4.5 percent on a currency and portfolio-adjusted basis.
S	Subordinator adverb	V	O
Actor		Pr: material	goal

18

EBITDA	before special items	benefited	from the second-half earnings contribution from the acquired Monsanto business	and	rose	by nearly 3 percent.
S		V	C	Coordinator	V	
Actor	Circ: time	Pr: material	Circ: manner		Pr: material	Circ: manner

19

In 2018,	there	was	also some encouraging news [about our pharmaceuticals pipeline] and [our ongoing product development.]
Preposition of itme	S	V	O
Circ: time	Existential there	Pr: existential	existent

20

For example,	we	received	approval	in the United States for Vitrakvi™, a highly effective and innovative cancer medication.
	S	V	O	indirect object
	actor	Pr: material	goal	Circ: place

21

e	successfully concluded	a Phase III study of darolutamide,	a development substance	llipted which/that	e	are working on	in oncology together with a partner.
	V+ adverb	O	Relative clause		S	V phrasal	
				Embedded clause			
	Pr:	goal			a	P	C

ctor	material				ctor	r: materia l	irc: location

22

Xa relto™	became	the only oral anticoagulant to be approved in the United States and Europe	for the treatment of coronary artery disease and peripheral artery disease.
S	V	O	Prepositional clause
Ac tor	Pr: material	goal	

23

At the same time,	we	achiev ed	further progress with our Leaps projects in disruptive technologies, such as in the area of stem cell research, together with our partners.
	S	V	O
Ad v time	Actor	Pr: material	goal

24

We	successfully completed	the acquisition of Monsanto	in summer 2018	following lengthy and intensive antitrust processes .
S	V+adv	O	Adv time	
Actor	Pr: material	goal	Circ: time	Prepositional phrase

25

The integration	is off to	a very good start and advancing rapidly.
S	V	O+ adv
Actor	Pr: relational	goal

26

Equally encouraging	is	the progress	we	have made	on reducing debt		
C	V	S	S				
			Embedded qualifier clause in noun phrase				
g	P	Acto					

oal	r: relational	r		r: material			

27

Our net financial debt of approximately € 36 billion	is	€3 billion	less than	we	had expected	at the start of the year.	
S		O			V		
				Embedded clause			
token	Pr: relational	value		enser	Pr: mental		

28

s I already mentioned,	there	was	a great deal	of discussion	last year	about the safety of glyphosate.	

	Existential there	V	O	Prepositional phrase	Adv time	Prepositional phrase	
				Object qualifier			
		Pr: relational	token		Circ: time	Circ	

29

The ruling by a court of first instance in the Johnson case	led to	negative reactions	in the media and the capital markets.
S	V	O	
Actor	Pr: material	goal	Circ: place

30

This	played into the hands	of the activists and professional critics of	Among consumers and stockholder	it	mainly caused	uncertainty.	

		agriculture.	s,				
	V metaphorical	O			V	complement	
				Embedded clause			
	Pr: mental	phenomenon		actor	Pr: material		

31

Yet	the facts	have not changed:	glyphosate	is	a safe product.		
	S	V	S O		complement		
				Embedded clause			
	Actor	Pr: material	Goal/token	Pr: relational	value		

32

That	has been proven	by numerous scientific studies and the	throughout the world	over a period of more than 40 years.

		independent assessments of regulatory authorities		
	V passive	O	Prepositional phrase	Prepositional phrase of time
Actor	Pr: material	goal	Circ: place	

33

Most recently,	the Canadian health ministry	once again reviewed	the safety of glyphosate,	stating unequivocally in January 2019 that	"No pesticide regulatory authority in the world currently	considers	glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed."

dv time	S	V	O		S	V	O
				verbiage			
	sayer	Pr: verbal			actor	Pr: mental	phenomenon

34

or us,	this official statement	serves	to underline once again	that	we	have	the scientific facts on our side.
	S	V	O		S	V	
				Embedded clause			
	phenomenon	Pr: mental	Prepositional phrase		actor	Pr: material	goal

35

We	will therefore continue to vigorously defend	glyphosate	in all the pending litigation.
S	V	O	
sayer	Pr: sayer	verbiage	Circ: place

36

In light of all these developments,	2018	was	a challenging year	but also	a year of significant progress.		
	S	V	complement		complement		
				Embedded clause			
	token	Pr: relational	value		value		

37

	am	pleased	that	for 2018	we	can once again enable	you, our stockholders, to participate appropriately in Bayer's success.
	V	complement			S	V phrasal	O
				Embedded clause			
token	Pr: relational	value			actor	Pr: material	goal

38

We	are therefore proposing	to the Annual Stockholders' Meeting	a dividend of €2.80 per share, leading to a new record dividend payout.
S	V	Indirect object	O
say	Pr: verbal		verbiage

er			

39

At the end of last year,	we	announced and explained	our company's updated strategy along with a related package of measures and ambitious medium term financial targets.
Adverbial	S	V	O
Circ: time	Sayer	Pr: verbal	verbiage

40 .

Our success in the coming years	will depend partly on	accomplishing the integration at Crop Science	but also	on implementing the measures [we announced] and [adjusting the innovation model in our pharmaceuticals business]
S	V	O1	connector	O2
senser	Pr: mental	phenomenon		

41

This	will put	Bayer	in the best possible position [to deliver long-term value creation as a world-leading life science company.]
Anaphoric demonstrative pronoun	V - strong epistemic modality	goal	
	Pr: material	Actor	Circ: means

42

42.a Based on our mission "Science for a better life,"	we	help	to address questions in health and nutrition [that are of paramount

			importance in people's lives]:
Subordinate clause	S	V	C
	actor	Pr: material	

42.b How	can	we	feed	a constantly growing global population in an era of climate change?
Interrogative adverb	aux. verb	S	V	O
Interrogative clause				
Circ: means	Pr: material	Actor	Pr	goal

42.c How	can	we	use	innovation	to shape demographic change in such a way that it leads to a longer lifetime that can be actively used in good physical and mental condition?
Interrogative adverb	aux. verb	S	V	O	
Interrogative clause					
Circ: means	Pr: material	Actor	Pr: material	goal	Resultative attribute

42.d How	can	we	ensure	that	people in developing countries	benefit better from	the latest research and technological progress?
Interrogative adverb	aux. verb	S	V	Embedded relative clause			
Interrogative clause							
Circ: means		senser	Pr: mental		senser	Pr: mental	Phenomenon
				Projection			

42.e How	can	we	best utilize	the opportunities of digitalization and artificial intelligence [for the benefit of patients, consumers, farmers and the environment]?
Interrogative adverb	aux. verb	S	V	
Interrogative clause				
Circ: means		senser	Pr: material	goal

42.f How	can	we	ensure	that	the world	manages	its finite resources responsibly and sustainably?
Interrogative adverb	aux. verb	S	V	Embedded clause			
Interrogative clause							
Circ: means		senser	Pr: mental		actor	Pr: material	goal

43

The answers [to these questions]	will clearly determine	not only our future prosperity	but also	our social cohesion.
S	V - strong epistemology	O	Connector+ conjunction	O
actor	Pr: material	Goal		goal

44

We	aim	to make our contribution as a company with a global reach, a global perspective and a strong sense of responsibility.

S	V	
Senser	Pr: mental	Resultative attribute

45

We	plan	to invest some €35 billion in our future during the period through 2022,	with research and development accounting for over two-thirds of this figure.
S	V	C	
Senser	Pr: mental	Resultative attribute	Circ: role

46

Our realigned Crop Science Division	is working on	innovative seed and crop protection products, digital and customized solutions for farms of all sizes, and new approaches to sustainable, resource-efficient agriculture.
S	V (phrasal)	O
Actor	Pr: material	goal

47

e	are working on	improvements in health care,	whether through our Pharmaceuticals Division [which is focusing on therapeutic areas with a

			high medical need] or through [the over-the-counter products of our Consumer Health Division] [which support individual health protection.]
	V	O	Correlative coordinator clause
ctor	Pr: material	goal	

48

The safety of our products [and the well-being of customers and patients]	are	our top priority.
S	V	O
Value	Pr: Relational	token

49

Our activities in health and nutrition	are united	by the common Bayer brand,	which enjoys a very good reputation around the world, standing for quality and integrity, as well as by a common infrastructure and, not least, by a common and vibrant corporate

			culture.
S	V passive		Relative clause
Value	Pr: relational	Token	

50

At Bayer,	we	place great value on	trust and mutual respect in our dealings with one another.
Adv place	S	V phrasal	O
Circ: Location	Senser	Pr: mental	Phenomenon

51

We	want	people	to know	[what	Bayer	stands for].
S	V	O				
Senser	Pr: mental	Phenomenon			senser	Pr: mental
			Resultative attribute with embedded clause			

52

We	plan to build on	the pioneering role		we	have assumed	regarding transparency, [such as through the publication of numerous safety studies in crop protection.]
	V + phrasal infinitive	O			V	O
Senser	Pr: mental	Phenomenon	Ellipted 'that'	Actor	Pr: material	goal

53

And	we	intend to live up to	our responsibility [as a global corporation [through our ongoing commitment to the principles of the United Nations Global Compact] and [an orientation toward clear values.]
Connector		V+ infinitive phrasal	C
	senser	Pr: mental	phenomenon

54

We	want	to be judged	– also by you, our stockholders	on our adherence to these values and [our attainment of the

			–	ambitious targets [we have set for the coming years.]
	V	Infinitive	Direct address	Prepositional phrase with embedding
Senser	Pr: mental	Resultative attribute	Circ: behalf	Circ: manner

55

Thank you	for the trust	you	place	in Bayer.
		S	V	
Direct address	Circ: reason	senser	Pr: mental	Circ: behalf/location

56

In 2019,	we	will continue	to do all		we	can	to live up to	this trust.
Preposition of time	S	V strong epistemic modality		Ellipted 'that'	S	Modal verb	Infinitive phrasal verb	O
Circ: time	actor	Pr: material	Resultative attribute		Senser	Pr: mental		phenomenon

57 Sincerely,

58

59 Werner Baumann
Chairman of the Board of Management of Bayer AG

13.3.1.1 Reference chains text 1 (Chairman's Letter):

Key to reference analysis (following Eggins, 2004: 38)

Number refer to sentences Ties are anaphoric unless indicated by: **C**: cataphoric **S**: esphoric **P**: comparative **L**: locational **B**: bridging **H**: homophoric **X**: Exophoric

Chain 1: CEO, Werner Baumann

(1) chairman's letter - (3) I'm - (8) I - (14) I - I

Chain 2: Bayer/Company/business segments

(1) our - (4) we - Bayer's history - (5) our business - we - our know-how- (6) our stock - our share price - (7) we - we - we - the company's - (8) we - our company's - (10) our actions - (12) our employees - (14) Board of management - (15) we - (16) - we - our growth potential - (17) we - our group sales - (21) we - our company's updated strategy - our success - (22) we - our pharmaceutical business - (23) - Bayer - (24) we - we - (25) our future prosperity - our social cohesion - we - our contribution as a company - (26) we - our future - (27) our realigned crop science Division - (28) we - our Pharmaceuticals Division - (29) our top priority - (30) our activities - the common Bayer brand - (31) Bayer - we - our dealings with one another - (32) - we - Bayer - we - (34) we - our responsibility - (35) we - our adherence - our attainment - we - (36) Bayer - (37) we

Chain 3: Stockholders/Shareholders

(2) dear stockholders - (14) you dear stockholders - your support and trust- (35) you - our stockholders-

Chain 4: Products

(1) safety of our products - (9) our products - (29) - the safety of our products

Chain 5: Employees

(12) our employees - (13) they - (14) them

Chain 6: Other stakeholders

(2) friends of Bayer - (9) the lives of our customers, patients, consumers, farmers - (24) people in developing countries - patients, consumers, farmers

and the environment - the world - (29) well-being of customers and patients - (32) people

Chain 7: Support/Trust
(8) main promise – (13) their commitment – (14) sincerely – your trust and support- (23) best possible position – (30) very good reputation around the world - quality and integrity – (31) great value on trust and mutual respect – (33) transparency – (34) clear values – (36) trust – (37) live up to this trust

Chain 8: Responsibility

(1) our top priority –(24) responsibly and (25) a strong sense of responsibility – clearly determine – (29) our top priority – (30) quality and integrity – (33) transparency – safety studies- (34) our responsibility as a global corporation – our commitment – clear values – (35) these values

Chain 9: Environment
(24) climate change – environment – finite resources – sustainably – (27) sustainable – resource-efficient agriculture

Chain 10: 'best company'

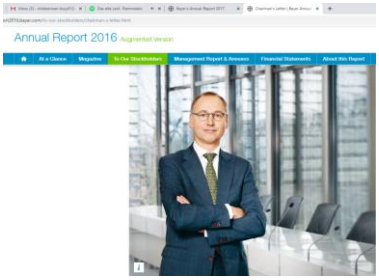
(4) biggest acquisition in Bayer's history – advancing to number one position – (5) among the best companies in the world – our know-how – innovation capabilities – (7) solid operational performance – (8) a million times over – (17) increased sales – (18) benefited from – rose -(20) successfully – (21) ambitious – (22) our success – (23) best possible position – a world leading life science company – (30) very good reputation around the world – quality and integrity – common and vibrant corporate culture – (35) attainment – ambitious targets

Chain (11): 'difficult year'
(3) Not an easy one (6) very disappointing – down – share price dropped – (7) overshadowed – uncertain – (15) difficult market environment – negative currency – growing uncertainty – unable – production bottlenecks – structural problems

13.3.1.2 Image analysis Text 1

Since this report does not have many images, compared with that of 2017, I have analysed the current images in the text, but also contrasted them with the ones from the previous year, finding an interesting progression.

2016



https://www.annualreport2016.bayer.com/to-our-stockholders/chairman-s-letter.html

2017

https://www.annualreport2017.bayer.com/to-our-stockholders/chairman-s-letter.html?pk_campaign=startseite&pk_source=ceo-btn

2018

(Image 2) (11)

13.3.1.3 Full text

Chairman's Letter

1 The safety of our products is our top priority

2 I'm pleased to present our new Annual Report, which looks back on a particularly eventful year that was not an easy one.

3 In 2018, we completed the biggest acquisition in Bayer's history, advancing to the number one position in the agriculture sector.

4 With that, we have stringently focused our businesses on the growth markets of health and nutrition, where we are among the best companies in the world with our know-how and innovation capabilities.

5 Nevertheless, the performance of our stock in 2018 was very disappointing.

6 While the DAX was down 18 percent on the year, our share price dropped by about 40 percent.

7 After we had to accept a ruling – which we consider to be incorrect – by a court of first instance in the United States, the strategic progress we made and the company's solid operational performance were overshadowed by the uncertain outcome of the product liability litigation concerning glyphosate.

8 Although it was these topics that dominated the headlines, I believe it's important to emphasize that last year we again kept our company's main promise – "Science for a better life" – millions of times over.

9 Our products have helped to improve the lives of our customers – patients, consumers and farmers.

10 That is what defines us, and that is what drives our actions.

11 Our employees throughout the world are key to making this possible.

12 In 2018, they again put their skills and their passion into their commitment to Bayer.

13 On behalf of the Board of Management, I would like to sincerely thank them for that commitment, and I also would like to thank you, dear stockholders, for your support and trust.

14 Operationally, we experienced a difficult market environment in 2018, with significant negative currency effects and growing uncertainty caused by global trade disputes.

15 On top of that, we were unable to fully exploit our growth potential because of production bottlenecks in the Pharmaceuticals Division and structural problems at Consumer Health.

16 We nevertheless increased our Group sales by 4.5 percent on a currencyand portfolio-adjusted basis.

17 EBITDA before special items benefited from the second-half earnings contribution from the acquired Monsanto business and rose by nearly 3 percent.

18 In 2018, there was also some encouraging news about our pharmaceuticals pipeline and our ongoing product development.

19 For example, we received approval in the United States for Vitrakvi™, a highly effective and innovative cancer medication.

20 We successfully concluded a Phase III study of darolutamide, a development substance we are working on in oncology together with a partner.

21 Xarelto™ became the only oral anticoagulant to be approved in the United States and Europe for the treatment of coronary artery disease and peripheral artery disease.

22 At the same time, we achieved further progress with our Leaps projects in disruptive technologies, such as in the area of stem cell research, together with our partners.

23 We successfully completed the acquisition of Monsanto in summer 2018 following lengthy and intensive antitrust processes.

24 The integration is off to a very good start and advancing rapidly.

25 Equally encouraging is the progress we have made on reducing debt.
26 Our net financial debt of approximately €36 billion is €3 billion less than we had expected at the start of the year.

27 As I already mentioned, there was a great deal of discussion last year about the safety of glyphosate.

28 The ruling by a court of first instance in the Johnson case led to negative reactions in the media and the capital markets.

29 This played into the hands of the activists and professional critics of agriculture. Among consumers and stockholders, it mainly caused uncertainty.

30 Yet the facts have not changed: glyphosate is a safe product.

31 That has been proven by numerous scientific studies and the independent assessments of regulatory authorities throughout the world over a period of more than 40 years.

32 Most recently, the Canadian health ministry once again reviewed the safety of glyphosate, stating unequivocally in January 2019 that “No pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed.”

33 For us, this official statement serves to underline once again that we have the scientific facts on our side.

34 We will therefore continue to vigorously defend glyphosate in all the pending litigation.

35 In light of all these developments, 2018 was a challenging year but also a year of significant progress.

36 I am pleased that for 2018 we can once again enable you, our stockholders, to participate appropriately in Bayer’s success.

37 We are therefore proposing to the Annual Stockholders’ Meeting a dividend of €2.80 per share, leading to a new record dividend payout.

38 At the end of last year, we announced and explained our company's updated strategy along with a related package of measures and ambitious medium-term financial targets.

39 Our success in the coming years will depend partly on accomplishing the integration at Crop Science but also on implementing the measures we announced and adjusting the innovation model in our pharmaceuticals business.

40 This will put Bayer in the best possible position to deliver long-term value creation as a world-leading life science company.

41 Based on our mission "Science for a better life," we help to address questions in health and nutrition that are of paramount importance in people's lives:

41a How can we feed a constantly growing global population in an era of climate change?

41b How can we use innovation to shape demographic change in such a way that it leads to a longer lifetime that can be actively used in good physical and mental condition?

41c How can we ensure that people in developing countries benefit better from the latest research and technological progress?

41d How can we best utilize the opportunities of digitalization and artificial intelligence for the benefit of patients, consumers, farmers and the environment?

41e How can we ensure that the world manages its finite resources responsibly and sustainably?

42 The answers to these questions will clearly determine not only our future prosperity but also our social cohesion.

43 We aim to make our contribution as a company with a global reach, a global perspective and a strong sense of responsibility.

44 We plan to invest some €35 billion in our future during the period through 2022, with research and development accounting for over two-thirds of this figure.

45 Our realigned Crop Science Division is working on innovative seed and crop protection products, digital and customized solutions for farms of all sizes, and new approaches to sustainable, resource-efficient agriculture.

46 We are working on improvements in health care, whether through our Pharmaceuticals Division which is focusing on therapeutic areas with a high medical need or through the over-the-counter products of our Consumer Health Division which support individual health protection.

47 The safety of our products and the well-being of customers and patients are our top priority.

48 Our activities in health and nutrition are united by the common Bayer brand, which enjoys a very good reputation around the world, standing for quality and integrity, as well as by a common infrastructure and, not least, by a common and vibrant corporate culture.

49 At Bayer, we place great value on trust and mutual respect in our dealings with one another.

50 We want people to know what Bayer stands for.

51 We plan to build on the pioneering role we have assumed regarding transparency, such as through the publication of numerous safety studies in crop protection.

52 And we intend to live up to our responsibility as a global corporation through our ongoing commitment to the principles of the United Nations Global Compact and an orientation toward clear values.

53 We want to be judged – also by you, our stockholders – on our adherence to these values and our attainment of the ambitious targets we have set for the coming years.

54 Thank you for the trust you place in Bayer. In 2019, we will continue to do all we can to live up to this trust.

Sincerely,

Werner Baumann

Chairman of the Board of Management of Bayer AG

13.3.2 Text 2: Report of the supervisory board letter to stockholders by Werner Wenning (p.12-17)

1 *Report of the Supervisory Board*

2 Dear stockholders:

3

During 2018,	the Supervisory Board	monitored	the conduct of the company's business by the Board of Management on a regular basis with the aid of detailed written and oral reports received from the Board of Management,	and also	acted	in an advisory capacity
Prep time	S	V	O	connector		
Circ: time	behaver	Pr: behavioural	phenomenon		Pr: behavioural	Circ: role

4

In addition,	the Chairman of the Supervisory	maintained	a constant exchange of

	Board		information with the Chairman of the Board of Management and with the other Management Board members.
	S	V	O
Circ: time	behaver	Pr: behavioural	phenomenon

5

In this way	the Supervisory Board	was kept continuously informed	about the company's intended business strategy, corporate planning (including financial, investment and human resources planning), earnings performance, the state of the business and the situation in the company and the Group.
adv	S	V passive	predicate
Circ: manner	goal	Pr: material	Circ: manner

[...]

7

The Supervisory Board	was involved	in decisions of material importance to the company.
S	V	predicate
behaver	Pr: behavioural	Circ: accompaniment

[...]

12 Work of the Supervisory Board

13

The Supervisory Board	convened	seven times	in 2018.
S	V	C	Prep time
token	Pr:relational	value	Circ: time

[...]

19

The deliberations of the Supervisory Board	focused on	questions relating to Bayer's strategy, portfolio, business activities and personnel matters.
S	V	O
senser	Pr: mental	phenomenon

20

The work of the Supervisory Board	focused particularly on	two main areas that were each addressed at several meetings: First, the Monsanto transaction, including the progress of the merger control proceedings, the performance of the Monsanto business, the related risks and the integration of the business.
S	V+ adv	O

senser	Pr: mental	phenomenon

21

And second,	the further development of Bayer's strategy and the portfolio, efficiency and structural measures required to implement it.
	nominalisation

22

Between the meetings of the Supervisory Board,	these issues	were	also the subject of an extensive dialogue between the Chairman of the Supervisory Board and the Chairman of the Board of Management.
	S	V	O
Circ: extent	token	Pr: relational	value

23

The discussions at the meetings held in 2018	centered on	the following topics.
S	V	O
senser	Pr: mental	phenomenon

24

At its February	the Supervisory	dealt with	the Annual Report 2017, the agenda	and adopted	resolutions on the compensatio

meeting,	Board		for the Annual Stockholders ' Meeting 2018, the status of the merger control proceedings relating to the Monsanto acquisition and the Group's risk management system,		n of the Board of Managemen t.
	S	V	O	connector+V	O
Circ: time	behaver	Pr: behavioural	phenomeno n	Pr: behavioural	phenomeno n

25

At an extraordinary meeting convened in April,	the Supervisory Board	looked	in detail	at the required divestment of parts of the Crop Science business in connection with the merger control proceedings for the Monsanto transaction.
Prep of time	S	V (phrasal)	adv	O
Circ: time and location	senser	Pr: mental		phenomoenon

[...]

32

In addition,	the Supervisory Board	adjusted	the performance targets for the Board of Management for 2018 in view of the closing of the Monsanto acquisition.
	S	V	O
Circ: manner	behaver	Pr: behavioural	phenomenon

33

The Supervisory Board	discussed	the status of the glyphosate-related litigations in detail.
S	V	O
sayer	Pr: verbal	verbiage

34

The Supervisory Board	then examined	in great detail	the further development of the strategy of the Bayer Group and its individual divisions.
S	V	adv	O
actor	Pr: material		goal

35

It	was established	that	the Supervisory Board	explicitly supports	the strategy of the Board of Management.
Dummy it			S	V	O
			behaver	Pr: behavioural	phenomenon

36

At an extraordinary meeting in November,	the Supervisory Board	dealt in detail with	the status of the Monsanto integration and the integrated financial planning.
	S	V (phrasal) +adv	O
Circ: location and time	behaver	Pr: behavioural	phenomenon

37

The Supervisory Board	also once again	looked closely at	the status of the litigations in connection with glyphosate.
S	adv	V phrasal with adv	O
actor		Pr: material	goal

38

The discussion	also addressed	the extent to which	these risks	had been analyzed and assessed	prior to the Monsanto acquisition.

S	V		S	V passive	Predicate - time
			Subordinate relative clause		
sayer	Pr: verbal	verbiage:	goal	Pr: material	Circ: time

39

Following the related discussion at the previous meeting,	the Supervisory Board	once again conferred	about the further development of the strategy	and adopted	resolutions on a series of portfolio, efficiency and structural measures.
Subordinating clause	S	V+adv	O	V	O
Circ: location	sayer	Pr: verbal	verbiage	Pr: behavioural	phenomenon

[...]

Werner Wenning, Chairman of the Supervisory Board of Bayer AG

47

Building on the discussions at previous meetings and a detailed examination of the relevant documents undertaken in the meantime,	the Supervisory Board	also dealt once again with	the risks arising from Monsanto's glyphosate business.
Subordinate -ing as subject clause	S	Ph. V. with adv	O
	behaver	Pr: behavioural	phenomenon

48

This discussion	also focused on	a comprehensive expert report by a prominent law firm	that	examined	compliance with audit obligations and duty of care responsibilities in this regard [when the Monsanto transaction was prepared and implemented].
S	V	O		V	
senser	Pr:mental	Phenomenon And actor		Pr: material	goal

49

The report	came to the conclusion	that	the members of the Board of Management	had fulfilled	their statutory duties in connection with the Monsanto transaction, particularly with regard to the examination and assessment of the liability risks related to the glyphosate business.
S	V phrasal		S	V	O
senser	Pr: mental		behaver	Pr: behavioural	phenomenon

50

The Supervisory Board	concurred	with the report's findings.
S	V	complement
senser	Pr: mental	Circ: matter

51

Finally,	the Supervisory Board	resolved	to issue an unqualified declaration of future compliance with the German Corporate Governance Code.
	S	V	O
	behaver	Pr: behavioural	phenomenon

52

Following the December meeting,	an information and discussion forum	was held	for the members of the Supervisory Board on the topic of innovation at Crop Science.
	S	V passive	
	goal	Pr: material	Circ: purpose

53 Committees of the Supervisory Board

[...]

84

At the August meeting,	the interim financial report and, in particular, the glyphosate-related litigations	were discussed	in detail.
Prep phrase of time	S	V passive	adv
Circ: time	goal	Pr: material	Circ: manner

[...]

Leverkusen, February 26, 2019

For the Supervisory Board

Werner Wenning
Chairman

Summary:

	Material processes:	Mental processes:	Verbal Processes:	Relational Processes:	Behavioural Processes:	Existential processes:
1 total :	7	7	3	2	13	
2	actors: 3	sensers: 7	sayers: 3	tokens: 2	behavers: 10	existent:
3	Bayer as actor: 2	Bayer as senser:6	Bayer as sayer: 3	Bayer as token: 2	Bayer as behaver: 10	Bayer as existent:
4	others as actor : 1	others as sensers: 1	others as sayers: 0	others as token: 0	others as behavers: 0	others as existent:
5	Goals: 7	phenomenon:6	verbiage: 3 receiver:	Value: 2	phenomenon: 11	
6	Bayer as goal: 5	Bayer as phenomenon: 4	Bayer as receiver: 0	Bayer as value: 2	Bayer as phenomenon: 9	
7	Others as goal: 2	others as phenomenon: 2	others as receiver: 0	others as value: 0	Others as phenomenon: 2	

13.3.2.1 Reference Chain Analysis:

Chain 1: Monsanto

(20) the Monsanto transaction - the performance of the Monsanto business - the related risks and the integration of the business - (47) Monsanto's glyphosate business - (24) the Monsanto acquisition - (25) the Monsanto transaction - (32) the Monsanto acquisition - (33) the glyphosate-related litigations - (36) the status of the Monsanto integration - (37) the status of the litigations in connection with glyphosate - (38) the Monsanto acquisition - (47) the risks arising from Monsanto's glyphosate business. - (48) the Monsanto transaction - (49) the Monsanto transaction - the liability risks related to the glyphosate business - (84) the glyphosate-related litigations

Chain 2: Bayer

(title) the supervisory board - (1) the supervisory board - (3) the Supervisory Board - the company's business by the Board of Management - the Board of Management - (4) the Chairman of the Supervisory Board - the Chairman of the Board of Management - the other Management Board members - (5) the Supervisory Board - the company's - the company and the Group - (7) The Supervisory Board - the company - (12) **the Supervisory Board - (13)**The Supervisory Board - (19) the Supervisory Board - Bayer's strategy,
portfolio, business activities and personnel matters - (20) the Supervisory Board - (21) Bayer's strategy and the portfolio, efficiency and structural measures - (22) meetings of the Supervisory Board - the Chairman of the Supervisory Board and the Chairman of
the Board of Management - (24) the Supervisory Board - the Group's risk management system - the Board of Management - (25) the Supervisory Board - the Crop Science business - (32) the Supervisory Board - the Board of Management - (33) The Supervisory Board - (34) The Supervisory Board - the strategy of the Bayer Group and its individual divisions. - (35) the Supervisory Board - the strategy of the Board of Management - (36) the Supervisory Board - (37) The Supervisory Board - (39) the Supervisory Board - (47) the Supervisory Board - (49) the members of the Board of Management - (49) their statutory duties - (50) The Supervisory Board - (51) the Supervisory Board - (52) the members of the Supervisory Board - Crop Science - (53) **Committees of the Supervisory Board**

Chain 3: Other stakeholders

(title) stockholders - (2) dear stockholders - (48) a prominent law firm - (51) the German Corporate Governance Code.

Chain 4: Bayer actions

(3) monitored - acted - (4) maintained - (5) was kept continuously informed - (7) was involved - (13) convened - (21) dealt with - adopted - (25) looked at - (33) discussed - (34) examined- (35) supports - (36) dealt in detail with - (47) also dealt once again with - (48) had fulfilled

13.3.2.2 Full text

Report of the Supervisory Board

1 During 2018, the Supervisory Board monitored the conduct of the company's business by the Board of Management on a regular basis with the aid of detailed written and oral reports received from the Board of Management, and also acted in an advisory capacity. 2 In addition, the Chairman of the Supervisory Board maintained a constant exchange of information with the Chairman of the Board of Management and with the other Management Board members.

3 In this way the Supervisory Board was kept continuously informed about the company's intended business strategy, corporate planning (including financial, investment and human resources planning), earnings performance, the state of the business and the situation in the company and the Group.

4 Where Board of Management decisions or actions required the approval of the Supervisory Board, whether by law or under the Articles of Incorporation or the rules of procedure, the draft resolutions were inspected by the members at the meetings of the full Supervisory Board, sometimes after preparatory work by the committees, or approved on the basis of documents circulated to the members.

7 The Supervisory Board was involved in decisions of material importance to the company.

8 We discussed at length the business trends described in the reports from the Board of Management and the prospects for the development of the Bayer Group as a whole, the divisions and the principal affiliated companies in Germany and abroad.

9 Change on the Supervisory Board

10 Dr. Klaus Sturany's term of office as a member of the Supervisory Board ended at the end of the Annual Stockholders' Meeting on May 25, 2018.

11 The Supervisory Board elected Professor Norbert Winkeljohann to succeed him until the end of the Annual Stockholders' Meeting 2023.

12 Work of the Supervisory Board

13 The Supervisory Board convened seven times in 2018.

14 No member of the Supervisory Board attended only half or fewer than half of its meetings or those of the committees on which they served.

15 The average attendance rate by Supervisory Board members at the meetings of the Supervisory Board and of its committees held in 2018 was more than 97 percent.

16 A detailed overview of the attendance of the individual members of the Supervisory Board at the meetings of the Supervisory Board and its committees is shown under **"Governance Bodies."**

17 The members of the Board of Management regularly attended the meetings of the Supervisory Board.

18 Where necessary, the Supervisory Board met without the Board of Management or with only the Chairman of the Board of Management present.

19 The deliberations of the Supervisory Board focused on questions relating to Bayer's strategy, portfolio, business activities and personnel matters.

20 The work of the Supervisory Board focused particularly on two main areas that were each addressed at several meetings: First, the Monsanto transaction, including the progress of the merger control proceedings, the performance of the Monsanto business, the related risks and the integration of the business.

21 And second, the further development of Bayer's strategy and the portfolio, efficiency and structural measures required to implement it.

22 Between the meetings of the Supervisory Board, these issues were also the subject of an extensive dialogue between the Chairman of the Supervisory Board and the Chairman of the Board of Management.

23 The discussions at the meetings held in 2018 centered on the following topics.

24 At its February meeting, the Supervisory Board dealt with the Annual Report 2017, the agenda for the Annual Stockholders' Meeting 2018, the status of the merger control proceedings relating to the Monsanto acquisition and the Group's risk management system, and adopted resolutions on the compensation of the Board of Management.

25 At an extraordinary meeting convened in April, the Supervisory Board looked in detail at the required divestment of parts of the Crop Science business in connection with the merger control proceedings for the Monsanto transaction.

26 The Supervisory Board also approved a further reduction of Bayer's interest in Covestro.

27 At its May meeting, the Supervisory Board discussed the business performance to date in 2018 and the upcoming Annual Stockholders' Meeting.

28 It also adopted resolutions pertaining to two deviations from the recommendations of the German Corporate Governance Code along with a resolution to approve the existing consulting contracts between Bayer companies and companies of the global PricewaterhouseCoopers (PwC) network in light of the proposal to the Annual Stockholders' Meeting that Professor Norbert Winkeljohann be elected to the Supervisory Board.

29 At an extraordinary meeting in July, the Supervisory Board examined the divestment of the global prescription dermatology products business and adopted a resolution on this matter.

30 At its September meeting, the Supervisory Board extended the service contract of Liam Condon by five years and that of Hartmut Klusik by one year, and appointed Stefan Oelrich to the company's Board of Management for a three-year term commencing November 1, 2018.

31 The Supervisory Board also approved Dieter Weinand's departure from the company by mutual agreement with effect as of October 31, 2018.

32 In addition, the Supervisory Board adjusted the performance targets for the Board of Management for 2018 in view of the closing of the Monsanto acquisition.

33 The Supervisory Board discussed the status of the glyphosate-related litigations in detail.

34 The Supervisory Board then examined in great detail the further development of the strategy of the Bayer Group and its individual divisions.

35 It was established that the Supervisory Board explicitly supports the strategy of the Board of Management.

36 At an extraordinary meeting in November, the Supervisory Board dealt in detail with the status of the Monsanto integration and the integrated financial planning.

37 The Supervisory Board also once again looked closely at the status of the litigations in connection with glyphosate.

38 The discussion also addressed the extent to which these risks had been analyzed and assessed prior to the Monsanto acquisition.

39 Following the related discussion at the previous meeting, the Supervisory Board once again conferred about the further development of the strategy and adopted resolutions on a series of portfolio, efficiency and structural measures.

40 Specifically, it discussed the planned divestment of the Animal Health business, the sunscreen and foot care businesses of the Consumer Health Division and the 60 percent interest in the German site services provider Currenta.

41 In connection with the planned efficiency and structural measures, the Supervisory Board examined the increased alignment of the pharmaceutical research activities toward external innovation and the reduction of inhouse capacities in this area, the concentration of production for all recombinant Factor VIII products at the Berkeley, California, site, the decision not to utilize the Factor VIII facility built in Wuppertal, and adjustments to the corporate and central functions, service functions and country platforms.

42 The Supervisory Board also discussed the updated financial planning of the Bayer Group and was briefed on the planned Capital Markets Day.

43 At its meeting in December 2018, the Supervisory Board undertook the routine review of the fixed compensation of the members of the Board of Management and the pension amounts of the former members of the Board of Management.

44 Also at this meeting, the Board of Management presented its planning for the business operations in the years 2019 through 2022 and its expectations for the company’s future rating.

45 The Supervisory Board approved the proposed financing framework for 2019 and the securing of a new credit facility.

46 At this meeting, the Supervisory Board took a detailed look at the efficiency audit, which had been conducted with external support.

47 Building on the discussions at previous meetings and a detailed examination of the relevant documents undertaken in the meantime, the Supervisory Board also dealt once again with the risks arising from Monsanto's glyphosate business.

48 This discussion also focused on a comprehensive expert report by a prominent law firm that examined compliance with audit obligations and duty of care responsibilities in this regard when the Monsanto transaction was prepared and implemented.

49 The report came to the conclusion that the members of the Board of Management had fulfilled their statutory duties in connection with the Monsanto transaction, particularly with regard to the examination and assessment of the liability risks related to the glyphosate business.

50 The Supervisory Board concurred with the report's findings.

51 Finally, the Supervisory Board resolved to issue an unqualified declaration of future compliance with the German Corporate Governance Code.

52 Following the December meeting, an information and discussion forum was held for the members of the Supervisory Board on the topic of innovation at Crop Science.

53 Committees of the Supervisory Board

The Supervisory Board has a Presidial Committee, an Audit Committee, a Human Resources Committee, a Nominations Committee and an Innovation Committee. The current membership of the committees is shown under **"Governance Bodies."**
The meetings and decisions of the committees, and especially the meetings of the Audit Committee, were prepared on the basis of reports and other information provided by the Board of Management. Reports on the committee meetings were presented at the meetings of the full Supervisory Board.

Presidial Committee: This comprises the Chairman and Vice Chairman of the Supervisory Board along with a further stockholder representative and a further employee representative. The Presidial Committee serves primarily as the mediation

committee pursuant to the German Codetermination Act. It has the task of submitting proposals to the Supervisory Board on the appointment of members of the Board of Management if the necessary two-thirds majority is not achieved in the first vote at a plenary meeting. Certain decision-making powers in connection with capital measures, including the power to amend the Articles of Incorporation accordingly, have also been delegated to this committee. On a case-by-case basis, furthermore, the Supervisory Board can delegate certain responsibilities to the Presidial Committee. Finally, the Presidial Committee may also undertake preparatory work for full meetings of the Supervisory Board.

The Presidial Committee convened twice in 2018. At a meeting in April, the Presidial Committee dealt with the issuance of shares to Temasek without granting subscription rights and adopted the necessary resolution on the partial use of the Authorized Capital II. At a meeting in June 2018, the Presidial Committee dealt with the capital increase with subscription rights to be implemented as well as with the issuance of bonds to implement an exchange offer for existing Monsanto bonds, and adopted resolutions on both items. By way of a written resolution in May 2018, the Presidial Committee amended the proposal for the use of the distributable profit that had been included in the Notice of the Annual Stockholders' Meeting because the number of shares had risen since its publication as a result of the capital increase for which subscription rights were excluded.

Audit Committee: The Audit Committee comprises three stockholder representatives and three employee representatives. In the year under review, Dr. Klaus Sturany served as Chairman of the Audit Committee until the day of the Annual Stockholders' Meeting, May 25, 2018, and Professor Norbert Winkeljohann succeeded him in this function following his election to the Supervisory Board on May 25, 2018. Both satisfied the statutory requirements concerning the expertise in the field of accounting or auditing that a member of the Supervisory Board and the Audit Committee is required to possess. The Audit Committee meets regularly four times a year.

Its tasks include in particular oversight of the accounting, the financial reporting process, the effectiveness and ongoing development of the internal control system, the risk management system, the internal audit system, the compliance system and

the audit of the financial statements. The Audit Committee prepares the resolutions of the Supervisory Board concerning the financial statements and management report of Bayer AG and the proposal for the use of the distributable profit, the consolidated financial statements and management report of the Bayer Group and the agreements with the auditor (particularly the awarding of the audit contract, the determination of the main areas of focus for the audit and the audit fee agreement). The committee submits a reasoned proposal to the full Supervisory Board concerning the auditor's appointment, and takes appropriate measures to determine and monitor the auditor's independence. The audit focuses particularly on whether the financial statements have been prepared in compliance with the statutory requirements and whether the financial reporting provides a true and fair view of the financial position and results of operations of the company and the Group.

The Audit Committee discussed developments in the area of corporate compliance at each of its meetings, where necessary.

The Chairman of the Board of Management and the Chief Financial Officer at the respective time regularly attended the meetings of the Audit Committee. Representatives of the auditor were also present at all the meetings and reported in detail on the audit work and the audit reviews of the interim financial reports.

The Audit Committee devoted special attention in 2018 to the effects of the Monsanto transaction on the financial reporting and to the litigations related to glyphosate. The individual meetings focused mainly on the following topics: At the February meeting, the Audit Committee discussed the financial statements of Bayer AG and the consolidated financial statements of the Bayer Group. It also carefully considered the risk report, which covers the risk early warning system, and the report on the internal control system (ICS). The Audit Committee discussed the further developed policies for risk reporting. Further, the Audit Committee examined the development of legal and compliance cases. Finally, the Audit Committee made a recommendation to the full Supervisory Board concerning the resolution to be submitted to the Annual Stockholders' Meeting on the appointment of the auditor of the financial statements. The principal topics at the April meeting were the yearly reports by the Group Compliance Officer and Internal Audit, digitization and process

optimization initiatives in the CFO's area, and determining the main areas of focus for the audit of the 2018 financial statements.

84 At the August meeting, the interim financial report and, in particular, the glyphosate-related litigations were discussed in detail. At its November meeting, the Audit Committee discussed the yearly report of the Tax department, the audit conducted pursuant to Section 32 of the German Securities Trading Act (WpHG) (EMIR), the audit budget for the external auditor for 2019 and the framework for the auditor's non-audit services.

Human Resources Committee: On this committee, too, there is parity of representation between stockholders and employees. It consists of the Chairman of the Supervisory Board and three other Supervisory Board members. The Human Resources Committee prepares the personnel decisions of the full Supervisory Board, which resolves on appointments or dismissals of members of the Board of Management. The Human Resources Committee resolves on behalf of the Supervisory Board on the service contracts of the members of the Board of Management. However, it is the task of the full Supervisory Board to resolve on the total compensation of the individual members of the Board of Management and the respective compensation components, as well as to regularly review the compensation system on the basis of recommendations submitted by the Human Resources Committee. The Human Resources Committee also discusses the long-term succession planning for the Board of Management.
The Chairman of the Board of Management regularly attended the meetings of the Human Resources Committee where the issues discussed did not relate to him personally.

The Human Resources Committee convened on three occasions and also passed one resolution in writing outside a meeting. In each case, the meetings involved deliberations and the adoption of resolutions relating to the compensation of the Board of Management and the service contracts of Board of Management members, the extension of the terms of office of Liam Condon and Hartmut Klusik, the departure of Dieter Weinand and the appointment of Stefan Oelrich to the Board of Management.

Nominations Committee: This committee carries out preparatory work when an election of stockholder representatives to the Supervisory Board is to be held. It suggests suitable candidates for the Supervisory Board to propose to the Annual Stockholders' Meeting for election. The Nominations Committee comprises the Chairman of the Supervisory Board and the other stockholder representative on the Presidial Committee.
The Nominations Committee met once in 2018 and adopted a recommendation for an election proposal to the Annual Stockholders' Meeting 2019.

Innovation Committee: The Innovation Committee is primarily concerned with the innovation strategy and innovation management, the strategy for the protection of intellectual property, and major research and development programs at Bayer. Within its area of responsibility, the committee advises and oversees the management and prepares any Supervisory Board decisions. The Committee comprises the Chairman of the Supervisory Board and five other members of the Supervisory Board, with parity of representation between stockholder and employee representatives. The Chairman of the Board of Management and the member of the Board of Management responsible for Innovation regularly attend the meetings of the Innovation Committee.
The Innovation Committee convened once in 2018. At this meeting, it dealt with digital transformation at Bayer and the further development of the Bayer Lifescience Center (Leaps) after the latter topic had been discussed at earlier meetings.

Corporate governance

The Supervisory Board dealt with the principles of corporate governance at Bayer. In particular, it resolved in its May meeting on a declaration on two temporary deviations from the recommendations of the German Corporate Governance Code. At its December meeting, the Supervisory Board then resolved to issue an unqualified declaration of future compliance. Further, at the meetings of the Supervisory Board the Chairman of the Supervisory Board gave a summary of his dialogue with investors.

Financial statements and audits

The financial statements of Bayer AG were prepared according to the requirements of the German Commercial Code and Stock Corporation Act. The consolidated financial statements of the Bayer Group were prepared according to the German Commercial Code and the International Financial Reporting Standards (IFRS). The combined management report was prepared according to the German Commercial Code. The auditor, Deloitte GmbH Wirtschaftsprüfungsgesellschaft, Munich, has audited the financial statements of Bayer AG, the consolidated financial statements of the Bayer Group and the combined management report. The auditor responsible for the audit was Professor Frank Beine. The conduct of the audit is explained in the auditor's reports. The auditor finds that Bayer has complied, as appropriate, with the German Commercial Code, the German Stock Corporation Act and / or the International Financial Reporting Standards endorsed by the European Union, and issues an unqualified opinion on the financial statements of Bayer AG, the consolidated financial statements of the Bayer Group and the combined management report. The financial statements of Bayer AG, the consolidated financial statements of the Bayer Group, the combined management report and the audit reports were submitted to all members of the Supervisory Board. They were discussed in detail by the Audit Committee and at a meeting of the full Supervisory Board. The auditor submitted a report on both occasions and was present during the discussions.

We examined the financial statements of Bayer AG, the proposal for the use of the distributable profit, the consolidated financial statements of the Bayer Group and the combined management report. While examining the combined management report, we also examined in particular the nonfinancial statement that is fully integrated in the management report. This statement was also examined by the auditor. We have no objections, thus we concur with the result of the audit.

We have approved the financial statements of Bayer AG and the consolidated financial statements of the Bayer Group prepared by the Board of Management. The financial statements of Bayer AG are thus confirmed. We are in agreement with the combined management report and, in particular, with the assessment of the future development of the enterprise. We also concur with the dividend policy and the decisions concerning earnings retention by the company. We assent to the proposal

for the use of the distributable profit, which provides for payment of a dividend of €2.80 per share.

The Supervisory Board would like to thank the Board of Management and all employees for their dedication and hard work in 2018.

Leverkusen, February 26, 2019
For the Supervisory Board

Werner Wenning
Chairman

13.3.3 Text 3: Our commitment to preserving biodiversity (p.69)

1

In the course of our business activities,	we	aim	to use natural resources responsibly	and	Ellipted ‘and we aim to’	respect biodiversity.
Prepositional phrase - subordinate	S	V	O	connector		O
Circ: time	behaver	Pr: behavioural	phenomenon			phenomenon

2

Our principles on biodiversity	are set forth	in both the Bayer Human Rights Policy and our own position on this issue.
S	V	
actor	Pr: material	Circ: place

3

In this,	we	express	our commitment	to the United Nations Convention on Biological Diversity and the associated Nagoya Protocol,	which	regulates	the balanced and fair sharing of the benefits arising from the use of genetic resources.

cohesive prep phrase with demonstrative pronoun	S	V	C	indirect object	relative pronoun	V	O
					Relative clause		
Circ: purpose	Sayer	Pr: verbal	verbiage	Receiver	(the UNCBD)	Pr: material	goal

4

Segment-specific measures	are applied	to implement	this.
S	V passive		demonstrative pronoun
goal	Pr: material	Circ: purpose (in order to)	goal

5 (subtitle)

Biodiversity	in the segments
S	prepositional phrase
	Circ: location

6

Crop Science	commits	itself	through a directive	to acquire and use	genetic resources	only in harmony with international and national legislation.
S	V				O	
behaver	Pr: behavioural	senser	Circ: manner		phenomenon	

7

At the same time,	Crop Science	is committed	to the preservation	and	improvement of crop plants	and	to the equitable distribution of access to their utilization.
	S	V		connector		connector	
Circ: Extent	senser	Pr: mental	phenomenon		phenomenon		phenomenon

8

We	support	sustainable agriculture	that takes account of people's nutritional needs and safeguards farmers' livelihoods,	while at the same time conserving a healthy environment.
S	V	O		
main independent clause			subordinate clause	relative clause
behaver	Pr: behavioural	phenomenon		Circ: matter

9

In this context,	Crop Science	promotes and supports	ecological enhancement measures in agriculture	and the recovery and protection of natural and semi-natural habitats.
	S	V	O	O
Circ: manner	behaver	Pr: behavioural	behaviour	behaviour

10

Together with farmers and	we	are working to find	solutions [to preserve biodiversity.]

scientific experts,			
subordinate clause	S	V	O
Circ: manner	actor	Pr: material	goal

11

At the Bayer ForwardFarms,	we	demonstrate	[how	sustainable agriculture	can be realized	in practice.]
	S	V	interrogative adverb	S	V	
			Circumstance adjunct			
Circ: location	behaver	Pr: behavioral	Phenomenon			

12

Bayer	is	a member of the Association of Research-Based Pharmaceutical Companies	and	supports	its position	on the U.N. Convention on Biological Diversity.
S	V	C	Connector	V	C	prep phrase
Token	Pr: relational	value		Pr: behavioural	phenomenon	circ: matter

13

An internal position on plant based medications	documents	how	natural substances	can be used	with respect to compliance with the Convention on Biological Diversity.

Commented [2]: short passive - ellipted responsibility

S	V	interrogative adverb	S	V - short passive	
		wh-interrogative complement clause			
actor	Pr: material		goal	Pr: material	Circ: role (purpose)

14

When planning new production sites,	Bayer	takes into account	[that	they	must not be set up	in areas [that are statutorily protected] [with regard to their natural characteristics, biodiversity or other factors.]
	S	V	relative pronoun	S	V short passive strong epistemic modality	
			complement clause			
Circ: manner	senser	Pr: mental		Goal	Pr: material	Circ: location

15

Due to our portfolio changes in 2018,	we	will undertake	an updated comparison of the geographical coordinates of our production sites against those of internationally recognized protected areas in 2019.
	S	V -strong epistemic modality	O
Circ: manner: reason	behaver	Pr: behavioural	phenomenon

	Material processes:	Mental processes:	Verbal Processes:	Relational Processes:	Behavioural Processes:	Existential processes:
1 total :	7	2	1	1	7	0
2	actors: 4	sensers: 2	sayers: 1	tokens: 1	behavers: 7	existent:
3	Bayer as actor: 3	Bayer as senser: 2	Bayer as sayer: 1	Bayer as token: 1	Bayer as behaver: 7	Bayer as existent:
4	others as actor 1	others as sensers: 0	others as sayers: 0	others as token:	others as behavers: 0	others as existent:
5	Goals: 5	phenomenon : 1	verbiage: 1 receiver: 1	Value: 1	phenomenon : 7	
6	Bayer as goal: 1	Bayer as phenomenon : 0	Bayer as receiver: 0	Bayer as value: 1	Bayer as phenomenon : 3	
7	Others as goal: 4	others as phenomenon : 1	others as receiver: 1	others as value:	Others as phenomenon : 4	

13.3.3.1 Reference chain analysis

Chain 1: Direct reference to biodiversity/species
preserving biodiversity (title) - (1) respect biodiversity - (2) our principles on biodiversity - (3) United Nations Convention on Biological Diversity - (5) biodiversity in the segments (title) - (9) the recovery and protection of natural and semi-natural habitats - (10) preserve biodiversity - (12) U.N. Convention on Biological Diversity - (13) Convention on Biological Diversity - (14) protected - natural characteristics, biodiversity and other factors
UNCBD repeated 4 times

Chain 2: The natural environment
(1) natural resources - Nagoya Protocol - genetic resources - (6) genetic resources - (7) crop plants - (8) sustainable agriculture - a healthy environment - (9) ecological enhancement measures - (14) natural characteristics - (15) protected areas

Chain 3: external authority bodies/ partners and stakeholders

(2) Bayer human Rights Policy - (3) United Nations Convention on Biological Diversity - Nagoya Protocol - (6) Crop Science - international and national legislation - (7) Crop Science - (9) Crop Science - (10) farmers and scientific experts - (11) Bayer ForwardFarms - (12) Association of Research-Based Pharmaceutical Companies - U.N. Convention on Biological Diversity - (13) Convention on Biological Diversity - (14) statutorily - (15) internationally recognized (protected areas)

13.3.3.2 Full text

Our commitment to preserving biodiversity

1 In the course of our business activities, we aim to use natural resources responsibly and respect biodiversity.
2 Our principles on biodiversity are set forth in both the Bayer Human Rights Policy and our own position on this issue.
3 In this, we express our commitment to the United Nations Convention on Biological Diversity and the associated Nagoya Protocol, which regulates the balanced and fair sharing of the benefits arising from the use of genetic resources.
4 Segment-specific measures are applied to implement this.
5 Biodiversity in the segments
6 Crop Science commits itself through a directive to acquire and use genetic resources only in harmony with international and national legislation.
7 At the same time, Crop Science is committed to the preservation and improvement of crop plants and to the equitable distribution of access to their utilization.
8 We support sustainable agriculture that takes account of people's nutritional needs and safeguards farmers' livelihoods, while at the same time conserving a healthy environment.
9 In this context, Crop Science promotes and supports ecological enhancement measures in agriculture and the recovery and protection of natural and semi-natural habitats.
10 Together with farmers and scientific experts, we are working to find solutions to preserve biodiversity.
11 At the Bayer ForwardFarms, we demonstrate how sustainable agriculture can be realized in practice.
12 Bayer is a member of the Association of Research-Based Pharmaceutical Companies and supports its position on the U.N. Convention on Biological Diversity.
13 An internal position on plantbased medications documents how natural substances can be used with respect to compliance with the Convention on Biological Diversity.
14 When planning new production sites, Bayer takes into account that they must not be set up in areas that are statutorily protected with regard to their natural characteristics, biodiversity or other factors.

15 Due to our portfolio changes in 2018, we will undertake an updated comparison of the geographical coordinates of our production sites against those of internationally recognized protected areas in 2019.

Foot care	Foot care	Dr. Scholl's™
Sun protection	Sun protection	Coppertone™
Crop Science		
Herbicides	Chemical crop protection products to control weeds	Roundup™, Adengo™, Alion™, Corvus™, Atlantis™, Harness™, Warrant™
Corn Seed & Traits	Seeds and traits for corn	Dekalb™, SmartStax™ RIB Complete, VT Double™ PRO, VT Triple™ PRO
Soybean Seed & Traits	Seeds and traits for soybeans	Asgrow™, Intacta RR2PRO™ Roundup Ready 2 Xtend™, Roundup Ready 2 Yield™
Fungicides	Biological and chemical products to protect crop plants from fungal diseases	Flint™, Fox™, Luna™, Nativo™, Prosaro™, Serenade™, Xpro™
Insecticides	Biological and chemical products to protect crop plants from harmful insects and their larvae	BioAct™, Confidor™, Movento™, Sivanto™
Environmental Science	Products for professional pest control, vector control, forestry, golf courses and parks, railway tracks	Ficam™, Maxforce™, Esplanade™, K-Othrine™
Vegetable Seeds	Vegetable seeds	Seminis™, DeRuiters™
Digital Agriculture	Digital applications for agriculture	Climate FieldView™
Other	Seeds and traits for cotton, oilseed rape / canola, rice and wheat as well as biological and chemical seed treatment products to protect against fungal diseases and pests	Gaucho™, Bollgard™ II, Bollgard™ II XtendFlex™, Deltapine™
Animal Health		
Companion animals business	Veterinary medicines and solutions to protect and maintain the health and wellbeing of companion animals, focusing on antiparasitics and anti-infectives	Advantage™ product family, Seresto™, Drontal™ product family, Baytril™

13.3.4 Text 4: Impact of crop protection products on the environment (p.73-74)

Impact of crop protection products	**On the environment**
Complex noun phrase with nominalisation	**Prep phrase of place**
	Circ: location

2 (title)

Bayer Bee Care:	**strengthening**	**bee health**
S	-ing as verb	O
actor	Pr: material	goal

Commented [3]: borderline case, as the 'be' verb is ellipted, according to Biber at al (Longman) (2002, p.25).

3

Bees and other pollinators	are	important for sustainable food production.
S	V	C
token	Pr: relational	value

4

Promoting the health of pollinators and sustainable agriculture	is	therefore of tremendous importance for our business.
S	V	O
token	Pr: relational	value

5

Our Bee Care Program	is	a central industry platform [to promote bee health.]
S	V	C
Token	Pr: relational	Value

6

Through this,	we	want to create	a balance	between promoting the health, safety and biodiversity of pollinators	and	optimizing agricultural productivity.
Anaphoric ref to Bee Care	S	V	O	Prep phrase	connector	
Circ: manner	behaver	Pr: behavioural	phenomenon	Circ: manner comparison		

7

We	contribute	our experience	in crop protection and animal health	to numerous projects and partnerships with the goal of protecting and improving pollinator health.

S	V	C	C	O
actor	Pr: material		Circ: quality/manner	goal

8

We	operate	a global Bee Care network and a Bee Care Center	in Germany	[to promote dialogue [on the topic of pollinator protection] [with all stakeholder groups.]
S	V	O		
Actor	Pr: material	Goal	Circ: location	Circ: purpose

9 **Bee safety and crop protection products (title)**

10 .

To minimize risks posed to bees by our crop protection products,	we	perform	extensive safety testing, risk assessments and product stewardship measures	and	develop	bee-friendly crop protection products and processes
	S	V	O1	Connector	V	O2
Circ:	Actor	Pr: material	Goal		Pr: material	goal

11

The first tests [to measure bee toxicity]	are conducted	already at the development stage.

S	V passive	Prep phrase
Goal	Pr: material	Circ: manner/time

12

We	are also convinced	that	neonicotinoids	are	insecticides [with a favorable environmental safety profile]	and	are not	dangerous [to bee colonies] [when used according to label instructions.]
S	V strong epistemic modality		S	V	C	connector	V – strong epistemic modality	C
Independent main clause		Complement clause - phenomenon						
Senser	Pr: mental		token	Pr: relational	Value with Circ: quality	Elipted S - neonicotinoids	Pr: relational	value

13 (subtitle)

Glyphosate	**helps to control**	**weeds**	**and**	**contributes**	**to sustainable farming**

S	V	O	Connector	V	
actor	**Pr: material**	**goal**		**Pr: material**	**Circ: role**

14

Glyphosate	is	a nonselective herbicide	that	is frequently used	in several markets globally for effective and at the same time simple and cost-effective weed control management.
S	V	C		V - passive	
			Complement clause		
Token	Pr: relational	value		Pr: material	Circ: location and purpose/quality

15

This active ingredient	was first introduced	in 1974	and	has since been marketed	under a number of different trade names in hundreds of crop protection products around the world by several dozen different companies.
S	V passive	Prep of time	connect	V passive	

Actor	Pr: material	Circ: time		Pr: material	Circ: behalf

16

In Europe,	most glyphosate-based herbicides	are used according	to the label to control weeds	in production fields of a wide range of crops.
	S	V passive		
Circ: location	goal	Pr: material	Circ: purpose	Circ: location

17

Some glyphosate-based products	can be used according	to the label to control weeds	in gardens and noncultivated areas, such as industrial complexes and along railway tracks.
S	V passive		
goal	Pr: material	Circ: purpose	Circ: location

18

Glyphosate	works	in plants	by specifically inhibiting an enzyme that [is essential to plant growth].
S	V		
actor	Pr: material	Circ: location	Circ: manner

19

This enzyme	is not found	in cells of humans or animals.
S	V passive	
actor	Pr: material	Circ: location

Glyphosate	has	a 40-year history of safeuse	when	used according to	label directions.
S	V	C		V passive	
			Relative clause		
token	Pr: relational	value		Pr: material	goal

20

This	is confirmed	by science-based evaluations conducted by regulatory bodies and other scientific institutions such as the U.S. Environmental Protection Authority (EPA) as well as the Canadian Department of Health, Health Canada,	which in January 2019	confirmed	that	“[n]o pesticide regulatory authority in the world	currently considers	glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed.”

Demonstrative pronoun	V passive		Relative clause	V				
	Pr: verbal	Circ: And sayer ellipted		Pr: verbal		senser	Pr: mental	phenomenon
						verbiage		

21

We	offer	extensive information	on the public debate surrounding the safety of glyphosate for users and the environment on our website.
S	V	O	prepositional phrase with nominalisation
actor	Pr: material	goal	Circ: matter/means

22

More information [on the lawsuits against Bayer in the United States]	can be found	in the notes [to the consolidated financial statements.]
S	V	
actor	Pr: material	Circ: place

Summary:

	Material processes:	Mental processes:	Verbal Processes:	Relational Processes:	Behavioural Processes:	Existential processes:
1 total :	17	2	2	7	1	
2	actors: 10	sensers: 2	sayers:	tokens: 7	behavers: 1	existent:
3	Bayer as actor: 5	Bayer as senser: 1	Bayer as sayer: 0	Bayer as token: 2	Bayer as behaver: 1	Bayer as existent:
4	others as actor : 5	others as sensers: 1	others as sayers: 1	others as token: 5	others as behavers: 0	others as existent:
5	Goals: 11	phenomenon : 3	verbiage: 1 receiver: 0	Value: 6	phenomenon : 1	
6	Bayer as goal: 4	Bayer as phenomenon : 0	Bayer as receiver: 0	Bayer as value: 1	Bayer as phenomenon :	
7	Others as goal: 7	others as phenomenon : 2	others as receiver: 0	others as value: 5	Others as phenomenon : 1	

13.3.4.1 Reference Chain Analysis:

Chain 1: materiality and business case

(3) sustainable food production - (4) of tremendous importance for our business

Chain 2: environment/ the natural world

(title) the environment -

Chain 3: species/ biodiversity

(2) bee health - (3) bees and other pollinators - (4) health of pollinators - (5) bee health - (6) health, safety and biodiversity of pollinators - (9) bee safety - (10) bees - bee-friendly - (11) bee toxicity - (12) bee colonies - (19) cells of humans or animals

Chain 4: Species in Bayer

(2) Bayer Bee Care - bee health - Bee Care Program - (7) animal health - (8) Bee Care network - Bee Care Centre

Chain 5: agriculture

(3) sustainable food production - (4) sustainable agriculture - (6) optimizing agricultural productivity - (16) production fields of a wide range of crops

Chain 6: other stakeholders and voices

(8) all stakeholder groups - (20) the U.S. Environmental Protection Authority (EPA) - the Canadian Department of Health, Health Canada

13.3.4.2 Full text

1	**Impact of crop protection products on the environment**
2	**Bayer Bee Care: strengthening bee health**
3	Bees and other pollinators are important for sustainable food production.
4	Promoting the health of pollinators and sustainable agriculture is therefore of tremendous importance for our business.
5	Our Bee Care Program is a central industry platform to promote bee health.
6	Through this, we want to create a balance between promoting the health, safety and biodiversity of pollinators and optimizing agricultural productivity.
7	We contribute our experience in crop protection and animal health to numerous projects and partnerships with the goal of protecting and improving pollinator health. www.cropsciencetransparency.bayer.com www.beecare.bayer.com A Combined Management Report 1.6 Safety for People and the Environment Bayer Annual Report 2018
8	We operate a global Bee Care network and a Bee Care Center in Germany to promote dialogue on the topic of pollinator protection with all stakeholder groups.
9	**Bee safety and crop protection products**
10	To minimize risks posed to bees by our crop protection products, we perform extensive safety testing, risk assessments and product

stewardship measures and develop bee-friendly crop protection products and processes.

11 The first tests to measure bee toxicity are conducted already at the development stage.

12 We are also convinced that neonicotinoids are insecticides with a favorable environmental safety profile and are not dangerous to bee colonies when used according to label instructions.

13 **Glyphosate helps to control weeds and contributes to sustainable farming**

14 Glyphosate is a nonselective herbicide that is frequently used in several markets globally for effective and at the same time simple and cost-effective weed control management.

15 This active ingredient was first introduced in 1974 and has since been marketed under a number of different tradenames in hundreds of crop protection products around the world by several dozen different companies.

16 In Europe, most glyphosate-based herbicides are used according to the label to control weeds in production fields of a wide range of crops.

17 Some glyphosate-based products can be used according to the label to control weeds in gardens and noncultivated areas, such as industrial complexes and along railway tracks.

18 Glyphosate works in plants by specifically inhibiting an enzyme that is essential to plant growth.

19 This enzyme is not found in cells of humans or animals.

20 Glyphosate has a 40-year history of safe use when used according to label directions.

21 This is confirmed by science-based evaluations conducted by regulatory bodies and other scientific institutions such as the U.S. Environmental Protection Authority (EPA) as well as the Canadian Department of Health, Health Canada, which in January 2019 confirmed that "[n]o pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed."

22 We offer extensive information on the public debate surrounding the safety of glyphosate for users and the environment on our website.

23 More information on the lawsuits against Bayer in the United States can be found in the notes to the consolidated financial statements.

13.3.5 Text 5: 1.6.3 Environmental Protection (p.77)

1

We	meet	our responsibility [to protect the environment [in many different ways.]
S	V	O
behaver	Pr: behavioural	phenomenon

2

We	continuously work to reduce	the environmental impact of our business activities	and	develop	product solutions [that benefit the environment.]
S	V	O	connector	V	O
Behaver	Pr: behavioural	phenomenon		Pr: material	goal

3

For us,	a resource-friendly and low-emissions approach to raw materials and energy	is ecologically and economically	expedient and efficient.
prepositional phrase	S	V+ adv	C
Circ: role	token	Pr: relational	value

4

These measures	are designed	to reduce environmental impact	and, at the same time,	cut	the costs associated with materials, energy, emissions and disposal.
O	V-passive		connector +adv of time	part of infinitive (are designed to reduce and cut..)	
goal	Pr: material	circ: purpose	circ: time		circ: purpose

5

As a pure life science company too,	we	remain committed	to climate protection.
	S	V	predicate

Circ: role: purpose	behaver	Pr: behavioural	phenomenon

6

Responsibilities and framework conditions	are stipulated	at Group level, such as through corporate policies, targets and key performance indicators (KPIs).
O	V passive	prep predicate phrase
goal	Pr: material	Circ: means

7

We	use	certified HSEQ management systems [to control operational implementation.]
S	V	O
actor	Pr: material	goal

8

Our environmental standards	apply	worldwide.
S	V	adv
actor	Pr: material	Circ: location

9 .

Our commitment	extends	beyond the scope of legal requirements
S	V	predicate adv
behaver	Pr: behavioural	Circ: means

10

We	perform	a voluntary ecological assessment for capital expenditure projects exceeding €10 million.
S	V	O
actor	Pr: material	goal

11

As part of the integration process,	the corresponding corporate policy	will also be extended	to the acquired agriculture business.
	S	V strong epistemic modality passive	predicate
circ: manner	phenomenon	Pr: behavioural	accompaniment: purpose

12

In the case of acquisitions,	we	examine	compliance with the applicable environmental and occupational safety regulations as well as fundamental employee rights at the production sites in

			question.
prep phrase	S	V	O
circ: matter	actor	Pr: material	goal

13

In connection with the acquired agriculture business,	Bayer	took over	another 162 environmentally relevant sites.
prep. ph	S	V	O
circ: matter	actor	Pr: material	goal

14

These	are included	in our environmental performance indicators as of the closing date of June 7, 2018.
S	V	predicate
token	Pr: relational	Circ: means

15

As a result,	nearly all our environmental performance indicators	are	considerably higher year on year.
adv	S	V	C
Circ: extent	token	Pr: relational	value

13.3.5.1 Summary

	Material processes: 	Mental processes: 	Verbal Processes: 	Relational Processes: 	Behavioural Processes: 	Existential processes: 
1 total :	**8**	**0**	**0**	**3**	**5**	
2	**actors: 5**	**sensers: 0**	**sayers: 0**	**tokens: 3**	**behavers: 5**	**existent:**
3	**Bayer as actor: 5**	**Bayer as senser: 0**	**Bayer as sayer: 0**	**Bayer as token: 1**	**Bayer as behaver: 5**	**Bayer as existent:**
4	**others as actor : 0**	**others as sensers: 0**	**others as sayers: 0**	**others as token: 1**	**others as behavers:**	**others as existent:**
5	**Goals: 6**	**phenomenon: 0**	**verbiage: 0 receiver: 0**	**Value:**	**phenomenon : 3**	
6	**Bayer as goal: 5**	**Bayer as phenomenon:0**	**Bayer as receiver: 0**	**Bayer as value: 1**	**Bayer as phenomenon : 1**	
7	**Others as goal: 1**	**others as phenomenon: 0**	**others as receiver: 0**	**others as value: 2**	**Others as phenomenon : 2**	

13.3.5.2 Reference Chain Analysis:

Chain 1: Monsanto

(11) the integration process - the acquired agriculture business - (12) In the case of acquisitions - (13) the acquired agriculture business

Chain 2: Environment/natural world

(1) protect the environment - (2) reduce the environmental impact - benefit the environment - (3) resource-friendly and low-emissions approach - raw materials and energy - ecologically and economically expedient and efficient - (4) reduce environmental impact - (5)climate protection - (13) 162 environmentally relevant sites.

Chain 3: Bayer

(1) We - our responsibility - (2) We - our business activities - (3) For us - (4) cut the costs - (5)a pure life science company - we - (6) Responsibilities and

framework conditions -Group level - corporate policies, targets and key performance indicators (KPIs) - (7) We - (8) Our environmental standards - (9) Our commitment - (10) We - (11) the corresponding corporate policy - (12) we - (13) Bayer - (14) our environmental performance indicators - (15) our environmental performance indicators

Chain 4: environmental frameworks/reporting
(7) certified HSEQ management systems -(8) environmental standards apply worldwide - (9) beyond the scope of legal requirements - (10) voluntary ecological assessment - (12) the applicable environmental and occupational safety regulations

13.3.5.3 Full text

1.6.3 Environmental Protection

1 We meet our responsibility to protect the environment in many different ways.
2 We continuously work to reduce the environmental impact of our business activities and develop product solutions that benefit the environment.
3 For us, a resource-friendly and low-emissions approach to raw materials and energy is ecologically and economically expedient and efficient.
4 These measures are designed to reduce environmental impact and, at the same time, cut the costs associated with materials, energy, emissions and disposal.
5 As a pure life science company too, we remain committed to climate protection. A 1.6.2/3 Rate of Plant Safety Incidents (LoPC-IR) 2017 2018 Loss of Primary Containment Incident Rate (LoPC-IR) 1 0.13 0.09 1 Number of LoPC incidents per 200,000 hours worked www.bayer.com/en/ safety.aspx A Combined Management Report 1.6 Safety for People and the Environment Bayer Annual Report 2018
6 Responsibilities and framework conditions are stipulated at Group level, such as through corporate policies, targets and key performance indicators (KPIs).
7 We use certified HSEQ management systems to control operational implementation.
8 Our environmental standards apply worldwide.
9 Our commitment extends beyond the scope of legal requirements.
10 We perform a voluntary ecological assessment for capital expenditure projects exceeding €10 million.
11 As part of the integration process, the corresponding corporate policy will also be extended to the acquired agriculture business.
12 In the case of acquisitions, we examine compliance with the applicable environmental and occupational safety regulations as well as fundamental employee rights at the production sites in question.
13 In connection with the acquired agriculture business, Bayer took over another 162 environmentally relevant sites.
14 These are included in our environmental performance indicators as of the closing date of June 7, 2018.
15 As a result, nearly all our environmental performance indicators are considerably higher year on year.

13.3.6 Text 6: 1.4.3 Societal Engagement (p.61)

1

Bayer's societal engagement	focuses	on people	who	work	worldwide in education, science, health and social innovation,	and who	are committed to	improving living conditions.
S	Intransitive verb	Prep phrase	Relative pronoun	V	adverbial	Connector and relative pronoun	V	
			Relative clauses					
senser	Pr: mental	Circ: matter	Actor – referring to people	Pr: material	Circ: location	Behaver (referring to people)	Pr: behavioural	phenomenon

2

In this way,	we	support	the U.N. Sustainable Development Goals "Good Health and Well- Being" (SDG 3) and "Zero Hunger" (SDG 2).
	S	V	O
Circ: manner	behaver	Pr: behavioural	phenomenon

For example,	we	enable	people in developing countries and emerging markets to access our medical products through our various Access to Medicine activities.
	S	V	O

Circ: matter	behaver	Pr: behavioural	phenomenon

3

Another funding area	is	sports and culture	in Germany.
S	V	O	Prep of place
Token	Pr: relational	value	Circ: place

4

In 2018,	Bayer	– including the acquired agriculture business –	made	available	some €66 million worldwide for charitable projects and activities (2017: €49 million for Bayer excluding Monsanto).
Prep of time	S	Gerund phrase describing the root noun Bayer	V	Adj. describing the sums	O
Circ: time	actor		Pr: material		goal

5

An interdisciplinary corporate function	is	responsible	for the strategic orientation and coordination of our societal engagement.

S	V	C	
token	Pr: relational	value	Circ: matter

6

Group-wide donation allocation and management policies	form	the basis	for our donation and foundation activities.
S	V	C	
Token	Pr: relational	value	Circ:

7

The Board of Management and an independent panel of internationally renowned experts	help make	major funding decisions.
S	V	O
Behaver	Pr: behavioural	phenomenon

8

The acquired	has	its own extensive	which	will be integrated	into our structures

agriculture business		societal engagement programs,			from 2019.
S	V	C	Relative pronoun	V	
			Relative clause		
token	Pr: relational	value		Pr: material	Circ: time and matter

Interesting phrasing – veiling of Monsanto? – I analysed this as an actor+goal/token+value other, not Bayer - and look at the material clause – no actor or goal, they are all ellipted.

9

Bayer's societal engagement	includes	the activities of its globally operating company foundations	that	are aligned toward	health care and nutrition: the Bayer Science & Education Foundation for leading-edge research, education and talent promotion, the Bayer Cares Foundation for social innovation and employee engagement,	and the Monsanto Fund [focusing on community projects, education, food and nutrition.]
S	V	O	Relative pronoun	V	C	C
			Relative clause			
token	Pr: relational	value	(Behaver – Bayer ellipted)	Pr: behavioural	phenomenon	phenomenon

10

We	work	together with leading nongovernmental organizations, patient groups, foundations, scientific institutions, educational partners and networks of experts around the world [to implement many of our initiatives.]
S	V	
actor	Pr: material	Circ: manner

11

Through various initiatives,	we	help improve	living conditions	very close to the company's sites.
Prep phrase	S	V	O	
Circ: manner	behaver	Pr: behavioural	Phenomenon	Circ: location

12

Our company foundations	support,	for example, science education	worldwide at schools near company sites	And	projects	promoting the agricultural self-sufficiency of smallholder farmers.
S	V	O	adverb	connector	O	adjective
behaver	Pr: behavioural	phenomenon	Circ: location		phenomenon	

13

13.3.6.1 Summary

	Material processes:	Mental processes:	Verbal Processes:	Relational Processes:	Behavioural Processes:	Existential processes:
1 total :	4	1	0	5	8	
2	actors: 3	sensers: 1	sayers:	tokens: 5	behavers: 7	existent:
3	Bayer as actor: 2	Bayer as senser: 1	Bayer as sayer:	Bayer as token: 4	Bayer as behaver: 6	Bayer as existent:
4	others as actor : 1	others as sensers: 0	others as sayers:	others as token: 1	others as behavers: 1	others as existent:
5	Goals: 1	phenomenon : 0	verbiage: receiver:	Value: 5	phenomenon : 10	
6	Bayer as goal:1	Bayer as phenomenon :0	Bayer as receiver:	Bayer as value: 3	Bayer as phenomenon : 2	
7	Others as goal: 0	others as phenomenon : 0	others as receiver:	others as value: 2	Others as phenomenon : 8	

13.3.6.2 Reference Chain Analysis

Chain 1: Monsanto
(4) the acquired agriculture business – Monsanto – (8) The acquired agriculture business - its own extensive societal engagement programs

Chain 2: other stakeholders
(1) people – (2) the U.N. Sustainable Development Goals - people in developing countries and emerging markets- (10) leading nongovernmental organizations, patient groups, foundations, scientific institutions, educational partners and networks of experts – (12) smallholder farmers - (13) international volunteering programs - volunteer projects by employees

Chain 3: Bayer
(1) Bayer's societal engagement - (2) we - we – (4) Bayer - €49 million for Bayer - (5) our societal engagement – (6) Group-wide donation allocation - our donation and

foundation activities – (7) The Board of Management – (8) our structures – (9) Bayer's societal engagement - globally operating company – the Bayer Science & Education Foundation for leading-edge research, education and talent promotion, the Bayer Cares Foundation for social innovation and employee engagement, and the Monsanto Fund – (10) We - our initiatives – (11) We – the company sites – (12) Our company foundations – (13) we

13.3.6.3 Full text

1.4.3 Societal Engagement

1 Bayer's societal engagement focuses on people who work worldwide in education, science, health and social innovation, and who are committed to improving living conditions.

2 In this way, we support the U.N. Sustainable Development Goals "Good Health and Well-Being" (SDG 3) and "Zero Hunger" (SDG 2). For example, we enable people in developing countries and emerging markets to access our medical products through our various Access to Medicine activities.

3 Another funding area is sports and culture in Germany.

4 In 2018, Bayer – including the acquired agriculture business – made available some €66 million worldwide for charitable projects and activities (2017: €49 million for Bayer excluding Monsanto). See also A 1.4.1 See also A 1.6.2 See also A 1.3 Pharmaceuticals and A 1.6.1 www.bayer.com/childcare See also A 4.2 GRI 102-43 www.bayer.com/oecdfao-guidance Social innovation: see Glossary A Combined Management Report 1.4 Commitment to Employees and Society Bayer Annual Report 2018

5 An interdisciplinary corporate function is responsible for the strategic orientation and coordination of our societal engagement.

6 Group-wide donation allocation and management policies form the basis for our donation and foundation activities.

7 The Board of Management and an independent panel of internationally renowned experts help make major funding decisions.

8 The acquired agriculture business has its own extensive societal engagement programs, which will be integrated into our structures from 2019.

9 Bayer's societal engagement includes the activities of its globally operating company foundations that are aligned toward health care and nutrition: the Bayer Science & Education Foundation for leading-edge research, education and talent promotion, the Bayer Cares Foundation for social innovation and employee engagement, and the Monsanto Fund focusing on community projects, education, food and nutrition.

10 We work together with leading nongovernmental organizations, patient groups, foundations, scientific institutions, educational partners and networks of experts around the world to implement many of our initiatives.

11 Through various initiatives, we help improve living conditions very close to the company's sites. Our company foundations support, for example, science education worldwide at schools near company sites and projects promoting the agricultural self-sufficiency of smallholder farmers.

13 Under the auspices of international volunteering programs, we support volunteer projects by employees near their workplace in many countries.

A 1.4.3/1 Societal Engagement in 2018 Monsanto and Monsanto Fund: community projects, food and nutrition, education, disaster aid Recreational, disabled and competitive sports, cultural events, support for young artists Health education and prevention, social health, access to medical care, sustainable development and smallholder farmer projects, disaster aid, employee volunteering and community projects, Grants4Impact & Aspirin Social Innovation School projects, Baylab school laboratories, talent promotion, scholarships, promotion of leading-edge research, scientific awards, promotion of academies, symposia, conferences €15.2 million Social innovation, health and nutrition €15.2 million Science and education €66 million total €16.4 million Monsanto and Monsanto Fund €19.2 million Sports and culture www.bayerfoundations.com www.monsantofund.org

13.3.7 Text 7: Stakeholder dialogue promotes acceptance and business success (p.34)

Stakeholder dialogue	promotes	acceptance	and	business success
S	V	C	Connector	C
behaver	Pr: behavioural	Phenomenon		phenomenon

1

As a company,	Bayer	is	a part of society and of public life.
	S	V	C
Circ: manner	token	Pr: relational	value

2

Through open dialogue with our stakeholders	we	aim to build	trust in our actions, our products and the social value of our services,	because	the expectations and viewpoints of our stakeholders	affect	public acceptance of Bayer and thus our commercial success.

	S	V	O		S	V	O
Circ: manner	behaver	Pr: behavioural	phenomenon	Subordinator conjuctive	actor	Pr: material	goal

2.1

How	we	create	direct financial value for our stakeholders worldwide with our business activities	is shown	by the value creation graphic on our sustainability website.
	S	V	O	V - passive	
Circ: manner	actor	Pr: material	goal	Pr: material	Circ:

3

Stakeholder dialogue	helps	us	to recognize	important trends and developments in society	and	our markets	at an early stage	and	take	this information	into account [when designing our business.]
S	V	O1		O2	connector	O3		connector		O4	V
senser	Pr: mental	phenomenon	Pr	phenomenon		phenomenon	Circ: time		Pr	phenomenon	Pr

4

The integration of various stakeholder groups	is planned	within the scope of our stakeholder engagement process.
S	V passive	Prep phrase
phenomenon	Pr: behavioural	Circ: role

5

This process	also	includes	monitoring the results of individual dialogue measures.
S	adverb	V	Post-predicate –ing clause
senser		Pr: mental	phenomenon

6

In strategic decision-making processes such as investment projects and launches of new products,	Bayer	approaches	key social and political players	right from the start of a new project	to canvass their support.
	S	V	O		
Circ: role	sayer	Pr: verbal		Circ: time	Circ: reason

*analysed as communicates

7

The open dialogue	makes	it	possible to identify opportunities and risks early on.
S	V	O	
actor	Pr: material	goal	

8

This process	is	in line with our Stakeholder Engagement Guideline	and	is supplemented	by an internal information platform.
S	V		connector	V passive	
token	Pr: relational	Circ: means		Pr: relational	Circ: matter

9

We	fundamentally distinguish	four stakeholder groups	with which	we	engage	in discussing different issues in various dialogue formats.
S	Adverb+V	O		S	V	Post-predicate – ing clause
			Subordinate relative clause			
Senser	Pr: mental	phenomenon		actor	Pr: material	Circ: role

10. Image T7(1)

A 1.2.3/3

Our Most Important Stakeholder Groups

Bayer			
Partners	**Financial market participants**	**Social interest groups**	**Regulators**
› Customers › Suppliers › Employees › Associations › Universities / schools	› Investors › Banks › Rating agencies	› General public › NGOs › Local communities › Competitors	› Lawmakers › Politicians › Authorities

11. Image T7 (2)

Diverse stakeholders in focus

GRI 102-43

Our stakeholder engagement process describes how the expectations of our stakeholders can be taken into account in a specific project, for example, and dialogue with them steered. We regularly review the engagement process based on social trends.

A 1.2.3/4

Stakeholder Engagement Process

12 Collaboration formats aimed at specific target groups

13

Our regular stakeholder activities	range from	dialogue at local, national and international level and active involvement in committees and specialist workshops all the way through to comprehensive information programs, issue-related multi-stakeholder events and participation in international initiatives and collaborations.
S	V	O
token	Pr:	value

	relational	

14

The selected topics described below	provide	insights into our engagement with respect to our most important stakeholder groups.
S	V	O
Senser	Pr: mental	phenomenon

15

We	always focus on	a fact-based dialogue.
S	V	O
Senser	Pr: mental	phenomenon

16

As part of the process of acquiring and integrating the agriculture business,	we	held	wide ranging talks with representatives of nearly all our stakeholder groups	in 2018.
	S	V		
Subordinate clause, circ: role	Actor	Pr: material	goal	Circ: time

17

Examples	included	the Capital Markets Day for	as well as	intensive media relations work

		investors and a Bayer AG parliamentary evening		[including joint interviews with a Bayer executive manager and a critic in leading publications (e.g. Board of Management member *Liam Condon and Robert Habeck, head of Germany's Green Party, in the German magazine Capital).]
S	V	O	connector	O
token	Pr: relational	phenomenon		phenomenon

*specific names!

18

Our approaches for addressing the glyphosate debate	included	launching a transparency initiative	and	publishing safety studies;	participating in topic-specific talks around the world (Liam Condon at the World Food Convention, for instance);	and	creating an online platform to answer questions about glyphosate, crop protection, agriculture and genetic engineering.
S	V	Post-predicate		Post-	Post-predicate i-		Post-predicate i-

		i-ing clause	onne ctor	predicate i-ing clause	ing clause	onne ctor	ing clause
token	Pr: relational	Value		Value	Value		Value

19

In the political realm,		conducted	discussions	with political decision-makers,	nd	collaborated	in specialist committees and cooperation projects.
Prep phrase		V	O		onnect or	V	
Circ: matter	ctor	Pr: material	goal	Circ: accompaniment		Pr: material	Circ: role

20

Active participation by Bayer in political decision-making processes	is explicitly sought	by the key players involved.
O	V passive	S
goal	Pr: material	actor

21

The company's Public and Governmental Affairs Committee	develops	the principles for the alignment of Bayer's political lobbying.
S	V	O

actor	Pr: material	goal

22

In 2018,	Bayer's global lobbying work	focused on	the issues of "innovation," "access," "reputation" and "freedom to operate."
Prep time	S	V	O
Circ: time	Senser	Pr: mental	phenomenon

23

We	prioritize	being a reliable partner	that	is aware of	its societal responsibility toward the communities adjacent to our sites.
S	V	Post-predicate – ing as adjective	R elative pronoun	V	O
			Relative clause		
senser	Pr: mental	phenomenon		Pr: mental	phenomenon

24

To this end –	at our producti on sites	we	maint ain	open dialog ue	between local manageme	whic h	is support ed	by the respective country

	in particular –				nt and community members,			organization.
	Prep of location			O		Relative pronoun	V passive	S
						Relative clause		
Circ: purpose	Circ: location	senser	Pr: mental	phenomenon			Pr: mental	senser

25

This dialogue	includes	personal discussions	with residents, citizens' initiatives, representatives of religious communities and the regional press.
S	V	O	Prepositional complement
token	Pr: relational	value	Circ: matter

26

This community dialogue	is anchored	in a globally valid corporate policy on site management.
S	V	Prepositional complement

token	Pr: relational	Circ: manner

27

In 2018,	our everyday business	once again included	dialogue with our customers – especially with respect to their satisfaction with our products and services.
Prep: time	S	V+adv	O
Circ: time	token	Pr: relational	value

28

In this context,	our segments	navigate	very different regulatory frameworks.
Prep phrase	S	V	O
Circ: manner	Actor	Pr: material	goal

29

As a consequence,	direct contact between Pharmaceuticals or Consumer Health and the respective customer environment, and especially	is regulated	in very different ways for each segment.

	patients,		
cojunction	S	V passive	Prepositional complement
Circ: manner	goal	Pr: material	Circ: means

30

With regard to the collection of customer satisfaction data,	different legal requirements	apply	for prescription medicines from Pharmaceuticals than for nonprescription medicines, for example.
Prepositional predicate	S	V	Prepositional complement
Circ: purpose	actor	Pr: material	Circ: comparison

31

The primary market research and data research	[that	must be conducted ,	including systematic internet analysis],	strictly adhere	to the legal requirements,	which	can vary significantly	depending on the market.
S – main		V- passive		V	O	Relativ	V	-ing comple

noun phrase		strong epistemic modality				e pro nou n		ment
Complex embedded noun phrase						Relative clause		
Behaver and goal				Pr: behavio ural	phenomen on		Pr: material	

32

At Crop Science,	customer-centricity	is achieved	throughout the value chain by way of the 500-plus projects of the food chain partnerships, for example, or through direct cooperation with farmers,	as demonstrated by the Bayer ForwardFarms.
Prep ph. place	S	V passive	Prepositional complement	
Circ: location	value	Pr: relational	Circ: manner	Token

33

These programs	emphasize	innovative crop solutions and services for sustainable agriculture.
S	V	O
Senser	Pr:	phenomenon

	mental	

34

For more information on dialogue with stakeholders,	please refer	to the chapters Investor Information, Employees (Communication at all levels), Procurement and Supplier Management (Training measures and dialogue on the issue of sustainability), Sustainability Management (International Initiatives), Societal Engagement (Universities / Schools) and Product Stewardship (Commitment); see also our sustainability website.
	V - imperative	

13.3.7.1 Summary

	Material processes:	**Mental processes:**	**Verbal Processes:**	**Relational Processes:**	**Behavioural Processes:**	**Existential processes:**
1 total :	**14**	**13**	**1**	**10**	**4**	
2	**actors: 12**	**sensers: 10**	**sayers: 1**	**tokens: 9**	**behavers: 3**	**existent:**
3	**Bayer as actor: 8**	**Bayer as senser: 7**	**Bayer as sayer: 1**	**Bayer as token: 7**	**Bayer as behaver: 2**	**Bayer as existent:**
4	**others as actor : 4**	**others as sensers: 3**	**others as sayers: 0**	**others as token: 2**	**others as behavers: 1**	**others as existent:**

5	**Goals: 10**	**phenomenon: 14**	**verbiage: 0 receiver: 0**	**Value:**	**phenomenon : 4**	
6	**Bayer as goal: 6**	**Bayer as phenomenon:9**	**Bayer as receiver: 0**	**Bayer as value: 3**	**Bayer as phenomenon : 1**	
7	**Others as goal: 4**	**others as phenomenon: 5**	**others as receiver: 0**	**others as value: 4**	**Others as phenomenon : 3**	

13.3.7.2 Chain Reference Analysis:

Chain 1: stakeholders

(title) stakeholder dialogue – society – public life -(2) our stakeholders - our stakeholders - public acceptance – (2.1) our stakeholders worldwide –(3) Stakeholder dialogue - developments in society – (4) various stakeholder groups - our stakeholder engagement process – (6) key social and political players - their support – (9) four stakeholder groups – (12) specific target groups – (13) Our regular stakeholder activities – (14) our engagement – (16) representatives of nearly all our stakeholder groups – (17) the Capital Markets Day for investors - Bayer AG parliamentary evening - intensive media relations work - joint interviews with a Bayer executive manager and a critic in leading publications - Board of Management member Liam Condon and Robert Habeck, head of Germany's Green Party, in the German magazine Capital – (19) political decision-makers - specialist committees and cooperation projects – (20) key players – (23) communities adjacent to our sites – (24) local management and community members – (24) residents, citizens' initiatives, representatives of religious communities and the regional press – (25) community dialogue – (26) our customers - their satisfaction – (27) customer environment – patients – (30) food chain partnerships - farmers

Chain 2: Bayer

(title) business success – (1) as a company – Bayer – (2) our stakeholders - our actions - our products - social value of our services - our stakeholders – Bayer - our commercial success – (2.1) we - our stakeholders worldwide - our business activities - our sustainability website – (3) our markets - our business – (4) our stakeholder engagement process - (6) Bayer – (8) our Stakeholder Engagement Guideline – (9) we – (13) Our regular stakeholder activities – dialogue - committees and specialist workshops - comprehensive information programs - issue-related multi-stakeholder events - our most important stakeholder groups – (15) we – (16) we - representatives of nearly all our stakeholder groups - (17) the Capital Markets Day for investors - Bayer AG parliamentary evening - intensive media relations work - joint interviews with a Bayer executive manager and a critic in leading publications - Board of Management member Liam Condon and Robert Habeck, head of Germany's Green Party, in the German magazine Capital – (20) Bayer – (21) The company's Public and Governmental Affairs Committee – Bayer's political lobbying – (23) we - a reliable partner - communities adjacent to our sites – (24) our production sites – we – (25) corporate policy on site management – (26) our

everyday business – our customers – our products and services – (27) our segments – (27) Pharmaceuticals or Consumer Health – (30) Crop Science – Bayer ForwardFarms – (32) Investor Information, Employees (Communication at all levels), Procurement and Supplier Management (Training measures and dialogue on the issue of sustainability), Sustainability Management (International Initiatives), Societal Engagement (Universities / Schools) and Product Stewardship (Commitment); see also our sustainability website.

Chain 3: action related to stakeholder engagement
(title) promotes – (2) open dialogue - build trust – (2.1) create direct financial value – (3) recognize important trends – (4) integration – (5) monitoring - individual dialogue measures – (7) open dialogue - identify opportunities and risks – (9) distinguish – engage - various dialogue formats – (12) collaboration – (13) participation in international initiatives and collaborations – (14) our engagement – (15) focus on a fact-based dialogue – (16) wide ranging talks – (24) maintain open dialogue – personal discussions – (27) navigate – (30) customer-centricity - direct cooperation

Chain 4 topics of engagement:
(18) the glyphosate debate - topic-specific talks - glyphosate, crop protection, agriculture and genetic engineering – (22) "innovation," "access," "reputation" and "freedom to operate."

13.3.7.3 Image analysis:

Most important stakeholder groups are positioned in the same level, i.e., they are not positioned in a hierarchy that may indicate importance. On the contrary, the only hierarchy indicated is Bayer where the banner is positioned above all others.
The title of image T7(1) Our Most Important Stakeholder Groups could be said to be an empty one because the listed stakeholders encompass every possible aspect. The General public (under Social interest groups) may be a stakeholder that Bayer engages with. However, when examining the way in which the text anchors the image (Barthes) we can see that the text is oriented towards a financial interest.

13.3.7.4 Full text

Stakeholder dialogue promotes acceptance and business success

1 As a company, Bayer is a part of society and of public life.
2 Through open dialogue with our stakeholders we aim to build trust in our actions, our products and the social value of our services, because the expectations and viewpoints of our stakeholders affect public acceptance of Bayer and thus our commercial success.
2.1 How we create direct financial value for our stakeholders worldwide with our business activities is shown by the value creation graphic on our sustainability website.

3 Stakeholder dialogue helps us to recognize important trends and developments in society and our markets at an early stage and take this information into account when designing our business.
4 The integration of various stakeholder groups is planned within the scope of our stakeholder engagement process.
5 This process also includes monitoring the results of individual dialogue measures.
6 In strategic decision-making processes such as investment projects and launches of new products, Bayer approaches key social and political players right from the start of a new project to canvass their support.
7 The open dialogue makes it possible to identify opportunities and risks early on.
8 This process is in line with our Stakeholder Engagement Guideline and is supplemented by an internal information platform.
9 We fundamentally distinguish four stakeholder groups with which we engage in discussing different issues in various dialogue formats.
10 Image T7 (1) A 1.2.3/2 Results of the Materiality Analysis Innovation Climate protection Business ethics Sustainable food supply Environmental protection Product stewardship Access to health care Major areas of activity from 2019 Bayer Customers Suppliers Employees Associations Universities / schools Partners Financial market participants Investors Banks Rating agencies General public NGOs Local communities Competitors Social interest groups Regulators Lawmakers Politicians Authorities
11 Image T7 (2) A 1.2.3/3 Our Most Important Stakeholder Groups www.bayer.com/areasof-activity www.bayer.com/gri GRI 102-46 www.bayer.com/valuecreation GRI 102-42, 102-43 GRI 102-40 A Combined Management Report 1.2 Strategy and Management Bayer Annual Report 2018 Diverse stakeholders in focus Our stakeholder engagement process describes how the expectations of our stakeholders can be taken into account in a specific project, for example, and dialogue with them steered. We regularly review the engagement process based on social trends.
12 **Collaboration formats aimed at specific target groups**
13 Our regular stakeholder activities range from dialogue at local, national and international level and active involvement in committees and specialist workshops all the way through to comprehensive information programs, issue-related multi-stakeholder events and participation in international initiatives and collaborations.
14 The selected topics described below provide insights into our engagement with respect to our most important stakeholder groups.
15 We always focus on a fact-based dialogue.
16 As part of the process of acquiring and integrating the agriculture business, we held wideranging talks with representatives of nearly all our stakeholder groups in 2018.
17 Examples included the Capital Markets Day for investors and a Bayer AG parliamentary evening as well as intensive media relations work including joint interviews with a Bayer executive manager and a critic in leading publications

(e.g. Board of Management member Liam Condon and Robert Habeck, head of Germany's Green Party, in the German magazine Capital).

18 Our approaches for addressing the glyphosate debate included launching a transparency initiative and publishing safety studies; participating in topic-specific talks around the world (Liam Condon at the World Food Convention, for instance); and creating an online platform to answer questions about glyphosate, crop protection, agriculture and genetic engineering.

19 In the political realm, we conducted discussions with political decision-makers, and collaborated in specialist committees and cooperation projects.

20 Active participation by Bayer in political decision-making processes is explicitly sought by the key players involved.

21 The company's Public and Governmental Affairs Committee develops the principles for the alignment of Bayer's political lobbying.

22 In 2018, Bayer's global lobbying work focused on the issues of "innovation," "access," "reputation" and "freedom to operate." A 1.2.3/4 Stakeholder Engagement Process Analysis / adjustment Interaction Strategy development Clustering Prioritization Characterization Preparation Identification GRI 102-43 GRI 102-43 GRI 102-44 GRI 102-44 www.bayer.com/polinvolvement GRI 102-44 A Combined Management Report 1.2 Strategy and Management Bayer Annual Report 2018

23 We prioritize being a reliable partner that is aware of its societal responsibility toward the communities adjacent to our sites.

24 To this end – at our production sites in particular – we maintain open dialogue between local management and community members, which is supported by the respective country organization.

25 This dialogue includes personal discussions with residents, citizens' initiatives, representatives of religious communities and the regional press.

26 This community dialogue is anchored in a globally valid corporate policy on site management.

27 In 2018, our everyday business once again included dialogue with our customers – especially with respect to their satisfaction with our products and services.

28 In this context, our segments navigate very different regulatory frameworks.

29 As a consequence, direct contact between Pharmaceuticals or Consumer Health and the respective customer environment, and especially patients, is regulated in very different ways for each segment.

30 With regard to the collection of customer satisfaction data, different legal requirements apply for prescription medicines from Pharmaceuticals than for nonprescription medicines, for example.

31 The primary market research and data research that must be conducted, including systematic internet analysis, strictly adhere to the legal requirements, which can vary significantly depending on the market.

32 At Crop Science, customer-centricity is achieved throughout the value chain by way of the 500-plus projects of the food chain partnerships, for example, or through direct cooperation with farmers, as demonstrated by the Bayer ForwardFarms.

33 These programs emphasize innovative crop solutions and services for sustainable agriculture.

34 For more information on dialogue with stakeholders, please refer to the chapters Investor Information, Employees (Communication at all levels), Procurement and Supplier Management (Training measures and dialogue on the issue of sustainability), Sustainability Management (International Initiatives), Societal Engagement (Universities /Schools) and Product Stewardship (Commitment); see also our sustainability website.

13.4 Appendix D: Syngenta Annual report texts for analysis

13.4.1 Text 1: Chief Executive Officer's statement (p.2-3)

1

2018	**was**	**a landmark year for Syngenta**
S	V	O
Circ: time	Pr: relational	value

2

"Through more than 150 listening sessions around the world with stakeholders from across the value chain,	we	now have	a much better understanding of	[what society	expects	from us]	[and what	sustainable agriculture	means	to different groups]
	S	V	C	S	V	O	connector	S	V	O
	token	Pr: relatio	value	senser	Pr: menta	Circ: mean		senser	Pr: menta	phenomeno

		nal			l	s			l	n

3 (Image 2)

4

It	was	our first full year of operations under the ownership of ChemChina,	during which	we	acquired	several new businesses,	delivered	strong financial growth	and strengthened	our position as a thought leader.
S	V	O	Relative pronoun	S	V	O	V	O	V	O
Dummy it	V	O	Relative clause							
	Pr: relational	token		actor	Pr: material	goal	Pr: material	goal	Pr: behavioural	phenomenon

5

We	continued to make	a substantial contribution to	that	farmers	can safely feed	the world today,	while	planning to sustainably	feed	future generations.

		ensuring								
S	V	O		S	V low epistemology	O		Ing-subj	V	O
behaver	Pr: behavioural	phenomenon		actor	Pr: material	goal		Ellipted actor	Pr: material	goal

6 Record Free Cash Flow in 2018

7

Sales	increased	in 2018 by 7 percent to $13.5 billion.
S	V	C
actor	Pr: material	Circ: time and quality

8

We	maintained	profitability and record free cash flow of $1.76 billion.
S	V	O
actor	Pr: material	goal

9

Crop Protection sales of $10.4 billion	increased	7 percent compared to 2017,	with solid recovery in Latin America and good new product sales of SDHI fungicides in North America and Europe.
S	V	C	Prep ph predicate
actor	Pr: material	Circ: quality/extent	Circ: manner

10

Seeds sales of $3.0 billion	were	6 percent higher,	reflecting stronger performance in Latin America and Eastern Europe.
S	V	C	predicate
token	Pr: relational	value	

11

Our Flowers business	grew	by 7 percent.
S	V	C
actor	Pr: material	Circ: extent

12 **Continued innovation**

13

Our broad spectrum ADEPIDYN® fungicide	is now registered	for use on more than 80 crops in the United States and – under the brand name MIRAVIS™ – for use on canola, grapes and potatoes in Australia and New Zealand.
S	V +adv of time	C
actor	Pr: material	Circ: purpose

14

Our new generation fungicide AMPEXIO® WG Pepite®	was launched	in 11 European countries.
S	V passive	Prep of place

goal	Pr: material	Circ: location

15

In weed control,	our first post-emergent broad-spectrum herbicide, TALINOR™,	was launched	in the US and Australia and	controls	more than 45 weeds.
Prep phr.	S	V passive	Prep ph location	V	O
	goal	Pr: material	Circ: location	Pr: material	goal

16

In France,	CALARIS® herbicide	is now providing	fast and effective broadleaf weed control in corn.
	S	V	C
Circ: location	actor	Pr: material	goal

17

MINECTO®	continued	its strong performance,	in the US, controlling insects in vegetables and specialty crops	and was introduced	to growers in Spain and Columbia.
S	V	C	prep ph. place	V	predicate
actor	Pr: material	goal	Circ: place	Pr: material	Goal

18

We	also continued	our leadership and innovation in seed treatment,	where	FORTENZA ™ Duo	was introduced	to African and Indian growers, helping them with early control of the

						devastating fall armyworm.
S	V	C	Relative pronoun	S	V - passive	predicate
			Relative clause			
behaver	Pr: behavioural	phenomenon		goal	Pr: material	

19

We	saw	double-digit growth in acres committed to our data-driven AGRIEDGE EXCELSIOR® farm management system, [while offers such as AGRICLIME™ – [sharing the risk of low rainfall – and [HYVIDO® Cashback Yield Guarantee have provided growers with the confidence [to invest in new technology.]]
S	V	C
senser	Pr: mental	phenomenon

20

The acquisition of FarmShots™ in the United States and Strider® in Brazil	further enhances	our digital capability.
S	V	C
actor	Pr: material	goal

21

Along with the acquisition of Nidera™ Seeds in 2018,	we	also purchased	Abbott & Cobb™, a vegetable seeds company.
	S	V	O
Circ: means	actor	Pr: material	goal

22

To ensure the right leadership in our Seeds business,	we	have brought on	a number of new hires and further developed internal talent.
	S	V	O
Circ: purpose	actor	Pr: material	goal

23

We	are also opening	a major global Seeds office in Chicago in the heart of US corn and soy growing regions.
S	V +adv	O
actor	Pr: material	goal

24 (Images 3,4,5)

03 Sustainable Business Report 2018

25 **Contributing to sustainable agriculture**

26

In my remarks last year,	I	highlighted	our commitment	to working more closely and transparently with governments, NGOs and society to collectively find the solutions [we need.]
	S	V	O	
Circ: manner	sayer	Pr: verbal	verbiage	Circ: purpose

27

Through more than 150 listening sessions around the world [with stakeholders from across the value chain,]	we	now have	a much better understanding of	what	society	expects	from us	and what	sustainable agriculture	means	to different groups.
	S	V	C	pronoun	S	V	O	Connector +pronoun	S	V	
Circ: manner	token	Pr: relational	value	phenomenon	senser	Pr: mental	Circ: manner		senser	Pr: mental	phenomenon

28

Our aim	has been	to have a more direct and inclusive conversation to help rebuild the trust between society and science.
S	V	predicate
token	Pr: relational	value

29

The sessions	have helped	us	[to] better understand our role	so	we	can continue to build	society's confidence in the farming and agricultural innovation sectors.

S	V	C	predicate	connector	S	V - low epistemic modality	O
actor	Pr: material	goal			actor	Pr: material	goal

30 **The Good Growth Plan: strong progress**

31

In 2018,	we	made excellent progress	– in some cases exceeding – the 2020 targets	set down	in The Good Growth Plan.
	S	V		[Ellipted: that was..]	
				Relative clause	
Circ: time	behaver	Pr: behavioural			Circ: matter

32

Through our commitments	we	have also contributed significantly	to the achievement of the United Nations Sustainable Development Goals.
Prep phrase	S	V + adv	predicate
	behaver	Pr: behavioural	phenomenon

33

In 2018,	the greenhouse gas footprints from our reference farms	showed	an average efficiency increase of 8.8 percent compared with the 2014 baseline.
	S	V	O
Circ: time	senser	Pr: mental	phenomenon

34

Across 1,443 reference farms	we	have seen	a 13 percent improvement in productivity since 2014 baseline, well on the way to the target of 20 percent.
Prep phrase	S	V	O
Circ: location	senser	Pr: mental	phenomenon

35

Working to actively promote conservation agriculture,	we	have exceeded	the 2020 target of improving the fertility of 10 million hectares of land on the brink of degradation.
-ing noun phrase	S	V	O
	behaver	Pr: behavioural	phenomenon

36

We	have also exceeded	our 2020 biodiversity target by 27 percent.
S	V	Predicate
behaver	Pr: behavioural	phenomenon

37

We	are demonstrating	substantial increases in smallholder yields, improving on-farm practices, with productivity across smallholder reference farms up by 21.9 percent compared to the 2014 baseline.
S	V	predicate
behaver	Pr: behavioural	phenomenon

38

At the same time,	we	were able to extend	the number of smallholders reached through training across the world to 6.1 million, bringing the cumulative total of people trained in safe use to 33.8 million, some two thirds more than our original 2020 target.
	S	V	predicate
Circ: time	behaver	Pr: behavioural	phenomenon

39

Our people	**are**	**at the center of all [we do]**

S	**V**	**C**
token	**Pr: relational**	**Circ: extent/manner**

40

None of this success	would be possible	without the dedication and passion of some 28,000 people of Syngenta.
S	V	C
token	Pr: relational	Circ: manner

41

We	depend on	their knowledge, expertise and commitment to bring innovation to farmers, collaborators and partners along the value chain.
S	V	C
behaver	Pr: behavioural	phenomenon

42

We	continue to invest	in capability development with the company-wide ‘Pulse Survey’ [providing us with excellent feedback on [where to focus our efforts in 2019.]
S	V	C
actor	Pr: material	Circ: purpose

43

It	is	great to see	that	engagement	is	highest among the millennials in our workforce, for it is this group that represent the future of our industry.
Dummy it	V	C		S	V	projection?
				token	Pr: relational	value

44

And	the future of our industry	is	bright.
connector	S	V	C
	token	Pr: relational	value

45

2018	has showed	us	what	is	possible	when	we	align	as one team with one plan.
S	V	O	S	V	C		S	V	
senser	Pr: mental	phenomenon	token	Pr: relational	value		token	Pr: behavioural	value

46

Our work,	in bringing sustainable agriculture solutions to millions of farmers around the world,	meeting the needs and expectations of society, while protecting and enhancing the environment,	matters	more than ever.
S		-ing clause	V	C
senser	Circ: manner		Pr: mental	

47

48 J. Erik Fyrwald

49 Chief Executive Officer

13.4.1.1 Summary

	Material processes:	**Mental processes:**	**Verbal Processes:**	**Relational Processes:**	**Behavioural Processes:**	**Existential processes:**

1 total :	**24**	**9**	**1**	**11**	**11**	
2	**actors: 17**	**sensers: 10**	**sayers: 1**	**tokens: 9**	**behavers: 11**	**existent:**
3	**Syngenta as actor: 16**	**Syngenta as senser: 2**	**Syngenta as sayer: 1**	**Syngenta as token: 8**	**Syngenta as behaver: 10**	**Syngenta as existent:**
4	**others as actor : 1**	**others as sensers: 8**	**others as sayers: 0**	**others as token: 1**	**others as behavers: 1**	**others as existent:**
5	**Goals: 18**	**Phenomenon: 7**	**verbiage: 1** **receiver: 0**	**Value: 7**	**phenomenon: 10**	
6	**Syngenta as goal: 12**	**Syngenta as phenomenon: 3**	**Syngenta as receiver: 0**	**Syngenta as value: 7**	**Syngenta as phenomenon: 6**	
7	**Others as goal: 6**	**others as phenomenon: 4**	**others as receiver: 0**	**others as value: 0**	**Others as phenomenon: 4**	

13.4.1.2 Reference chain analysis:

Chain 1: Syngenta and products

(1)Syngenta - (2) us - (4) our - the ownership of ChemChina - we - our position as a thought leader - (5) We - (7) Sales - (8) We - (9) Crop Protection sales - good new product sales of SDHI fungicides - (10) Seeds sales - (11) Our Flowers business - (13) Our broad spectrum ADEPIDYN® fungicide - (14) Our new generation fungicide AMPEXIO® WG Pepite® - (15) our first post-emergent broad-spectrum herbicide, TALINOR™ - (16) CALARIS® herbicide - (17) MINECTO® - (18) We - our leadership and innovation - FORTENZA™ Duo - (19) We - (20) our digital capability - (21) we - (22) our Seeds business -we - new hires and further developed internal talent - (23) We - (26) my -I - our commitment - we - (27) we - us - (28) Our aim - (29) us - our role - we - (31) we - The Good Growth Plan - (32) our commitments - we - (33) our reference farms - (34) we - (35) we -(36) our 2020 biodiversity target - (37) We - (39) Our people - we - (40) 8,000 people of Syngenta - (41) We - (42) We - us - out efforts - (43) the millennials in our workforce - this group - the future of our industry - (44) our industry - (45) us - we - one team - (46) Our work,

Chain 2: Environment/natural environment

(35) land on the brink of degradation - (36) our 2020 biodiversity target - (46) protecting and enhancing the environment

Chain 3: Other stakeholders

(2) stakeholders from across the value chain - society - different groups - (5) farmers - the world - future generations - (14) European countries - (17) insects - growers in Spain and Columbia - (18) African and Indian growers - of the devastating fall armyworm - (19) growers (22) new hires and further developed internal talent - (26) governments, NGOs and society - (27) stakeholders from across the value chain - society - different groups - (28) society and science - (29) society's confidence -the farming and agricultural innovation sectors - (32) the United Nations Sustainable Development Goals - (34) reference farms - (37) smallholder reference farms - (40) 8,000 people of Syngenta - (41) their knowledge, expertise and commitment - farmers, collaborators and partners - (46) millions of farmers - society - protecting and enhancing the environment

13.4.1.3 Image analysis

Cover image: Image 1

Image 2

Image 3,4,5

03 Sustainable Business Report 2018

His gaze in all images is directed at the activity, which could be interpreted as action-directed, busy and ‘doing’, productive corporate life.

All the participants in the images are male

The CFO's attire is smart, indicating he is only an observer, he is in direct contact at all levels of the company, from the farmers in the fields, to the scientific divisions (image 2, the participants are wearing a white lab coat).

The CFO is positioned close to the participants, side by side relinquishing hierarchy and demonstrating the unified goal the company that was mentioned in *(45) 2018 has showed us what is possible when we align as one team with one plan.*

The images show him in physical interaction with 'the work', he is touching the plants and the soil.

The viewer is invited as an observer, to see all the activity and the company hard at work. The work is also portrayed to be accomplished in a team. Each image is depicting the CFO in the centre, albeit surrounded by other people who are often backgrounded.

13.4.2 Text 2: Creating value now and for the long term (p.4)

1

Syngenta	plays	a vital role [in enabling the food chain [to feed the world safely] [and take care of our planet].
S	V	C
behaver	Pr: behavioural	phenomenon

2

Our ambition	is	to be the most collaborative and trusted team in agriculture, providing leading seeds and crop protection innovations to enhance the prosperity of farmers, [wherever they are.]
S	V	predicate
token	Pr: relational	value

3

Our strategy	is	to grow through customer focused innovation – not just in product research and development, but in every aspect of our

		business model.
S	V	phenomenon
token	Pr: relational	value

4

We	seek	new and better ways to use resources, to develop and deliver products and services to farmers, and to create value for our many stakeholders – including employees, the communities	where	they	live	and society at large.
S	V	C	Relative pronoun	S	V	C
			Relative clause			
behaver	Pr: behavioural	phenomenon		actor	Pr: material	phenomenon

5

All this innovation	has	one focus:	a passion for our customers, the farmers	who	grow	the world's food.
S	V	C		Relative pronoun	V	
token	Pr: relational	value	value	Actor (farmers)	Pr: material	goal

6

To make our business work,	we	have to understand	their needs and deliver products and services	that	they	value.
	S	V - strong epistemic modality	predicate	Relative pronoun	S	V
Circ: purpose	senser	Pr: mental	phenomenon		senser	Pr: mental

7

And to make our business sustainable,	we	have to take	the long view:	ensuring that what	[we	do	today strengthens Syngenta and the food chain for tomorrow – economically, environmentally and socially.]
	S	V - strong epistemic modality	predicate		S	V	C
Circ: purpose	senser	Pr: mental		phenomenon			
					actor	Pr: material	goal

8

That's why	our Good Growth Plan commitments	are	integral to our business strategy.
	S	V	C
reason	token	Pr: relational	value

9

They	put	sustainability	center stage	in the way [that]	we	do	business	And [they]	align closely	with the UN's Sustainable Development Goals.
S	V	predicate	V	adv	S	V		Ellipted S	V	
Main clause				Relative clause				Main clause		
behaver	Pr: behavioural	phenomenon	Pr: behavioural		actor	Pr: material	goal	[they - ellipted]	Pr: behavioural	Circ: manner

10

If	we	succeed,	we	will achieve	not only growth for our business but also growth for all –	creating value	that	benefits	our employees, customers, communities and food chain partners.
	S	V	S	V - strong epistemic modality	C	C	Relative pronoun	V	C

Conditional dependent clause			Main clause			Relative clause		
	behaver	Pr: behavioural	behaver	Pr: behavio ural	phenomenon		Pr: behavio ural	phenom enon

11

Our success	will be measured	through the benefits	we	bring	to agriculture and the environment.
S	V passive strong epistemic modality	C	S	V	predicate
			Relative clause		
goal	Pr: material	Circ: manner	behaver	Pr: behavioural	phenomenon

12

But in a sector as challenging as agriculture,	success	is	not a given.
	S	V	C
	token	Pr: relational	value

13

It	will require	**determined execution**.
S	V	C
senser	Pr: mental	phenomenon

14

We	will need to collaborate	with many partners to achieve better outcomes and to earn trust by delivering on our commitments.
S	V	C
behaver	Pr:	Circ: manner

	behavioural	

15

That trust	depends	not just on what we do: the “how” matters, too.
S	V	C
senser	Pr: mental	phenomenon

16

So	transparency, ethics, safety and compliance	are	core to the way we work.
Adv conj	S	V	C
	token	Pr: relational	value

17

In operating our business model,	we	’re	determined	to live by the values we have set ourselves – which are emboldened in the paragraphs above.
	S	V	C	predicate
Circ: manner	token	Pr: relational	value	value

18

(Image 6)

13.4.2.1 Summary

	Material processes:	Mental processes:	Verbal Processes:	Relational Processes:	Behavioural Processes:	Existential processes:
1 total :	5	5	0	7	9	
2	actors: 4	sensers: 5	sayers: 0	tokens: 7	behavers: 8	existent:
3	Syngenta as actor: 2	Syngenta as senser: 2	Syngenta as sayer: 0	Syngenta as token: 5	Syngenta as behaver: 8	Syngenta as existent:
4	others as actor : 2	others as sensers: 3	others as sayers: 0	others as token: 2	others as behavers:	others as existent:
5	Goals: 4	Phenomenon: 4	verbiage: 0 receiver: 0	Value: 7	phenomenon: 8	
6	Syngenta as goal: 3	Syngenta as phenomenon: 2	Syngenta as receiver: 0	Syngenta as value: 5	Syngenta as phenomenon: 4	
7	Others as goal: 1	others as phenomenon: 2	others as receiver: 0	others as value: 2	Others as phenomenon: 4	

13.4.2.2 Reference chain analysis:

Chain 1: Syngenta

(1)Syngenta - (2) Our ambition - the most collaborative and trusted team - (3) Our strategy - customer focused innovation - our business model - (4) We - (5) **our customers**, the farmers who grow the world's food - (6) our business - we - (7) our

business - we - we - Syngenta - (8) our Good Growth Plan commitments - our business strategy - (9) They - we - (10) we - we - our business - (11) Our success - we - (14) We - our commitments - (15) we - we - (16) our business model - we - we - ourselves

Chain 2: The environment/ the natural world
(2) leading seeds - (7) environmentally - (11) the environment

Chain 3: Species

Chain 4: Other stakeholders
(1)- the world - our planet - (2) the prosperity of farmers - they - (4) farmers - our many stakeholders - employees - the communities where they live - society at large - (5) **our customers**, the farmers - the world's food - (6) their needs - they - (7) the food chain - (9) the UN's Sustainable Development Goals - (10) **all** - our employees, customers, communities and food chain partners - (11) agriculture and the environment - (14) many partners

13.4.3 Text 3: Our offer (p.6)

1 **Innovation with purpose**

2

Society's expectations around farming technology	do not stand still;	neither	does	the technology itself.
S	V		V	S
behaver	Pr: behavioural		Pr:behavioural	behaver

3

In recent years,	there	has been	a shift in focus from feeding a growing world population to increasing debates around environmentally sustainable diets and nutrition — from 'enough food' to 'good food'.

Circ: time	Existential there	Pr: existential	existent

4 (Image 7)

5

For many years,	we	have been advancing	the technologies for sustainable crop protection practice.
	S	V	O
Circ: time	actor	Pr: material	goal

6

Data science and precision agriculture	continue to reduce	the quantities of chemicals needed for effective control,	and	new biocontrols	are adding	non-chemical solutions to the farmer's

						toolbox.
S	V	O	con nect or	S	V	O
actor	Pr: material	goal		actor	Pr: material	goal

7

We	’re	Proud of the progress	we	’re making,	while recognizing that there’s still a long way to go.
S	V	O	S	V	
token	Pr: relational	value	behaver	Pr: behavioural	

8

We	’re	eager	to have a better conversation about what sustainable agriculture really means – with farmers, channel partners, food companies, food retailers, NGOs, academics and governments.
S	V	C	predicate
token	Pr: relational	value	

9

Not only to explain our views,	but also to equally listen and understand the expectations of all our stakeholders.
Dependent clause	Dependent clause

10

We	need to build	greater consensus through wider discussion with stakeholders	about how we can work together to create truly sustainable solutions in ways that reinforce society's confidence in farming and agricultural innovation.
S	V	C	
behaver	Pr: behavioural	phenomenon	Circ: purpose

11

We	strive to build	constructive and open relationships with governments, regulators, and NGOs.
S	V	O
behaver	Pr: behavioural	phenomenon

12

And	we	continue to establish	strategic partnerships and alliances with organizations such as the World Business Council for Sustainable Development, the International Rice Research Institute, The Nature Conservancy, and many scientific and academic institutions worldwide.
connector	S	V	predicate
	behaver	Pr: behavioural	phenomenon

13

These collaborations and partnerships	have always been	an important part of the way we work.
S	V+adv	C

token	Pr: relational	value

14

Sustainability	matters	increasingly to value chain companies	because	of the commitments	they	are making	to consumers.
S	V	adv+predicate	connector	O	S	V	O
senser	Pr: mental	Phenomenon		Circ: reason phenomenon	senser	Pr: mental	Circ: purpose

15

We	prioritize	sustainability issues at every stage of our work, from the lab to the field.
S	V	O
behaver	Pr: behavioural	phenomenon

16

Our research and development processes	assess	the impacts of candidate compound and techniques from the earliest possible stages.
S	V	O
senser	Pr: mental	phenomenon

17

And we	are integrating	sustainability into our commercial offer to farmers, promoting the benefits of using our products to grow crops with lower impacts.
Connector and S	V	O
behaver	Pr: behavioural	phenomenon

18

Working more closely with downstream partners in the value chain	means	we	can integrate	innovative products and agronomic services	that	enable	growers to deliver what they need and meet their specifications in areas such as traceability and sustainability.
S	V	S	V	O		V	O
senser	Pr: mental	behaver	Pr: behavioural	phenomenon		Pr: material	goal

19

In Italy, for example,	we	work	with pasta manufacturers including De Matteis on the Grano Armando project to establish crop protection protocols	that enable growers to produce higher yields of top-quality durum wheat and secure them higher and more reliable incomes.
	S	V	C	Relative clause
Circ: place	actor	Pr: material	Circ: role	

20

We	have now also bred	a new wheat variety with tailored agronomy specifically for this project.
S	V +adv	C
actor	Pr: material	goal

21

In Argentina,	we	are working	with soybean and peanut growers together with a local food processor – AGD – on multifunctional landscapes	that	enhance	biodiversity and pollination.
	S	V	O		V	
				Relative clause		
Circ: place	actor	Pr: material	Circ: manner		Pr: material	goal

22

One key goal	is	to satisfy the developing sustainability requirements of their European export customers.
S	V	predicate

token	Pr: relational	Circ: purpose

23

Sustainable agriculture	matters increasingly	to governments, too.
S	V+adv	O
senser	Pr: mental	phenomenon

24

This	is encouraging	them	to work more closely with us, and nowhere more so than in China, where the government is driving rapid modernization of agriculture alongside a transition to a much more sustainable economy.
S	V	O	predicate
senser	Pr: mental	phenomenon	Circ: purpose

25

Along with our stewardship programs,	we	support	sustainable manufacturing and production of crop protection active ingredients and products in China.
	S	V	C
Circ: manner	behaver	Pr: behavioural	phenomenon

26

We	do	this	through our long-term commitment to

			rigorous supplier selection, continuous supplier management and applying our world-class manufacturing standards.
S	V	O	Prep phrase
actor	Pr: material	goal	Circ: manner

27 (Images 8, 9)  

28

"We	are committed	to driving ever more sustainable agricultural practices and to working with others across society and the value chain to deliver better food for the future.
S	V	predicate
behaver	Pr: behavioural	phenomenon

8 Alexandra Brand

9 Chief Sustainability Officer

13.4.3.1 Summary

	Material processes:	**Mental processes:**	**Verbal Processes:**	**Relational Processes:**	**Behavioural Processes:**	**Existential processes:**

1 total :	**10**	**6**	**0**	**4**	**11**	**1**
2	**actors: 7**	**sensers: 6**	**sayers: 0**	**tokens: 4**	**behavers: 9**	**existent:**
3	**Syngenta as actor: 5**	**Syngenta as senser: 2**	**Syngenta as sayer: 0**	**Syngenta as token: 3**	**Syngenta as behaver: 9**	**Syngenta as existent:**
4	**others as actor : 2**	**others as sensers: 4**	**others as sayers: 0**	**others as token: 1**	**others as behavers: 0**	**others as existent: 1**
5	**Goals: 8**	**Phenomenon: 5**	**verbiage: receiver: 0**	**Value: 3**	**phenomenon: 11**	
6	**Syngenta as goal: 2**	**Syngenta as phenomenon: 1**	**Syngenta as receiver: 0**	**Syngenta as value: 3**	**Syngenta as phenomenon: 7**	
7	**Others as goal: 6**	**others as phenomenon: 4**	**others as receiver: 0**	**others as value:0**	**Others as phenomenon: 4**	

13.4.3.2 Reference chain analysis

Chain 1: Syngenta
(title) - Our offer (5)we - (7)We - we - (8) We - (9) our views - all our stakeholders - (10) We - we - (11) We - (12) we - (13) we - (15) We - our work - (16) Our research and development processes - (17) we - our commercial offer - (18) we - (19) we - (20) We - (21) we - (24) us - (25) our stewardship programs - we -(26) We -our long-term commitment - our world-class manufacturing standards -(28) we

Chain 2: The natural environment/species
(21) multifunctional landscapes - biodiversity and pollination

Chain 3: Other stakeholders
(2)Society - (3) world population - (6) farmer's toolbox - (8) farmers, channel partners, food companies, food retailers, NGOs, academics and governments - (9) all our stakeholders - (10) stakeholders - society - (11) governments, regulators, and NGOs - (12) the World Business Council for Sustainable Development - the International Rice Research Institute - The Nature Conservancy - many scientific and academic institutions worldwide - (14) value chain companies - they - consumers - (17) farmers - (18) downstream partners - growers - they - their specifications - (19) pasta manufacturers - De Matteis on the Grano Armando project -growers - them - (21) soybean and peanut growers - a local food processor – AGD - their European export customers - (23) governments - (24) them - (25) China - (28) others across society

13.4.3.3 Image Analysis

4 Image 7:

27 Image 8,9

Image 7 displays a green field, with 'wildlife' border foregrounded, showing white blossoming flowers not too dissimilar to the luscious green field, with trees bordering the field in the distance.
This visualisation aligns with X who discuss the insidiousness of pesticides. In other words, the image presents a false reality and a constructed one as well. Image 7 presents only one choice, taken at a particular point at the farming cycle, a point after and before the application of pesticides. Thus the viewer is not presented with what a field would look like after the application of dessicants, for example. The angle of the image is not at the level of the field, but towering in over it.

The cleanliness and serenity portrayed through the blue skies, contributes to the construction of a metaphor of NATURE IS AGRICULTURE.

There is a disconnection between agriculture, the natural world, and human animals is evident in the images (8,9). The participants in the images are positioned in an actor position as in a transitive interaction: the participants are positioned above nature, featured acting UPON nature.

13.4.4 Text 4: The Good Growth Plan (p.18-19)

1

The Good Growth Plan	is	a core element of our strategies for both our Crop Protection and Seeds businesses to ensure their success and long-term viability.
S	V	C
token	Pr: relational	value

2

It	defines	six commitments in areas where improvement is essential to secure the future of agriculture and our planet's ecosystems.
S	V	C
token	Pr: relational	value

3

Each commitment	sets	hard, stretch targets to be achieved by 2020.
S	V	C
token	Pr: relational	value

4

We	report	our progress against these KPIs each year	and	provide	additional progress information online at www.data.syngenta.com.
S	V	C	connector	V	C
sayer	Pr: verbal	verbiage		Pr: material	goal

5

The Good Growth Plan's principles and priorities	are	deeply embedded in the way	we	do business.
S	V	C	S	V phrase

			that - ellipted, adverbial	
token	Pr: relational	value	actor	Pr: material

6

We	are gathering	unprecedented agricultural data and insight from our reference farms,	which	we	are sharing	with partners, academics, NGOs and public institutions worldwide.
S	V	C		S	V	
			Relative clause			
behaver	Pr: behavioural	phenomenon		actor	Pr: material	Circ: manner

7

The lessons	['That' ellipted'	we	learn]	are enabling	us	to enhance our commercial offer, delivering real and measurable benefits to farmers, rural communities and the environment.
S		S	V	V	O	predicate
senser		Relative clause				
		senser	Pr: mental	Pr: mental	phenomenon	Circ: manner

8

In these ways,	the Plan	Contributes to	the sustainability both of our own business, and of the wider world	that	we	serve.
	S	V	C		S	V
Circ: manner	behaver	Pr: behavioural	phenomenon		actor	Pr:material

9

So	it	's	appropriate	to view our sustainability development not only in business terms, but also in relation to the UN's 17 Sustainable Development Goals (SDGs).
	S - dummy it	V	C	predicate
		Pr: relational	value	Circ: purpose

10

In the UN's words,	achieving these goals	"requires the partnership of governments, private sector, civil society and citizens alike to make sure we leave a better planet for future generations".
	S	

sayer/circ: on behalf		Pr: verbal, Verbiage

11

We	believe	that	Syngenta	is actively contributing	to many of the SDGs,	and	we	recognize	a responsibility to maintain a culture of continuous improvement against them.
S	V		S	V	predicate	connector	S	V	O
senser	Pr: mental		behaver	Pr: behavioural	phenomenon		senser	Pr: mental	phenomenon
		phenomenon							

12

In the following sections – on The Good Growth Plan and our own operations –	we	highlight	the relevant SDGs alongside our report on the progress we are making.
	S	V	C
Circ:	behaver	Pr: behavioural	phenomenon

(Image 10)

(Image 11, p.19)

13.4.4.1 Summary

	Material processes:	Mental processes:	Verbal Processes:	Relational Processes:	Behavioural Processes:	Existential processes:
1 total :	4	4	2	5	4	0
2	actors: 3	sensers: 3	sayers: 2	tokens: 4	behavers:	existent: 0
3	Syngenta as actor: 3	Syngenta as senser: 3	Syngenta as sayer: 1	Syngenta as token: 4	Syngenta as behaver: 4	Syngenta as existent:
4	others as actor : 0	others as sensers: 0	others as sayers: 1	others as token: 0	others as behavers: 0	others as existent:
5	Goals: 1	Phenomenon:	verbiage: 2	Value: 0	phenomeno	

		3	**receiver: 0**		**n: 4**	
6	**Syngenta as goal: 1**	**Syngenta as phenomenon: 3**	**Syngenta as receiver: 0**	**Syngenta as value: 4**	**Syngenta as phenomeno n: 2**	
7	**Others as goal: 0**	**others as phenomenon:0**	**others as receiver: 0**	**others as value:0**	**Others as phenomeno n: 2**	

13.4.4.2 Reference Chain Analysis:

Chain 1: Syngenta

(1)The Good Growth Plan - our strategies - our Crop Protection - Seeds businesses - their success - (4) We - our progress - (5) The Good Growth Plan's principles and priorities - we - (6) We - our reference farms - (7) we farmers - (8) our own business - we (serve) - (9) our sustainability development - (11) We - Syngenta - we - (12) The Good Growth Plan and our own operations - we - our report - we

Chain 2: Environment

(2) our planet's ecosystems

Chain 3: Other stakeholders

(6) partners, academics, NGOs and public institutions worldwide - (7) farmers, rural communities and the environment - (8) the wider world - (9) the UN's 17 Sustainable Development Goals (SDGs). - (10) the UN's words - partnership of governments, private sector, civil society and citizens - we - future generations

13.4.4.3 Image Analysis

(Image 10)

Traditional agriculture, of all the images this is the only one that shows someone ‘authentic’. But it is out of context. The viewer is also a spectator and there is no eye contact

(Image 11, p.19)

13.4.5 Text 5: Help biodiversity flourish (p.26-27)

Help	biodiversity	flourish
V - could be analysed as imperative or as ellipted subj - we	O	predicate
Pr: material *	goal	Circ: (ellipted 'to') purpose

*analysed as: 'we help biodiversity to flourish'

1

Enhance	biodiversity	on 5 million hectares of farmland
V	O	
Pr: material	goal	Circ: location

*analysed as: 'we enhance biodiversity'

2

The experience and evidence base	we	're building	demonstrates	that	biodiversity investment	Makes business sense
S	S	V	V		S	V phrase
	Relative phrase			O		
behaver	actor	Pr: material	Pr: behavioural		senser	Pr: mental

3 UN Sustainable Development Goals 2, 15, 17

4 **Progress and key achievements**

5

2020 target	exceeded	by over 27 percent
S	V	
actor	Pr: material	Circ: manner

6

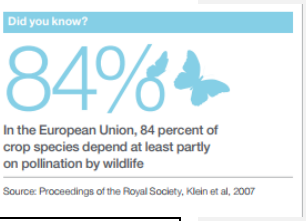
Published	research	to quantify the economic and social benefits of multi-functional field margins
V	O	predicate
Pr: material	goal	Circ: purpose

7

Stepped up	biodiversity projects	with national institutions in China
V	O	
Pr: behavioural	phenomenon	Circ: accompaniment

8 **Did you know?**

9 – I have the paper this is citing (Klein 2006) (Image 12)



In the European Union, 84 percent of crop species	depend at least partly on	pollination	by wildlife
S	V + adv	O	
Circ: place senser	Pr: mental	phenomenon	Circ: manner

10

The sustainability of agriculture	relies on	biodiversity	— for plant breeding, pollination and food diversity.
S	V	O	
senser	Pr: mental	phenomenon	Circ: accompaniment

11

We	are promoting and enabling	action to increase and connect habitats	that	support	healthy and diverse wildlife populations.
S	V	O	Relative pronoun	V	O
			Relative clause		
behaver	Pr: behavioural	phenomenon/ behaver (habitats)		Pr: behavioural	phenomenon

12

A key strategy	is	managing less-productive farmland alongside fields and waterways [[to reintroduce local species,] [provide buffers for soil and water,] and [provide corridors connecting wildlife habitats.]]
S	V	C
token	Pr: relational	value

13

These multi-functional field margins (MFFMs)	support	sustainable intensification on the more productive land.
S	V	C
behaver	Pr: behavioural	phenomenon

14 **Demonstrating the value of diversity**

15

Although	we	surpassed	our 2020 target	in 2017,
Subordinating conjunction	S	V	O	Prep time
Subordinate clause				
Circ: manner	actor	Pr: material	goal	Circ: time

we	continue	investing in both new and existing biodiversity initiatives,
S	V	predicate
behaver	Pr: behavioural	phenomenon

we	continue	investing in both new and existing biodiversity initiatives.
S	V	predicate
behaver	Pr: behavioural	phenomenon

16

We	have now implemented	301 projects in 39 countries, benefiting a total of 6.4 million hectares.
S	V+adv	O
behaver	Pr: behavioural	phenomenon

17

Benefits for farmers	include	reduced soil erosion and better soil nutrient cycling, crop pollination, pest control and water quality regulation.
S	V	O
token	Pr: relational	value

18

Wider social gains	include	enhanced genetic diversity, carbon sequestration, flood attenuation and recreation opportunities.
S	V	O
token	Pr: relational	value

19

After an exceptional year in 2016,	the pace of increase in impacted acreage	has	moderated.
	S	V	C
Circ: time	token	Pr: relational	value

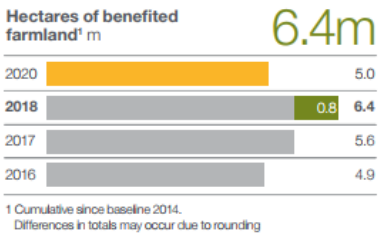
20

Though integrating biodiversity into commercial offers	is	a complex task,
S	V	C
token	Pr: relational	value

we	have continued	to develop and promote	that	emphasize	biodiversity as an

		programs			integral part of good agricultural practice and land stewardship .
S	V	predicate	Relative pronoun	V	O
behaver	Pr: behavioural	Phenomenon / senser		Pr: mental	phenomenon

21



(Image 13)

22

In collaboration with Bioversity International and Arcadis,	we	have developed	a discussion paper evaluating the value of MFFMs in the agricultural landscape.
	S	V	O
Circ: manner	actor	Pr: material	goal

23

It	documents	20 natural and environmental benefits, along with 15 social-capital benefits,	and	quantifies	them financially,	to help farmers see the monetary value that MFFMs create for them and

						for society.
S	V	O	conn ector	V	O+adv	predicate
toke n	Pr: relational	value		Pr: material	goal	Circ: manner/pur pose

24

We	are now organizing	events and roundtables [with our partners, using this paper to generate interest from value chain companies and the financial sector]	that	will drive	higher investment in MFFMs.
S	V	O		V	O
actor	Pr: material	goal/ behaver		Pr: behavioural	phenomeno n

25

Download	the joint discussion paper on multi-functional field margins www.publications.syngenta.com
V - imperative	O
Pr: material	goal

26 **Scaling up Operation Pollinator™**

27

We	Continue to promote	landscape connectivity – a key factor for habitat and biodiversity conservation in

		agricultural landscapes.
S	V	predicate
behaver	Pr: behavioural	phenomenon

28

Our largest program	is	in Brazil,	where	we	started	work	in 2008	and	are still building momentum	with policy makers, farmers, local communities, NGOs and value chain companies.
S	V		Relative pronoun	S	V	O	Prep time	connector	V	Prep phrase
token	Pr: relational	Circ: place		actor	Pr: material	goal	Circ: time		Pr: behavioural	Circ: accompaniment

29

Projects that began in municipalities	now expand	across whole states.
S	V +adv	Prep phrase
actor	Pr: material	Circ: place

30

In addition to this,	our principal focus in 2018	has been on extending	our Operation Pollinator™ programs	around the world.
	S	V	C	Prep phrase
Circ:	behaver	Pr: behavioural	phenomenon	Circ: place

31 (subtitle)

Help	biodiversity	flourish	continued
V	O	predicate	
Could be imperative or pr: material Analysed as ‘we (ellipted) help biodiversity flourish’	goal	Circ: purpose	

32

In 2018,	we	joined	several Chinese government agricultural and research bodies in staging a Bee Conference with the theme “Bee Booming, Plant Flourishing, Green Growing”.
	S	V	O
Circ: time	behaver	Pr: behavioural	phenomenon

33

This	provided	an opportunity to share our experience gained through implementing our Operation Pollinator™ and Hives on Farms programs on over 10,000 acres of Chinese farmland and fruit orchards, see case study (right).
S	V	C
token	Pr: relational	value

34

Value chain companies	are increasingly interested	in collaborating on Operation Pollinator projects,	and	we	began	new initiatives with food companies	in Argentina and Brazil in 2018.
S	V	O	connector	S	V	C	
senser	Pr: mental	Circ:		actor	Pr: material	goal	Circ: place and time

35

We	are also looking	beyond farmland:
S	V	
senser	Pr: mental	Circ:

we	have been applying	our management expertise and seed consulting services to transform a growing number of out-of-play areas on golf courses into improved habitat for bees and other pollinators
S	V	O
actor	Pr: material	goal

36

(Image 14)

37 **(subtitle)**

Bees	**are**	**the keys to kiwis**	**[that**	**please]**

S	V	C		V
token	Pr: relational	value		Pr: mental

38

In China,	we	have been working	with the Institute of Apiculture Research	at the Academy of Agricultural Sciences	on projects to improve fruit yields and quality	through better pollination.
	S	V				
Circ: location	actor	Pr: material	Circ: accompaniment	Circ: location	Circ:matter	Circ: manner

39

We	have had	significant success	with bees	in kiwi orchards	in Sichuan province	where	we	established	field margins	and	put	bee hives	on farms.
S	V	C				Relative pronoun	S	V		connector	V	O	
token	Pr: relational	value	Circ: matter	Circ: location	Circ: place		actor	Pr: material	goal		Pr: material	goal	Circ: place

40

We	have shown	how	bee pollination	can provide	a cheaper and more efficient alternative to hand pollination, producing higher quality fruit with strong consumer appeal.
S	V		S	V	O

		O			
behaver	Pr: behavioural		actor	Pr: material	Goal

13.4.5.1 Summary

	Material processes:	Mental processes:	Verbal Processes:	Relational Processes:	Behavioural Processes:	Existential processes:
1 total :	33	7	0	10	31	0
2	actors: 14	sensers: 5	sayers:	tokens: 10	behavers: 13	existent:
3	Syngenta as actor: 12	Syngenta as senser: 2	Syngenta as sayer:	Syngenta as token: 6	Syngenta as behaver: 12	Syngenta as existent:
4	others as actor : 2	others as sensers: 3	others as sayers:	others as token: 4	others as behavers: 1	others as existent:
5	Goals: 14	Phenomenon: 4	verbiage: receiver:	Value: 9	phenomenon: 12	
6	Syngenta as goal: 7	Syngenta as phenomenon: 1	Syngenta as receiver:	Syngenta as value: 3	Syngenta as phenomenon: 6	
7	Others as goal: 7	others as phenomenon: 3	others as receiver:	others as value: 6	Others as phenomenon: 6	

13.4.5.2 Reference Chain Analysis:

Chain 1: Syngenta

(2) **we - biodiversity investment -** (11) We - (15) we - our 2020 target in 2017 - we - biodiversity initiatives biodiversity initiatives - (16) We - (20) we - (22) we - (23) We - our partners - (24) **Operation Pollinator™** - (26) We - (27) Our largest program - (29) our principal focus - our Operation Pollinator™ programs -(31) we - (32) our experience - our Operation Pollinator™ and Hives on Farms programs - (33) Operation Pollinator projects - we - (34) We - (38) We - we - (39) We

Chain 2: Environment

(title) biodiversity - (1) biodiversity - 5 million hectares of farmland - (2) **biodiversity investment - (6)** multi-functional field margins - (7) biodiversity projects - (9) pollination by wildlife - (10) biodiversity — for plant breeding, pollination and food diversity - (11) habitats - wildlife populations -(12) farmland - fields and waterways - local species - soil and water - wildlife habitats - (13) multi-functional field margins (MFFMs) - more productive land - (14) **the value of diversity**(15) biodiversity initiatives biodiversity initiatives - (16) 6.4 million hectares - (17) soil erosion - soil nutrient cycling - crop pollination - water quality regulation - (18) enhanced genetic diversity - (20) biodiversity - biodiversity - (24) www.publications.syngenta.com - (25) multi-functional field margins - (26) habitat and biodiversity conservation - (32) fruit orchards - (34) we - our management expertise and seed consulting services - (35) **Bees - (37)**better pollination - (38) bees in kiwi orchards - field margins - beehives - (39) bee pollination

Chain 3: Other stakeholders

(3) UN Sustainable Development Goals 2, 15, 17 - (7) national institutions in China - (17) farmers - (22) Bioversity International and Arcadis - farmers - them - society - (23) our partners - (27) policy makers, farmers, local communities, NGOs and value chain companies - (31) several Chinese government agricultural and research bodies - (33) food companies - (34) habitat for bees and other pollinators - (37) the Institute of Apiculture Research at the Academy of Agricultural Sciences

Chain 4: discourse of counting and measurement

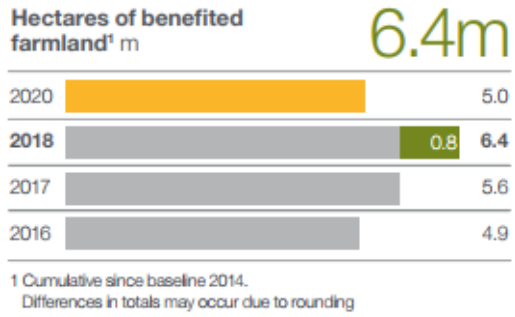
(5) 2020 target exceeded by over 27 percent - (6) quantify the economic and social benefits -(15) our 2020 target in 2017 - (16) 6.4 million hectares - (17) farmers - (22) 20 natural and environmental benefits - quantifies them financially - monetary value that MFFMs - (23) higher investment in MFFMs - (37) fruit yields - better pollination - (39) a cheaper and more efficient - producing higher quality fruit

Chain 5: discourse of human technocratic use of the natural environment

(18) enhanced genetic diversity, carbon sequestration, flood attenuation and recreation opportunities - (19) impacted acreage - (20) good agricultural practice and land stewardship -(22) agricultural landscape - (26) landscape connectivity - agricultural landscapes - (31) Bee Conference -“Bee Booming, Plant Flourishing, Green Growing” - (32) Chinese farmland - fruit orchards - (34) farmland - out-of-play areas on golf courses -

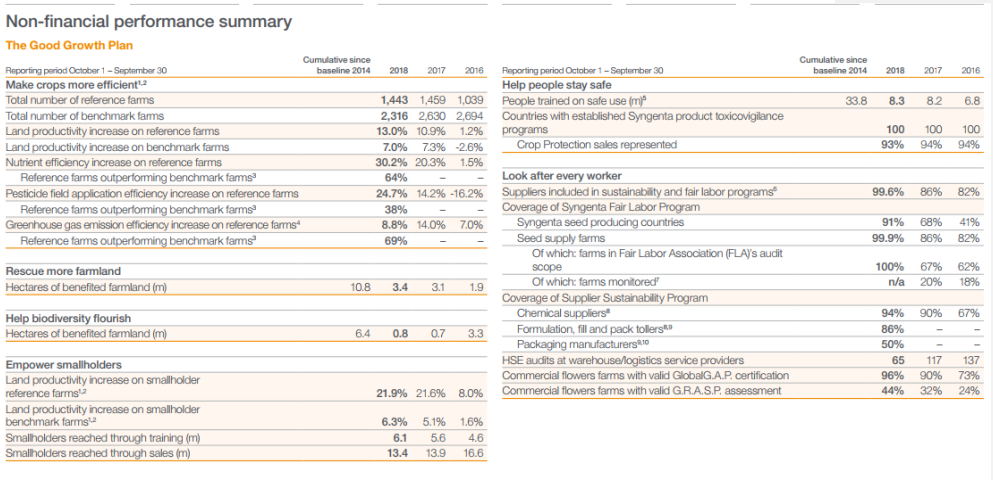
13.4.5.3 Image Analysis

21 (Image 13)



36 (Image 14)

13.4.6 Text 6: Non-financial performance summary (p.52)



Non-financial performance summary

The Good Growth Plan

Reporting period October 1 – September 30	Cumulative since baseline 2014	2018	2017	2016
Make crops more efficient[1,2]				
Total number of reference farms		**1,443**	1,459	1,039
Total number of benchmark farms		**2,316**	2,630	2,694
Land productivity increase on reference farms		**13.0%**	10.9%	1.2%
Land productivity increase on benchmark farms		**7.0%**	7.3%	-2.6%
Nutrient efficiency increase on reference farms		**30.2%**	20.3%	1.5%
Reference farms outperforming benchmark farms[3]		**64%**	–	–
Pesticide field application efficiency increase on reference farms		**24.7%**	14.2%	-16.2%
Reference farms outperforming benchmark farms[3]		**38%**	–	–
Greenhouse gas emission efficiency increase on reference farms[4]		**8.8%**	14.0%	7.0%
Reference farms outperforming benchmark farms[3]		**69%**	–	–
Rescue more farmland				
Hectares of benefited farmland (m)	10.8	**3.4**	3.1	1.9
Help biodiversity flourish				
Hectares of benefited farmland (m)	6.4	**0.8**	0.7	3.3
Empower smallholders				
Land productivity increase on smallholder reference farms[1,2]		**21.9%**	21.6%	8.0%
Land productivity increase on smallholder benchmark farms[1,2]		**6.3%**	5.1%	1.6%
Smallholders reached through training (m)		**6.1**	5.6	4.6
Smallholders reached through sales (m)		**13.4**	13.9	16.6

Reporting period October 1 – September 30	Cumulative since baseline 2014	2018	2017	2016
Help people stay safe				
People trained on safe use (m)[5]	33.8	**8.3**	8.2	6.8
Countries with established Syngenta product toxicovigilance programs		**100**	100	100
Crop Protection sales represented		**93%**	94%	94%
Look after every worker				
Suppliers included in sustainability and fair labor programs[6]		**99.6%**	86%	82%
Coverage of Syngenta Fair Labor Program				
Syngenta seed producing countries		**91%**	68%	41%
Seed supply farms		**99.9%**	86%	82%
Of which: farms in Fair Labor Association (FLA)'s audit scope		**100%**	67%	62%
Of which: farms monitored[7]		**n/a**	20%	18%
Coverage of Supplier Sustainability Program				
Chemical suppliers[8]		**94%**	90%	67%
Formulation, fill and pack tollers[8,9]		**86%**	–	–
Packaging manufacturers[8,10]		**50%**	–	–
HSE audits at warehouse/logistics service providers		**65**	117	137
Commercial flowers farms with valid GlobalG.A.P. certification		**96%**	90%	73%
Commercial flowers farms with valid G.R.A.S.P. assessment		**44%**	32%	24%

1 Make crops more efficient

2 Land productivity increase on reference farms

3 Land productivity increase on benchmark farms

4 Nutrient efficiency increase on reference farms

5 Pesticide field application efficiency increase on reference farms

6 Greenhouse gas emission efficiency increase on reference farms

7 Rescue more farmland

8 Hectares of benefitted farmland

9 Help biodiversity flourish

10 Hectares of benefitted farmland

11 Empower smallholders

12 Land productivity increase on smallholder reference farms

13 Land productivity increase on smallholder benchmark farms

14 Smallholders reached through training

15 Smallholders reached through sales

16 Help people stay safe

17 People trained on safe use

18 Countries with established Syngenta toxicovigilance programs

19 Crop protection sales represented

20 Look after every worker

21 Suppliers included in sustainability and fair labour programs

22 Coverage of Syngenta Fair Labour Program

23 Syngenta seed producing countries

24 Seed supply farms

25 Of which farms in Fair Labor Association

26 of which farms monitored

27 Coverage of Supplier Sustainability Program

28 Chemical suppliers

29 Formulation, fill and pack toilers

30 Packaging manufacturers

31 HSE audits at warehouse/logistics service providers

32 Commercial flowers farms with valid GlobalG.A.P certification

33 Commercial flower farms with valid G.R.A.S.P assessment

13.4.6.1 Reference Chain analysis:

Chain 1: Discourse of instrumentalism/efficiency/numbers

(1) Efficient - (2) Land productivity - (3) Land productivity - (4) Nutrient efficiency - (5) Pesticide field application efficiency - (6) Greenhouse gas emission efficiency

Chain 2: Dominant discourse of agriculture

(7) Rescue more farmland (24) Seed supply farms - (32) Commercial flower farms - (33) Commercial flower farms

Chain 3: The natural environment, species and biodiversity

(1)Crops - (2) Land - (3) Land - (9) biodiversity - (12) Land - (13) Land

13.4.7 Text 7: Syngenta Public Policy Position on Enhancing Agricultural Biodiversity

Introduction

1 Agriculture depends on a complex variety of plant and animal life.

2 This variety and variability of animals, plants and micro-organisms, used directly or indirectly for food and agriculture, is referred to as 'agricultural biodiversity'.

3 Agricultural biodiversity is the backbone of agriculture sustaining the ecosystem functions that underpin soil health and plant pollination, thereby helping ensure farmers can grow the food needed to sustain growing populations over the world.

4 Besides resources for food, fuel, and fiber, biodiversity within agriculture also provides access to a range of social and economic benefits, allowing opportunities to enrich surrounding communities.

5 Despite this, agricultural biodiversity – and biodiversity more broadly – is increasingly under threat, as habitats are lost due to climate change, urban sprawl, and agricultural intensification and expansion.

6 Overexploitation and unsustainable land use are among the leading causes of biodiversity loss and land degradation worldwide.

7 Farmland is often managed in ways that significantly change the way water and nutrients cycle, potentially placing stress on biodiversity both on and off the farm.

8 In addition, growing demand for agricultural products leads farms to expand, causing natural areas to suffer from deforestation and land clearance.

9 What can be done?

10 In order to protect and restore biodiversity in agricultural landscapes it is essential to increase the quantity and quality of habitat on and around farms, while optimizing farm yield and profitability.

11 This includes establishing farm edge habitats, un-cropped or set-aside areas such as field margins, field corners, buffer zones, and protected areas.

12 Besides enhancing biodiversity along the margins of a field, biodiversity can also be enhanced within.

13 Sustainable soil management practices such as diversified crop rotations and green manuring, cover crops, intercropping, and conservation tillage affect water content, nutrient levels, and the number, variety, and health of the micro- and macro-organisms in the soil.

14 This in turn adds to the quality and quantity of soil organic matter.

15 As a result, increasing the count and diversity of these organisms aids the establishment, growth, and nutrient content of the crops we grow, and improves the health and fertility of the soil itself.

16 Therefore, enhanced soil biodiversity offers potential advantages to yield and cropprofitability, with soil fauna playing an important role in nutrient cycling and soil structure maintenance, thus hindering the loss of productive land and reducing the need for additional crop inputs.

17 Simultaneously, achieving higher yields on-farm can reduce the need for agriculture expansion into the remaining natural habitats vital for biodiversity and other ecosystem services.

18 Achieving more from each crop, per hectare of land, per drop of water and per measure of farm input, helps to reduce pressure on land occupancy and can provide more space for biodiversity and ecosystem conservation.

19 Protecting uncultivated land, and promoting the use of sustainable intensive agriculture on cultivated areas, can also be shown to help increase the number of pollinating insects, prevent soil erosion, control pest populations, and shield our valuable freshwater resources from agro-chemicals run-off.

20 Despite the potential for long-term gain, many farmers perceive barriers to adopting sustainable intensive agriculture, lacking short-term incentives to justify the time and money required.

21 In solving this problem, an effective starting point may be asking: “How can we persuade farmers of the importance of enhancing biodiversity?”

22 What role does Syngenta play?

23 Syngenta supports farmers to improve the productivity of their crop, encouraging them to adopt higher yielding crop varieties, precision application of agrochemical and organic biological products, optimized irrigation strategies, and digitally advanced mechanization.

24 Furthermore, Syngenta supports and enables farmers to do so while maintaining and improving the sustainability of their businesses, providing innovative solutions that drive business growth and reduce the ecological and environmental impacts of agriculture.

25 We recognize that improper use crop protection products can compromise agricultural biodiversity, and as such we invest heavily in product stewardship and safety initiatives to train applicators on their safe and responsible use.

26 Similarly, we are investing in and exploring opportunities for precision application technology, remote sensing, and biologicals, to help farmers sustainably optimize their use of our products.

27 We launched our Good Growth Plan in 2013 to improve the sustainability of agriculture through six commitments to be achieved by 2020.

28 Although we already surpassed our 2020 target to enhance biodiversity on 5 million hectares of farmland in 2017, we continue to invest in both new and existing biodiversity initiatives.

29 We have now implemented 301 projects in 39 countries, benefiting a total of 6.4 million hectares.

30 This is not to mention our commitment to rescuing farmland on the brink of degradation, which, through projects to encourage minimum soil disturbance, crop rotation, and permanent soil cover using crop residues or cover crops, has improved the health of 10.8 million hectares of farm soil; in excess of 800,000 hectares over our original 2020 target.

31 With improved soil structure, greater access to nutrient resources from residual crop litter, and minimal disturbance from farm equipment, these steps can also be considered positive factors in enhancing soil biodiversity by protecting and enabling life beneath the soil.

32 A vital part of this is helping farmers manage less-productive farmland alongside fields and waterways to reintroduce local species, provide buffers for soil and water, and reconnect habitats for wildlife.

33 **Syngenta projects and engagements to enhance biodiversity: Operation Pollinator**

34 The pollination of plants by bees and other pollinators is essential for many important crops.

35 Our Operation Pollinator program aims to provide more and better habitats to boost pollinator numbers and health by protecting and enhancing overall

biodiversity, improving crop yields, and securing a balance between sustainable farming and environmental protection.

36 By creating areas with natural resources for feeding and breeding around cropped land on commercial farms, Operation Pollinator aims to increase the number and variety of pollinating insects on cropland, including bees, beetles, ants, and other flying species such as hoverflies, and butterflies.

37 Syngenta provides appropriate seed mixtures of local origin, agronomic training, and advice on establishing and managing field margins for pollinators.

38 During the past 15 years, we have helped farmers establish and manage field margins in oilseed rape, sunflower, apples, pears, melons, vines, and olive crops.

39 As of 2018, we have helped agronomists train more than 2,500 farmers with these practices.

40 Operation Pollinator extends to 18 countries in Europe,19 as well as the United States, Canada, Brazil, India, China, Korea, and Japan.

41 The program is supported by a wide range of stakeholders, from universities to government bodies, farmer organizations, NGOs and food chain partners.

42 Seed mixtures have been specifically selected and adapted to local conditions in each country according to soil type, climate, crops, and farming systems.

43 Multifunctional Field Margins

44 This project is an extension of our Operation Pollinator project.

45 The wild relatives of conventional crops, as well as many species of bird, small mammals, and medicinal and ornamental plants, can flourish in and around agricultural landscapes, living alongside crops and livestock; though many of these plants and animals are suffering decline.

46 Overall, there is a lack of management concerning non-cropped farmland in current agricultural practice, limiting the possible benefits to biodiversity these spaces can provide.

47 As well, ongoing efforts by farmers to consolidate fields can reduce the size of marginal areas and hinder general landscape diversity.

48 Syngenta, working with partners, encourages farmers to establish and manage biodiversity rich spaces along field margins, corners, and within buffer zones where access by large-scale farm machinery is limited.

49 These multifunctional field margin (MFFM) projects have made a significant contribution to The Good Growth Plan’s target of enhancing biodiversity on 5 million hectares of farmland.

50 MFFMs help reduce soil erosion, regulate water drainage and irrigation, and attract predatory invertebrates who act as natural pest control and thereby improve crop yield and quality.

51 MFFMs also provide a network of societal benefits in recreational services and aesthetic value, among others.

52 Sustainable forest management and restoration of degraded farmlands

53 For Syngenta, agricultural biodiversity enhancement also applies to sustainable forest management and to degraded farmland restoration.

54 We engage farmers, farm cooperatives, and local municipalities to carefully manage forests to ensure the safety of wildlife and to preserve the natural environment.

55 The focus is on protection, restoration and management of forests and degraded farmland.

56 The forest is a working environment, producing fuel and fiber and generating ecosystem services for agriculture and societies.

57 Landscape Connectivity

58 Biodiversity is frequently damaged as species habitats are lost or fragmented.

59 These smaller and more isolated populations can lead to limited genetic variation, as well as poor evolutionary adaptability, increasing the risk of extinction.

60 Such trends are also exacerbated by climate change.

61 When individual field margins are connected, different features of the landscape become integrated, creating rich habitats on marginal and less productive farmland alongside fields and waterways.

62 Such interconnected habitat infrastructures and corridors within and between landscapes provide multiple ecological benefits at a landscape level.

63 For instance, they facilitate the movement of seeds and animal species (gene flow for genetic diversity), act as windbreaks, prevent erosion and improve soil fertility and health.

64 Syngenta runs projects and engagements with farmers and local communities to understand and adopt practices for connected landscape features.

65 The edges of arable fields or riparian lands are ideal for establishing biodiversity corridors, often being less fertile, less productive or inaccessible

to modern farm machinery, and so are considerably less valuable for crop production.

66 More insight into and evidence for the benefits of connected landscapes will increase community acceptance and support for establishing them as a way to achieve biodiversity benefits.

67 As such, Syngenta advocates for sensible policies and calls for support to promote landscape connectivity conservation in both rural and urban landscapes.

68 Conclusion

69 Biodiversity in agricultural landscapes is in decline globally.

70 Syngenta is seeking the most effective ways to reverse the impact of agriculture on biodiversity loss, by driving agricultural intensification without taking land out of production or expanding into untouched native habitats.

71 With its focus on sustainable intensive agriculture, combined with the utilization of marginal or unproductive areas of farmlands, Syngenta is enhancing biodiversity in agricultural landscapes, while improving crop productivity.

72 This approach also helps farmers to improve soil fertility, build resilience against climate change, enhance pollination and pest control services, and better shield natural waterways from residues and run-off.

73 We believe concerned stakeholders should work together to identify programs encompassing a variety of local partnerships and environmental and cultural approaches for agricultural biodiversity enhancement.

74 The way ahead We will continue to engage with farmers to bring them the knowledge and solutions needed to improve the profitability of their own operations, while at the same time enabling them to improve the sustainability of their businesses.

75 We will do this by accelerating innovation that address interconnected environmental, societal and economic challenges.

76 Biodiversity degradation and climate change will increasingly become central drivers for our innovation alongside meeting farmers' needs.

77 We will research and develop products in consideration of externally verified sustainability principles, specifically addressing climate change and biodiversity loss.

78 Alongside this, we will support and encourage on-ground adoption of practices that enhance biodiversity on and around fields and arable land, as well as driving productivity on the land used by farming to prevent, reduce or mitigate expansion into natural landscapes. 79 We will continue to measure and report the progress we make towards agricultural biodiversity

enhancement and will monitor environmental and societal impacts of our biodiversity projects.

80 We will keep on investing in existing and new biodiversity projects and programs to further improve biodiversity in agricultural landscapes.

81 We will continue to train our local sales teams to effectively roll out biodiversity projects.

82 We will maintain frequent dialogues and engagements with local stakeholders (universities, farmers, cooperatives, value chain partners, etc.) to better understand local needs and opportunities.

83 We will join with partners and stakeholders to advocate for policy changes and to bring farmers technologies and practices they need to be successful in enhancing biodiversity; for example seeds, crop protection, machinery, financial services, and agronomic protocols.

84 We will also develop a strong case for the benefits of agricultural biodiversity in each region in which we operate, as well as engage with lead farmers to showcase these benefits and disseminate their knowledge to other farmers.

13.5 Appendix E: Bayer Multimodal texts and transcriptions

13.5.1 Multimodal text 1 CREEPY, CRAWLY, FUZZY, BUZZY OR DOWNRIGHT YUCKY

…

… BUT WE CAN'T LIVE WITHOUT THEM.

(1) Yuck or cute? Destroyer or savior? Survival whizz or fragile fairy? Insects trigger a wide scope of images in our minds.
(2) Most recently they have been making headlines in the media because several studies suggest they are declining.
(3) Bayer Bee Care looks at the bigger picture.
(4) They might be small, but their impact is huge.
(5) They are the most important animal pollinators; (6) they are soil fertilizers and garbage recyclers, keeping fields and forests clean by processing dead animals and plants; (7) they are pest controllers, keeping mosquito populations at bay; (8) and they are a vital food source for bigger animals, such asmammals, birds, fish and other vertebrates:

(9) “Without their services, our ecosystem would collapse,” says Bayer researcher Dr. Sascha Eilmus.
(10) “Insects, like beetles or butterflies, and related arthropods, such as spiders, are important for every single human on the planet. (11) They enable us to live.”
(12) Each species specializes in different roles, performing services which bring benefits to humans.
(13) Many of these services are rarely seen or appreciated, yet some are desperately missed, if not provided.
(14) If one particular specialist is absent, it can cause real problems and take your breath away … as was the case when camels were first imported to Australia in the 19th century.
(15) At that time, no local insect was specialized in recycling camel dung, (16) so it just stayed where it was. (17) The problem mounted – literally – and was finnally solved by another import from abroad: dung beetles.


Image 1

(18) AT A GLANCE

(19) Insect groups, like beetles or butterflies and related arthropods, such as spiders, can survive almost anywhere: (20) From the arctic to the tropics, from the desert to wetlands, swamps, creeks and lakes.

(20) // Their services to the ecosystems of our planet include soil fertilization, pollination and organic waste recycling.

(21) Unfortunately, they have a downside too: Mosquitos transmit diseases such as malaria, zika and
dengue, while caterpillars, beetles, moths or locusts can destroy crops and cause famine, if left
uncontrolled.

(22) // Bayer researchers are passionate about them all: (23) They work to promote them where they are beneficial, control them where they cause harm and protect them where they don’t.

(24) ARE INSECTS DECLINING?

(25) “MOST OF THE CAUSES OF A DECLINE IN INSECT NUMBERS ARE THE RESULT OF HOW WE TREAT

NATURE: (26) IN THE PAST 20 YEARS OR SO, WE HAVE BEEN
OPTIMIZING OUR LANDUSE IN ALL POSSIBLE WAYS, SACRIFICING THE HABITATS OF INSECT SPECIES."
Dr. Christian Baden

(27) Recently, scientists in several countries have rung the alarm bell:

(28) Their studies indicate that the abundance of insects in certain areas has decreased.

(29) Environmentalists, politicians, concerned citizens and scientists are trying to verify the figures and identify the causes.

(30) Looking for causes, many people think that they have found an easy equation:

(31) Insecticides kill insects, so they must be the culprit.

(32) But a reality check shows that there is no such simple explanation.

(33) "Instead, it is a whole bunch of factors that combine to impact insects," says Bayer entomologist Dr. Christian Baden.

(34) "Most of the causes are the result of how we treat nature:

(35) In the past 20 years or so, we for instance have been optimizing our landuse in all possible ways, sacrificing the habitats of insect species. Hedgerows, field edges, weedy patches, meadows, meadow orchards, pasture, meandering brooks and fallow land – they have largely disappeared, leaving many insects without their natural environment and food source."

(36) Christian Baden adds soil sealing and urbanization as contributory factors and also emphasizes the role of light pollution by street lamps, billboards and industrial lighting:

(37) They can confuse or attract nocturnal insects, making them easy prey for spiders and bats.

(38) Pest insects continue to thrive, however, despite being exposed to crop protection products, says Sascha Eilmus, explaining

(39) "We are actually creating habitats for them.

(40) They are specialists at consuming our crops and we cultivate power food for them in our fields.

(41) So they have a heyday, while the specialist insects which rely on rare wild plants are declining because their homes are in the shrinking natural or semi-natural landscapes."

(42) "PEST INSECTS ARE SPECIALISTS AT CONSUMING OUR CROPS AND WE CULTIVATE POWER FOOD FOR THEM IN OUR FIELDS. SO THEY HAVE A HEYDAY, WHILE THE SPECIALIST INSECTS WHICH RELY ON RARE WILD PLANTS ARE DECLINING BECAUSE THEIR HOMES ARE IN THE SHRINKING NATURAL LANDSCAPES."
Dr. Sascha Eilmus


(Image 2: A highly destructive pest – the Colorado Beetle can decimate potato crops by devouring the plants' foliage. On occasion, it can also impact tomato and eggplant production.)


(Image 3)

RESEARCHERS FOR BIODIVERSITY

(43) Being a global player in agriculture, Bayer has a vested interest in healthy ecosystems and the company's researchers are passionate about striking a balance for bees, bugs, spiders & co.: Controlling them where they cause harm, protecting them where they don't and promoting them where they are beneficial to humans.

(44) "I believe in modern agriculture," says Christian Baden,

(45) "after all, we need to eat.

(46) That is why it is our responsibility as researchers to help control insect pests: (47) It makes the difference between hunger and no hunger."

(48) He illustrates the importance of controlling harmful insects by highlighting the impact of the invasive Fall Army Worm Spodoptera frugiperda in Africa, where up to 80 percent of the harvest in the past has been lost because the smallscale farmers had no tools to fight the pest.

(49) And even the crops they managed to reap from the field were not secure: Pantry pests were threatening to soil, eat and damage their stored harvest.

(50) “We help farmers, big and small, to protect their yields,” says Baden, “and this makes my job rewarding and worthwhile.

(51)I can help shape agriculture and feed the world!”

(52) When developing the tools to control insect pests, Bayer researchers never lose sight of beneficial insects or the environment.

(53) Sascha Eilmus works in early-stage research and explains that the screening of molecules for their impact on beneficial insects starts nearly as early as the discovery of their insecticidal potential.

(54) “A molecule will not be pursued further, for those uses which are not compatible with beneficial insects like bees,” he says.

(55) “Farmers need both chemicals AND beneficial insects.”

(56) Bayer researcher Dr. Michael Marx from Environmental Safety adds another dimension of Bayer’s commitment to insect biodiversity: “During development of suitable compounds, our selection process looks beyond beneficial insects:

(57) We want to protect aquatic organisms, nontarget plants, vertebrates, soil organisms, bees and other pollinators, non-target arthropods and even potential insect pest species – as long as they are outside the crop.

(58) Bayer tests about 250,000 molecules before we find the one suitable compound that meets all our requirements.”

The Fall Army Worm is an insect pest, native to tropical and sub-tropical regions of the Americas and Africa. (Image 4)

Folsomia candida, a species of springtail, is found in the soil and has been used as a beneficial model organism in research studies. (Image 5)

The insect team requires a special license to breed invasive pest species which must be contained in special facilities.

(Image 6)

(Image 7)

(59) Bugs in all shapes and sizes are the passion of entomologist Christian Baden. But what does he think about edible insects?

(60) “In many Asian countries, fried bugs are a popular snack and they are considered delicacies.

(61) I’ve tried them, too and they are quite tasty.

(62) In Brazil, queen ants are served fried or dipped in chocolate and 19th century cookbooks from Germany still offer recipes for “May bug soup”.

(63) From a nutritional point of view it makes sense:

(64) Insects are top protein suppliers that can easily keep up with popular meat sources such as beef.

(65) As with every food source, however, you need to take care that the way they are produced en masse is still sustainable.

(66) And trendsetters are hopping on the bandwagon: “ENTO-preneurs” are popping up like mushrooms all over the world, challenging daring consumers with insect pizzas and pastas or bug burgers.

(67) Spiders GOOD FOR YOU

 (Image 8)

(68) Michael Marx has loved spiders as long as he can remember.

(69) As a child, he even took them home, and while his mother was not really amused by his collection of living creepy crawlies in the house, he loved to observe and study them.

(70) His tip for dealing with spiders: “If you see a spider in your home, don’t kill it, it’s a beneficial! (71) Gently escort it outdoors so that it may do its job of controlling the flies and mosquitos outside your bedroom window.”

(72) Butterfies DELICATE BUT TOUGH

 (Image 9)

(73) Sascha Eilmus’ favorite insects are native and exotic butterflies and tropical stick insects & katydids (large green American long-horned grasshoppers).

(74) He has made them his hobby since childhood.

(75) He breeds some very exotic species like the giant stick insects or leaf-imitating grasshoppers and also keeps native butterflies, like the beautiful European Peacock with its blue and yellow eyespots on the wings, in abundance in his garden.

(76) What does he like about them?

(77) “They are fragile and delicate but, at the same time, their stamina and assertiveness are remarkable: They can even travel across whole continents.

(78) The Monarch Butterfly, for example, spends the winter in Mexico and the first generation sets out in spring to fly north for the summer.

(79) It takes four generations of butterfly before they finally arrive as far as Canada.

(80) The last generation then returns to Mexico in one go when the weather gets cold."

(81) INSECT PEST MANAGEMENT AND POLLINATOR PROTECTION

(82) The times of fighting pests with only chemicals are long gone.

(83) Today, many farmers minimize the use of pesticides by embracing "Integrated Pest Management" which includes stress- and pest-resistant crops, crop rotation and beneficial insects like ladybugs (a.k.a. Aphid Exterminator), parasitic wasps (a.k.a. White Fly Killer) and even bees
(which can be employed to spread biological plant disease control as they fly from flower to flower).

(84) To promote the wellbeing of bees and other pollinators, Bayer founded its Bee Care Program in 2011.

(85) The program's agricultural projects include advancing beekeeping practices in African and Asian smallholder communities.

(86) Farmers whose crops are dependent on pollination are trained to live alongside bees and learn how pollination and crop protection go hand-in-hand in sustainable agriculture. Like the project with the National Museums of Kenya (NMK), looking to identify important insect pollinators for vegetable farming in Kenya and learning about ways to conserve them.

(87) Or the CropLife project in India. Michael Marx elaborates: "For pomegranate farmers in the Indian province of Maharashtra, the yield was up by almost 35 percent and the fruit quality improved, while the training they received helped them to use chemical crop protection in a more targeted
and thus efficient way, resulting in higher profit margins.

(88) As a result, they saw a welcome increase in their net income of 42 percent."

(89) The Bayer Bee Care Program is also engaged in a project to test ecological enhancement measures to enrich the diversity and abundance of wild bees and butterflies in intensively farmed areas in Germany's Upper Rhine Valley: It involves sowing interconnected wildflower areas to create a network of natural and semi-natural habitats on five to ten percent of the farmland, and creating 'bee banks' which are soil mounds to attract ground-nesting wild bees.

(90)"ADEQUATELY TESTED CHEMICALS, WITH A PROVEN TRACK RECORD FOR SAFETY, WILL BE JUST ONE TOOL IN A HIGHLY-SOPHISTICATED AND DIVERSE TOOLBOX FOR GROWERS."

Michael Marx

(100) The results look promising and will hopefully inform farmers, policy makers and agricultural planners on measures that can support wild pollinators as a part of sustainable farming efforts.

(101)Yet supporting insects is not limited to the agricultural setting.

(102) Every garden can be a paradise for insects, by introducing native, pollen- and nectar-rich
plants, or features that offer shelter like insect hotels, dead wood or natural stone walls.

(103) Bayer is getting ready for the future, preparing for agriculture 2.0: “There will be big changes in agriculture in the next 20-30 years,” predicts Michael Marx.

(104) “By using digital farming technologies, we can fight pests where and when they appear, controlling them in a very precise way, using less chemicals.

(105) And there is the genetic potential of plants.

(106) We can breed crops that will resist their hungry antagonists and even withstand the impact of climate change, to survive drought and flooding.

(107)All of this means that the agricultural sector will make great progress in the years to come.”

(108) THE FUTURE OF INSECTS

(109) Future crops will be tougher, use of chemicals more targeted and human technologies smarter, say the researchers.

(110) So where does that leave their favorite passion? What do they think about the future of insects?

(111)“If you look at it from an evolutionary point of view – over a period of, let’s say, the next 60 million years – their odds are very good even under adverse conditions,” says Christian Baden.

(112) “Their capability for adjustment is high and over the millennia they would evolve new varieties that could render all the specialist services that we need.

(113)Our problem is: We can’t wait that long.

(114) We need them now.

(115)So if we want them to maintain our ecosystems, we must do everything we can to protect them.”
(116) And the good news is: There are agricultural landscape management practices that can support wild pollinators and many other insects, so they can thrive.

(117) FACTS & FIGURES

(118) Insects are the largest and most diverse animal group on earth.

(119) There are over one million catalogued insect species but scientists believe there are millions more waiting to be discovered.

(120) There are around 400,000 known species of beetle.

(121) And even though butterflies are much more visible due to their striking beauty, there are “only” 160,000 known species.

(122) With their eight legs instead of six, spiders are not insects but arachnids.

(123) They eat a lot of insects, consuming some 400 - 800 million tons each year.

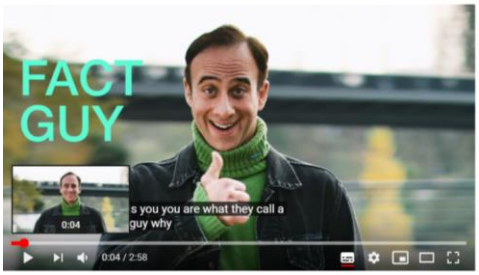
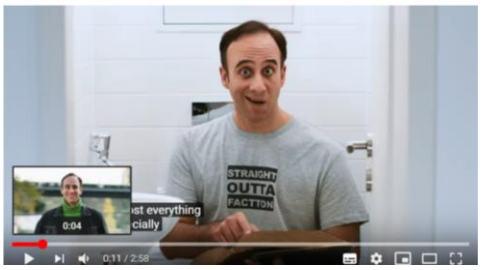
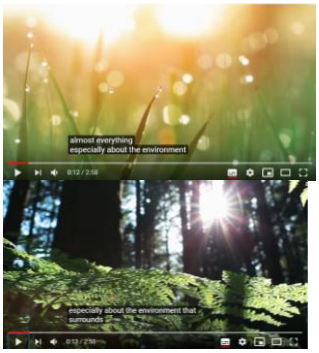
(124) Most individual insects are small, but of the land animals their total biomass is the biggest of all.

(125) In the African savannah, for example, their biomass exceeds that of the local antelope, giraffe and elephant populations.

(126) As far as numbers go, insects dwarf mankind: It is estimated that there are some 10 quintillion
(10,000,000,000,000,000,000) individual insects on Earth.

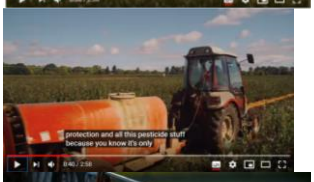
13.5.2 Video 1: Bayer for more TRANSPARENCY: Environmental Safety

Following Baldry and Thibault (2006) video transcript

Time	Image	Lexical cohesion
00:00 - 00:03		*upbeat background music starts* * 00:00 (1) this is you (2) you are what they call (.) a fact guy (3) why fact guy well because
00:07		(4) you just know things and to be honest
00:11 00:12		(5) almost everything especially about (6) the environment that surrounds you and that you deeply love
00:12		(6) the environment

	 	
00:14 00:21	  	(7) and because you know that <there are thousands of animal and plant species around you while taking a walk through the forest

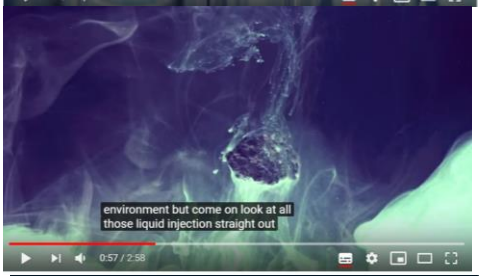
	  	*upbeat background music stops* *owl call*> and
00:21		(8) you never feel alone
00:24 - 00:29		*background music starts* (9) because you **know** that flowers are not just beautiful they also react to sound waves you::

		vocalization as if talking to the flower well yeah so you love the facts and that's why you hate *upbeat background music stops*
00:36	    	(10) crop protection and all this pesticide stuff

		*upbeat background music starts* (11)Because you know its only purpose is to
00:41		(12)destroy the environment
00:43		while killing all your sweet
00:44		Little (sarcasm)

<table>
<tr><td></td><td> 
</td><td>friends</td></tr>
<tr><td>0:46-
0:54</td><td></td><td>*background
music stops*</td></tr>
<tr><td>00:53

00:57</td><td> 



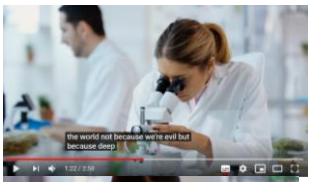
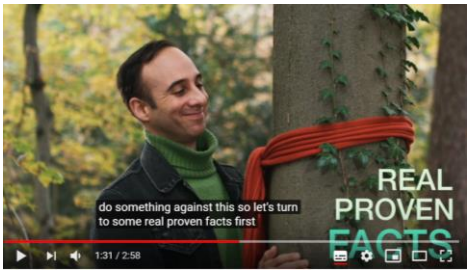

</td><td>*background
music starts* (13)
okay you don’t
really know what
crop protection
does to the
environment but
in Joe’s voice
(14) “c’mon look at
all
those liquid
injection

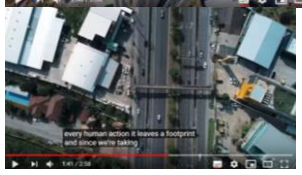
straight out of

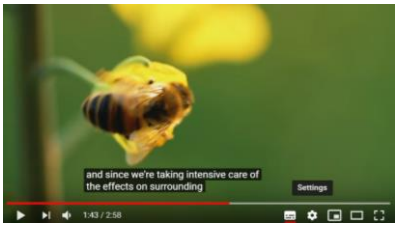
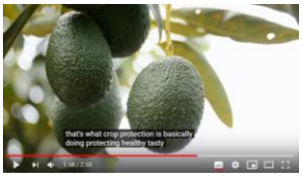
hell stuff</td></tr>
</table>

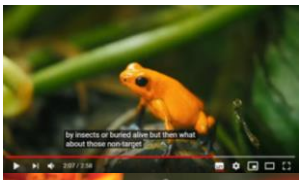
00:57	 	**good god**
1:00		*choral/angelic church score with god's hands*
01:00 01:02 01:04	 	*background music stops* (15) well here's the thing while having all the information available at any time (16) hey siggy *tech female robot voice* I want cake*

01:08		*comical sound* (background music starts* (17) there are some topics left we still don't know much about
1:09-1:12		*background music stops* (18) And that's when a fact guy turns into a gut guy
01:13		(19) well perhaps we could help 01:15 ***upbeat music starts***we're **Bayer**
01:17 01:19		(20) we sell those crop protection products to farmers all over the world not because we're **evil *ominous background gargling sound on top of upbeat music***

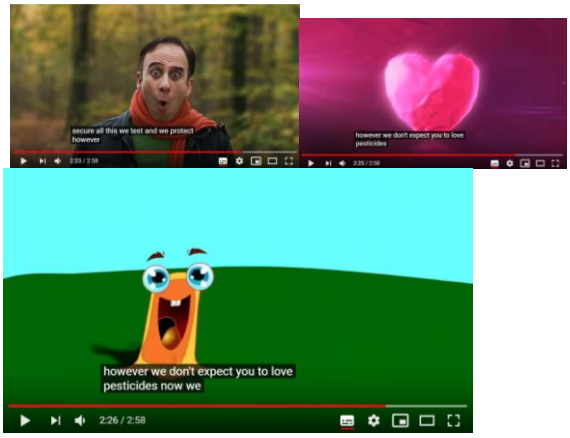
01:22 01:23	  	(21) but because deep down in our curious scientist minds
01:25		(22) we know *background music stops* that plants can get sick just as humans
01:28 - 01:30		(23) and that we can do something against this so let's turn to some real proven facts first *upbeat music starts*

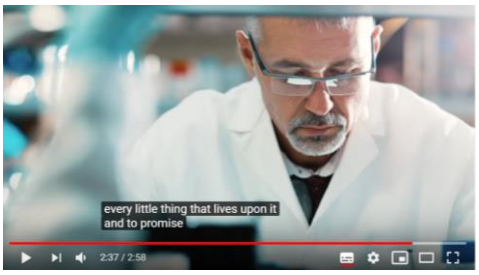
01:32		(24) yes pesticides that come with crop protection 01:35 do affect the environment
01:37		(25) like actually every human action it leaves a
1:40	   	(26) footprint (light pollution, fragmentation, sealed soil, habitat loss)

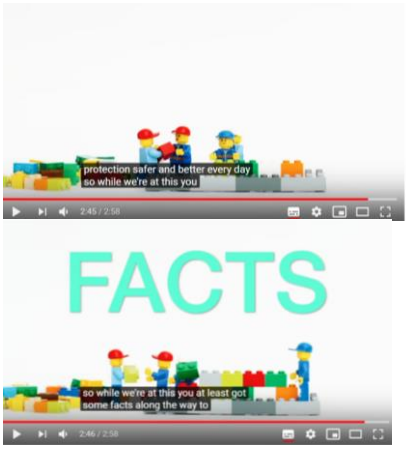
		
01:40		(27) and since we're taking intensive care of
01:42		the effects on surrounding nature
01:44 01:49 01:55	  	(28) crop protection is only a bad thing for crop 01:46 diseases pests and weeds and many other ugly things we call them target organisms and they attack our plants 01:54 that's what crop protection is basically 01:56 doing
01:56		(29) protecting healthy tasty food from

	 	
01:59	 	getting killed by (30) **evil** diseases or eaten 02:03 by insects or buried alive
02:06	  	(31) but then what about those non-target organisms
02:09		(32) Well due to heavy regulation standards all over the world

		
02:13		(33) a crop protection product simply cannot be released when there's any non acceptable risk for them
02:18		(34) To secure all this (35) we test
2:21		*background music stops* (36) And we protect

2:22		(37) And we protect *rain sound*
		*buzzing*
2:22		*rain sound*
02:23		Actor says (38) wo:w *upbeat music starts* (39) however we don't expect you to love 02:25 pesticides now

02:27		(40) we know that you still have concerns *actor says mmhm*
02:29		(41) so may be the only thing we want you to know is that we care *ding*
02:32		(42) that we share your love for our earth and
2:35-2:36	 	(43) every little thing that lives upon it (owl vocalises)
02:35		(44) and to promise you that we will work

02:38		our lovely scientists **asses off** to make crop 02:41 protection safer and better every day
02:43 - 02:45		(45) so while we're at this you at least got some facts along the way to be able to
02:47		(46) to be able to move things into perspective (bayer perspective sheet) for

02:48		(47) yourself and become that fact guy again
2:52		

13.6 Appendix F: Syngenta multimodal texts and transcripts

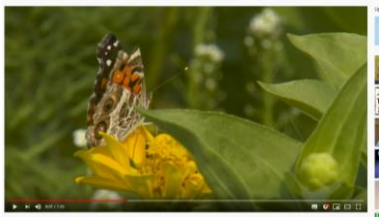
13.6.1 Video 1: Syngenta: Responding to our stakeholders

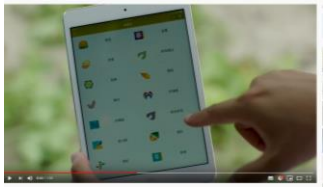
https://www.youtube.com/watch?v=Nr4sKsYTPzI

Following Baldry and Thibault (2006) video transcript

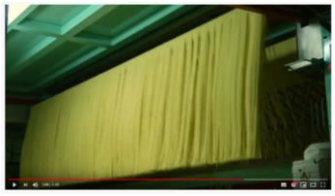
Time	Image	Lexical cohesion
00:01 - 00:02		*upbeat background music starts* * 00:00
00:02 - 00:14	  	(1) last year we had **a hundred and fifty** (raising eyebrows) listening sessions (.) **all** over the world, where we engaged over **three hundred key** influencers in the agriculture food **chain** ↑ to hear from them what agriculture technology companies
00:15 - 00:19		like Syngenta need to do to better address sustainability.

		
00:21 - 00:22		(2) Four key areas that they want us to focus ↑**even more** ↓on:
00:22		climate change
00:24		biodiversity,
		water
		and residues

		(3) we are going to put climate change,
	 	and biodiversity,
00:33		at the center of our innovation, alongside farmers' needs
00:36 - 00:39		(4) we're going to strive for the lowest residues in crops and the environment

		
00:40 - 00:45	  	(5) and we're going to invest (5.1) in solutions that matter most to farmers (5.2) and the environment
00:45 - 00:47 - 00:51	  	(6) I think if you look historically, (6.1) we're a science-based company

		(6.2) that has been having a very positive impact in these areas
00:52		(7) but there's more we can do
00:53 - 01:05	   	(8) We can engage with partners across the value chain to ensure ↑ (.) that the new technologies we develop and the way we apply them

	 	together with farmers has a bigger impact
01:06 - 01:14	   	(9) but we're also going to have lots of partnerships, with universities, with NGOs, food companies, and people across the value chain to define exactly what the goals are we're **all** trying to achieve together

		
01:15 - 01:18	 	(10) we're going to take our investments in technology,
01:18 - 01:21 01:22	  	(11) and we're going to invest them in a way that not only continue to address farmers' needs (11.1) but continue to address the broader needs of society,

	   	(11.2) so that we can have more impact, and it's better understood.

13.6.2 Video 2: Syngenta Operation Pollinator

https://www.youtube.com/watch?v=wP9I1Q_7iIw&t=54s

Following Baldry and Thibault (2006) video transcript

Time	Image	Lexical cohesion
	 	(1)*buzzing sound* as the cartoon bee sweeps across the screen
0:02 - :0:03		(2) Bees offer much more than honey.
00:04 - 00:13		(2) in fact more than three quarters of crops all over the world depend on pollination by bees butterflies insects birds bats and more
00:14 - 00:27	 	(3) Pollinator-dependent crop production has increased 3-fold globally over the last 50 years (4) and the value of pollinators to ecosystems is estimated to more than €150 billion **annually**

		sounds of birds chirping and bees buzzing and upbeat music
00:27 -		(5) In recent years, pollinators are threatened by a combination of causes,
		(5.1) including habitat loss and fragmentation,
		(5.2) agricultural intensification *here the soundtrack cuts and this is inserted* (5.3) non sustainable use of crop protection products *this isn't in the original text that occupies the video*
		(5.4) environmental pollution pathogens and climate change *here the soft guitar score in the background stops for a second and resumes in the next frame*
		(6) we can help address the decline of pollinators by promoting more sustainable practices that diversify agricultural landscapes

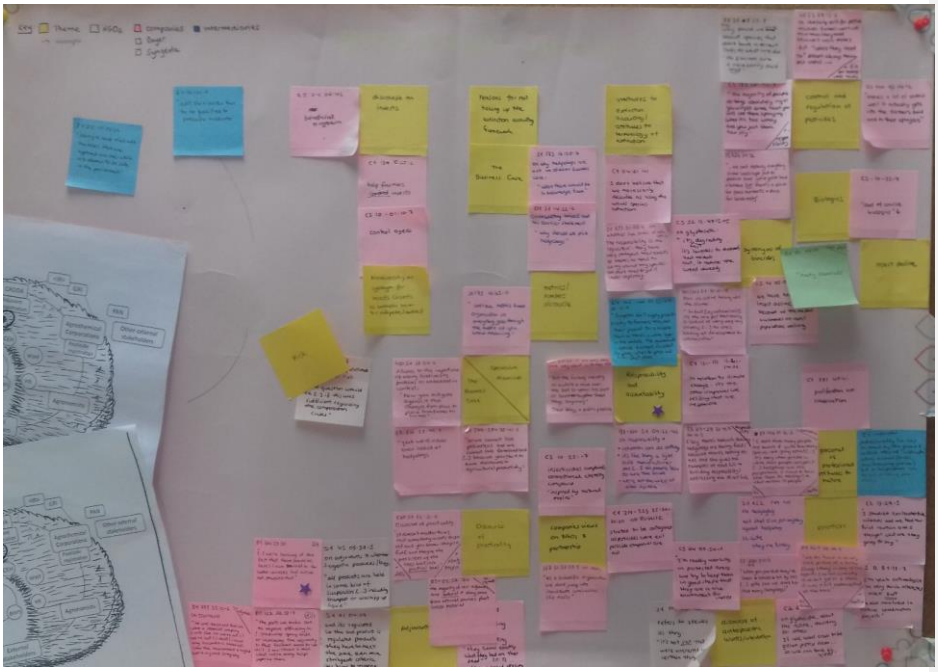
		
00:54 - 01:03	  	(7) For over **15 years**, our Operation Pollinator seed mixes have promoted the creation of new habitats on the field margins or on fallow land, directly increasing pollinator numbers and enhancing overall biodiversity. *bird chirping in the background*
01:05 - 1:14	 	(8) Operation Pollinator field margins, also create “green corridors”, known as field margins, that allow many species to move within landscapes, (8.1) strengthening ecological integrity and preventing species loss.
1:15 - 1:24		(9) Field margins also act as buffers against runoff and soil erosion,

		(9.1) protecting our valuable water resources.
1:25 - 1:36	 	(10) Operation Pollinator *originally started as the Buzz Plan in the UK in 2001 (10.1) since then it has expanded globally and* is an essential part of Syngenta's Good Growth Plan.
1:36 - 1:47		(11) Syngenta has already enhanced biodiversity on more than 5 million hectares of farmland, and continues helping growers put more food and habitat for pollinators back into the farming landscape.
1:47 - 1:56	 	(12) Because pollinators are vital to agriculture, our environment and our quality of life!

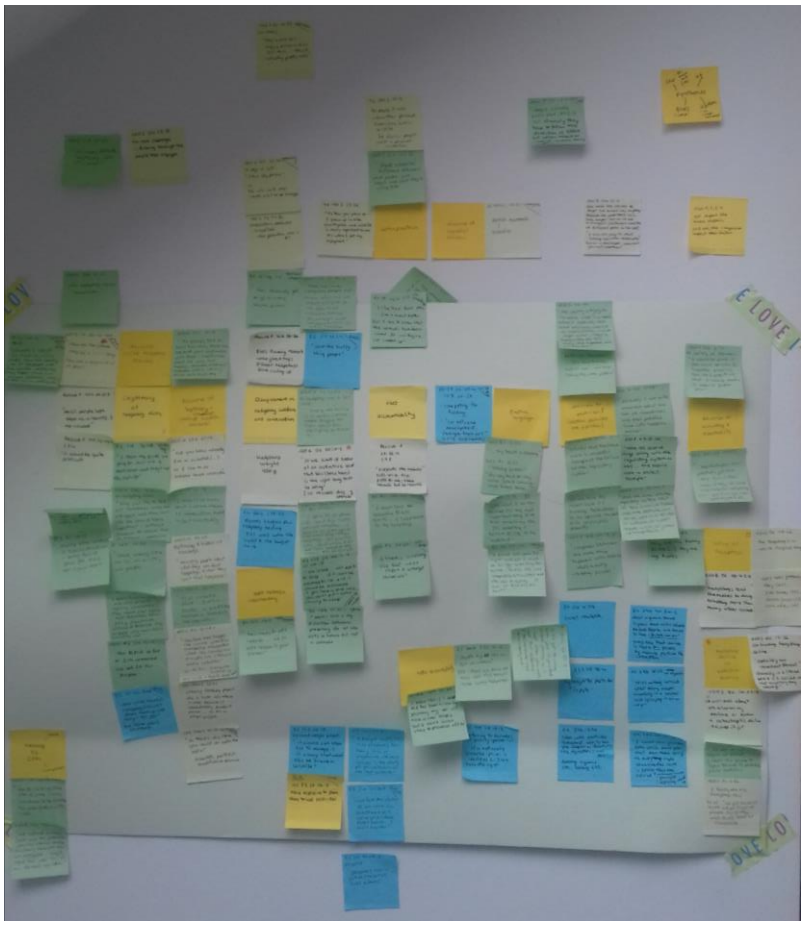
		

13.7 Appendix G: Spoken discourse analysis

13.7.1 Analysis process of company interviews



13.7.2 Analysis process of interviews with stakeholders



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