Facilitating effective external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects

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The candidate confirms that the work submitted is his own, except where work which has formed part of jointly-authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

The work in Chapter 7 of the thesis has appeared in the following publication:

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All aspects of the publication above were undertaken by the candidate. However, the candidate benefited from guidance and suggestions from the named co-authors who played the usual role of supervisor.

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Dedication

To my parents for their endless love, support and encouragement

To my wife for her never-ending support

To my dear children "Hamza", "Rahaf" and "Rawan" for all the moments I took away from them to fulfil my dream

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Abstract

Due to the lack of agreement on the problems they are meant to address, civil engineering infrastructure projects often become subject to controversy once they enter the public arena. Therefore, a case study research to examine the extent of external stakeholder involvement in the pre-design phase of two civil engineering infrastructure projects from the UK was conducted. The findings revealed that external stakeholders are having limited (if any) input into key aspects of the project defined during the pre-design phase – the earliest phase of the project life cycle. It was found that due to the lack of an overarching approach for project identification, we often see lobby groups mobilising support for a project (solution) that may constitute opportunities to the developers, but neither solve the external stakeholders' problems nor meet their expectations. This results in misalignment of the project purpose and external stakeholder expectations, thereby leading to lack of buy-in from external stakeholders which in turn can limit project success. Consequently, a novel two-stage project identification process for identifying civil engineering infrastructure projects was developed. The proposal brings together infrastructure developers and external stakeholders at an early stage of the project life cycle to first identify problems, and second to generate solutions, assess them and then choose a preferred solution to be included in the feasibility stage. To ensure that the proposal is applicable, it was validated through interviews with project managers, stakeholder managers, project stakeholder organisations and local authorities from the UK. The novelty of the two-stage process is in which project identification, problem solving and stakeholder involvement processes have been synthesised and integrated to fulfil the need for addressing the limited external stakeholder involvement in project identification while being theoretically rigorous.

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List of Abbreviations

APM	Association for Project Management
APPG	All-Party Parliamentary Group
BBC	British Broadcasting Corporation
BEIS	Department for Business, Energy and Industrial Strategy
BR	British Rail
BRB	British Railways Board
BS	British Standards
BSI	British Standards Institution
CEC	City of Edinburgh Council
CLRL	Cross London Rail Links
DCO	Development Consent Order
DECC	Department for Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
ETN	Edinburgh Tram Network
GRIP	Governance for Railway Investment Projects
HC Deb	House of Commons Debate
HS	High Speed
ICE	Institution of Civil Engineers
LRT	Light Rapil Transit
LTS	Local Transport Strategy
LU	London Underground
NIA	National Infrastructure Assessment
NIC	National Infrastructure Commission
NN NPS	National Networks National Policy Statement
NPSs	National Policy Statements

NSIPs	Nationally Significant Infrastructure Projects
OECD	Organisation for Economic Co-operation and Development
OGC	Office of Government Commerce
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PRINCE	PRojects IN Controlled Environments
RIBA	Royal Institute of British Architects
SP	Scottish Parliament
SPV	Special Purpose Vehicle
SRA	Strategic Rail Authority
sSRA	shadow Strategic Rail Authority
TEL	Transport Edinburgh Ltd
TfL	Transport for London
tie	transport initiative edinburgh
WEL	Waterfront Edinburgh Limited

List of publications

Part of the outcome of the research presented in this thesis has been published in an international conference.

- Elmahroug, M.H., Tutesigensi, A. and Smith, N.J. 2016. A Problem Solving Approach to Identifying Civil Engineering Infrastructure Projects. In: Chan, P.W. and Neilson, C.J., eds. *Proceedings of the 32th Annual ARCOM Conference, 5-7 September 2016, Manchester, UK*. Association of Researchers in Construction Management, pp.901-910.

List of presentations

Findings from the present research have been presented at two Postgraduate Research (PGR) Conferences and one Royal Academy of Engineering (RAEng) Annual Regional Lecture as follows:

- Elmahroug, M. H. and Tutesigensi, A. 2015. *Initiating civil engineering infrastructure projects: a new approach*. [Poster]. The PGR Students' Conference 2015, 8-9 September, Leeds University Union.
- Elmahroug, M. H., Tutesigensi, A. and Brookes, N. J. 2015. *If an infrastructure project is the solution, then exactly what was the problem?.* [Poster]. The RAEng Annual Regional Lecture and Poster Competition, 11 March, The Active Learning Laboratory, School of Engineering, Liverpool University.
- Elmahroug, M. H., Tutesigensi, A. and Brookes, N. J. 2014. *The delay between project initiation and stakeholder involvement in infrastructure projects*. [Poster]. The PGR Students' Conference 2014, 9-10 September, Leeds University Union.

Chapter 1 Introduction

1.1 Background to the research

Civil engineering infrastructure projects, such as highways, bridges, airports, pipelines and railways, form the backbone of any modern, successful and competitive economy (HM Treasury, 2013). They promote prosperity and growth, improve quality of life and enhance the well-being of a modern society. The adequacy of infrastructure helps determine one country's success and another's failure. Good infrastructure raises productivity and lowers production costs, but has to expand fast enough to accommodate growth (World Bank, 1994). Well-developed infrastructure is a critical factor for ensuring the effective functioning of the economy because it determines the location of economic activities that can develop within a country, and integrates the national market as well as connecting it to markets in other countries and regions (World Economic Forum, 2013). Hence, client organisations of civil engineering infrastructure projects (often governments/public sector organisations) seek to ensure they invest in the right infrastructure project at the right time in order to secure economic competitiveness in the long term (Gardiner, 2005).

Civil engineering infrastructure projects often have a significant impact upon communities. The economic, environmental, sociological and political implications of civil engineering infrastructure projects could last for varying periods of time (Koehn, 1993). Therefore, it is vital that these projects are conceived and delivered in the most beneficial manner for all internal and external stakeholders (Fiori and Kovaka, 2005).

Although they are solutions to problems facing communities, societies or even an entire nation, civil engineering infrastructure projects often become subject to controversies once they enter the public arena. For example, in 2011, a public consultation on a new high speed railway from London to Birmingham (High Speed 2) took place. Although it was one of the largest national consultations ever undertaken by the Department for Transport (Department for Transport, 2012a), the project has become subject to controversy once it entered the public arena. One of the major arguments against the project is that it is too expensive and will not deliver major benefits before 2026.

More recently, on 25 June 2018, the UK Parliament unambiguously backed controversial plans to build a third runway at Heathrow airport (HC Deb, 25 June 2018). However, it was not a free vote. Tory MPs were under orders to support the government (BBC, 2018).

This shows that it is the government which has the upper hand when it comes to decide on what infrastructure projects to build. The 415-119 vote cleared the way for Heathrow to submit an application for development consent for the project, and triggered a wave of criticisms from a significant section of the British society. One of the major arguments against the project is that it would jeopardise the UK's climate targets and worsen air pollution in London.

As a consequence, there is a need to investigate the extent of external stakeholder involvement in the development of civil engineering infrastructure projects in the UK. It is the author's contention that limited external stakeholder inputs into key aspects of the project defined during the pre-design phase (the earliest phase of the project life cycle) often results in misalignment of the project purpose and external stakeholder expectations. This leads to lack of buy-in from external stakeholders which in turn can limit project success. Therefore, the present research seeks to improve the effectiveness of the pre-design phase by addressing the limited external stakeholder involvement in this early phase of civil engineering infrastructure projects.

1.2 Research aim and objectives

The aim of the research presented in this thesis is *"to improve the effectiveness of the pre-design phase of civil engineering infrastructure projects through the means of external stakeholder involvement in order to facilitate the alignment of project purpose with external stakeholder expectations".*

In order to meet this aim, the following objectives have been set:

1. to examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects,
2. to develop a means for enabling effective external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects, and
3. to evaluate the developed means for improvement.

1.3 Outline of methodology

An outline of the methods/research methods used to achieve the research objectives is illustrated in **Figure 1.1**, and is described in the text that follows.

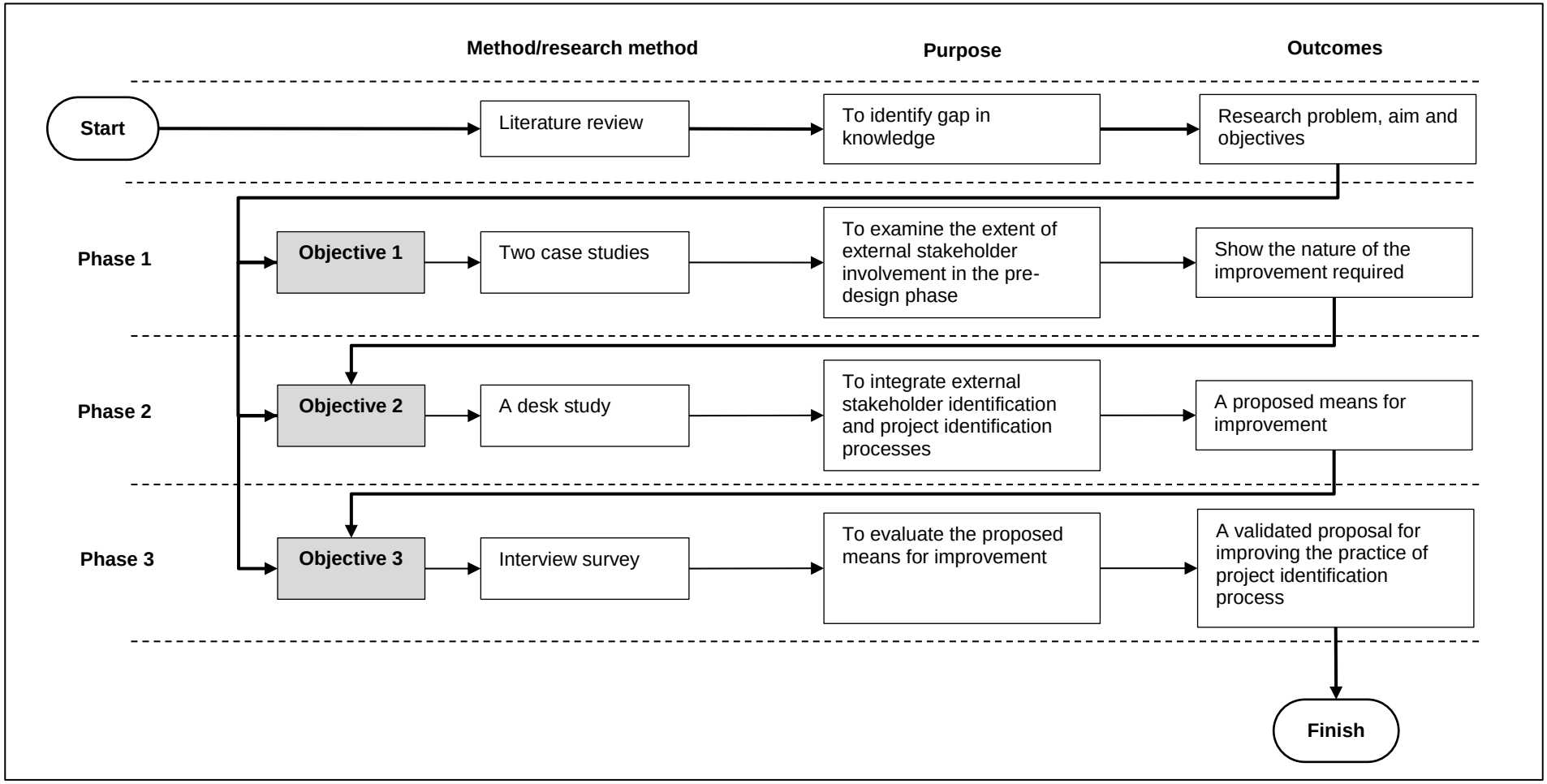

Figure 1-1 Outline of method/research method to achieve each objective

Figure 1-1 should be viewed from an overall research perspective with a view to improve the effectiveness of the pre-design phase of civil engineering infrastructure projects in order to facilitate the alignment of project purpose with external stakeholder expectations. As it can be seen from Figure 1-1, the research objectives are linked together in order to collectively fulfil the research aim and, thus address the research problem. The research aim and objectives were pursued in three phases as follows:

- Phase 1: Exploratory phase which involved the examination of the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects (Objective 1) by obtaining empirical data from two case studies. The purpose of this was to identify the practice of identifying civil engineering infrastructure projects, delineate the practice of external stakeholder identification and involvement during project identification and to establish the attributes of the time lag and the reasons why it exists. This helped show the nature of improvement required.
- Phase 2: Synthesis phase which involved the use of findings from the exploratory phase and a desk study involving mapping of a generic civil engineering infrastructure project life cycle into problem solving process models. The purpose of this was to develop a means for integrating project identification and external stakeholder identification processes during the pre-design phase of civil engineering infrastructure projects (Objective 2). The outcome of this phase is a new two-stage project identification process for civil engineering infrastructure projects.
- Phase 3: Evaluation phase which involved the evaluation of the proposed two-stage project identification process for civil engineering infrastructure projects (Objective 3) which results from the synthesis phase. For this purpose, interviews with project managers, stakeholder managers and other project stakeholders from the UK were conducted.

The research design and methods for the present research are discussed in greater detail in Chapter 4 of this thesis. The next section, by contrast, presents the scope of the research.

1.4 Scope of the research

The present research is confined with the following boundaries:

- The term project refers to many fields and industries, however, the research presented in this thesis is confined to civil engineering infrastructure projects and their management.
- Although the term infrastructure covers the physical assets that underpin the interlocking networks and systems of transport, energy generation and distribution, solid waste management, water distribution, waste water management and electronic communication, the present research and arguments in this thesis are confined to civil engineering infrastructure transport projects.
- The life cycle of a civil engineering infrastructure project comprises several phases, although the current research is confined to the pre-design phase (the first phase).
- The present research is confined to external project stakeholders and their identification and involvement in the pre-design phase of civil engineering infrastructure projects.
- The research reported here was conducted in the UK, so its findings may reflect the UK environment.

Although the author has no intention to claim conclusions beyond these boundaries, implications of the findings beyond these boundaries are outlined in Chapter 9.

1.5 Structure of the thesis

The thesis comprises nine chapters including the current chapter. The chapters are organised as follows:

- Chapter 1 (present chapter) provides an overview of the research and outlines the research aim and objectives as well as the research scope.
- Chapter 2 is a critical review of the concept of civil engineering infrastructure project identification. The chapter justifies the author's interest in this topic, and sheds new light on the exclusion of the pre-design phase from the project management standards and project management bodies of knowledge. The chapter considers the pre-design phase in the context of the UK infrastructure planning process, justifies the need for an overarching approach for identifying

infrastructure needs/projects and concludes that attention has to be given to the documents/processes that trigger a new project.

- Chapter 3 is a critical review of the concept of external stakeholder management in the context of civil engineering infrastructure projects. It justified the author's interest in external stakeholders by explaining why this group of stakeholders matter. The chapter also derives a generic external stakeholder management approach for the purpose of the present research. It also demonstrates how the limited external stakeholder involvement in project identification can contribute to poor project performance. The chapter is then concluded by articulating the research problem.
- Chapter 4 describes the research design and methods for the research presented in this thesis. It shows the theoretical justifications and rationale for the methods chosen to fulfil the research objectives set in section 1.2.
- Chapter 5 examines the extent of external stakeholder involvement in the pre-design phase of Edinburgh tram Network (ETN) project – Case Study 1. It presents the analysis and the author's interpretation of the project identification process, external stakeholder process and problem identification process during the pre-design phase of ETN project.
- Chapter 6 examines the extent of external stakeholder involvement in the pre-design phase of Crossrail project – Case Study 2. It presents the analysis and the author's interpretation of the project identification process, external stakeholder process and problem identification process during the pre-design phase of Crossrail project.
- Chapter 7 presents the development of the proposed two-stage project identification process for improving the effectiveness of the pre-design phase of civil engineering infrastructure projects through the means of effective external stakeholder involvement in project identification. Elements of the proposed process are described and supported in this chapter.
- Chapter 8 describes the evaluation of the proposed two-stage project identification process developed in Chapter 7. The outcome of assessing the proposed process is presented in this chapter.
- Chapter 9 presents the conclusions of the thesis and recommendations for future research.

Chapter 2 The Pre-Design Phase of Civil Engineering Infrastructure Projects

The purpose of this chapter is to explore the pre-design phase of civil engineering infrastructure projects (the focus of the current research). The chapter is divided into seven sections as follows:

- Section 2.1, ‘Definitions’, provides definitions for a project, project management and civil engineering infrastructure projects;
- Section 2.2, ‘Why civil engineering infrastructure projects matter’, highlights the importance of civil engineering infrastructure projects and justifies the author’s choice of this field of study;
- Section 2.3, ‘Civil engineering infrastructure projects as solutions to problems’, supports the author’s contention that civil engineering infrastructure projects are at best solutions to societal problems through the identification of these projects to communities, societies and nations;
- Section 2.4, ‘A generic life cycle of civil engineering infrastructure projects’, derives a generic civil engineering infrastructure project life cycle in order to demonstrate where the focus of the present research (the pre-design phase) fits in;
- Section 2.5, ‘The importance of the pre-design phase’, justifies the author’s interest in this early project phase of civil engineering infrastructure projects;
- Section 2.6, ‘Management of the pre-design phase’, examines published project management guidelines and bodies of knowledge in terms of the inclusion of any advice on how project pre-design phase should be carried out;
- Section 2.7, ‘The pre-design phase and public policy development in the UK’, considers the UK planning process, in particular, the devolvement of public policy statements in order to identify where the pre-design phase starts; and
- Section 2.8, ‘Chapter summary’, provides a conclusion to this chapter.

2.1 Definitions

2.1.1 Project

A project is a unique undertaking consisting of a set of coordinated and controlled activities with start and finish dates, carried out to fulfil an objective conforming to specific requirements including constraints of time, cost and resources (British Standards Institution, 2000a). A project is also defined as a unique, transient endeavour undertaken to achieve planned objectives (Association for Project Management, 2012a). This definition has been slightly modified by the Project Management Institute (PMI). PMI defines a project as a temporary endeavour undertaken to create a unique product, service or result (Project Management Institute, 2013).

The definitions above suggest that there is a consensus that a project is a unique and a temporary endeavour. Temporary means that for each project, there are specific start and specific end (finite duration), and does not necessarily mean short in duration. Unique, on the other hand, refers to different client, different location, different contractor, different stakeholders, etc. (ibid). Moreover, although projects can have social, economic and environmental impacts that far outlive the projects themselves, the definitions above do not appear to take into consideration the concept of stakeholders. The author recognises the importance of the achievement of time, cost and quality specifications, but also emphasises on the acceptance of the final outcome by the project stakeholders. Consequently, taking into account the concept of stakeholders, the present research defines a project as:

> *a unique, temporary endeavour undertaken to achieve planned objective conforming to specific requirements including constraints of time, cost and resources for the benefit of the stakeholders.*

2.1.2 Project management

Project management is the application of knowledge, skills, tools and techniques to project activities to achieve the project requirements (Project Management Institute, 2013). It is the process by which projects are defined, planned, monitored, controlled and delivered so that agreed benefits are realised (Association for Project Management, 2006).

Project management is also defined as the planning, monitoring and control of all aspects of a project and the motivation of all those involved in it to achieve the project objectives on time and to the specific cost, quality and performance (British Standards Institution, 2000a). This definition appears more comprehensive than the definitions mentioned

above, as it refers to the project stakeholders, and recognises the importance of the achievement of time, cost and quality specifications as well as capturing the main management elements of planning, monitoring and control. Therefore, the present research adopts this definition.

2.1.3 Civil engineering infrastructure project

Governments, professional organisations and academics have proposed numerous definitions of infrastructure. For example, the Organisation for Economic Co-operation and Development (OECD) defines infrastructure as a means for ensuring the delivery of goods and services that promote prosperity and growth and contribute to the quality of life, including social well-being, health and safety of citizens (OECD, 2012). Infrastructure UK (2010, p.5) defines infrastructure as:

> *The networks and systems in energy, transport, digital communication, flood protection, water and waste management. These are all critical to support economic growth through the expansion of private sector businesses across all regions and industries, to enable competiveness and to improve the quality of life of everyone in the UK.*

Infrastructure UK describes infrastructure as systems and networks that are 'critical' to the economy and the well-being of a society. This underlines the economic and social importance of infrastructure to communities, societies and nations. The Institution of Civil Engineers, on the other hand, describes infrastructure as the physical assets that underpin the interlocking networks of transport, energy generation and distribution, solid waste management, water distribution, waste water management and electronic communication (Institution of Civil Engineers, 2009b). This definition encompasses some of the elements of the Infrastructure UK's definition of infrastructure, but differs in that the Institution of Civil Engineers defines infrastructure as physical assets rather than networks and systems.

Another definition of infrastructure is that by The Economist (2015) which states that:

> *The economic arteries and veins. Roads, ports, railways, airports, power lines, pipes and wires that enable people, goods, commodities, water, energy and information to move about efficiently.*

The Economist's description of infrastructure as arteries and veins reflects the vital importance of infrastructure to the functioning of a society. This description considers infrastructure as both physical assets and networks and systems which makes this definition more comprehensive than the definitions of the Institution of Civil Engineers and the Infrastructure UK.

The definitions above suggest that infrastructure is perceived as means, assets, systems or networks, and underline the significance of infrastructure projects. These definitions also highlight the main sectors of infrastructure of transport, energy, communication and water. For the purpose of the present work, the author incorporates the essence of the project's definitions (**section 2.1.1**) with the infrastructure's definitions (discussed above) to define civil engineering infrastructure projects as:

> *Temporary unique civil engineering endeavours undertaken to address societal problems facing communities, societies or even an entire nation in order to enable economic competitiveness, to promote prosperity and growth and to improve quality of life.*

The above definition is for the purpose of the present work, and is not meant to replace other definitions. The definition captures the essence of a project's definition, and is also in agreement with the definitions of infrastructure upon the key role infrastructure plays in stabilising and increasing productivity in a country/region. However, it differs from other definitions in that it reflects the author's contention that civil engineering infrastructure projects should be perceived as solutions to problems. In support of this contention, the next section identifies some aspects of the importance of civil engineering infrastructure projects.

2.2 Why civil engineering infrastructure projects matter

The purpose of this section is to support the author's contention that civil engineering infrastructure projects are at best solutions to societal problems. In doing so, the author identified the importance of civil engineering infrastructure projects to communities, societies and nations. This was done through a rapid but purposeful review of publications produced by professional and governmental organisations that are concerned with infrastructure. These organisations are the World Bank, World Economic Forum, Institution of Civil Engineers, McKinsey Global Institute, Organisation for Economic Co-operation and Development, National Audit Office and HM Treasury. Thirteen publications were considered, and it was found that the importance of civil engineering infrastructure is twofold: economic and social. Each of these is discussed in more detail in the following sub-sections.

2.2.1 Economic importance

The economic importance of civil engineering infrastructure projects consists in the capability of these projects to drive competitiveness and support economic growth. This is usually achieved through boosting productivity, reducing business costs, diversifying means of production and creating jobs. The World Economic Forum, for example,

presents infrastructure in second place on its list of important drivers of competitiveness (World Economic Forum, 2016; 2015; 2014; 2013). This importance results from the key role infrastructure projects play in determining the locations of the economic activities, supporting economic and regional development and attracting foreign investment. In this section, a list of ten aspects of economic importance of infrastructure projects has been compiled, and presented below. Civil engineering infrastructure projects

1. drive competitiveness and support economic growth,
2. boost productivity,
3. reduce business costs,
4. diversify means of production,
5. create jobs,
6. support economic and regional development,
7. help integrate national and international markets,
8. increase durability of private capital,
9. increase the volume of international trade, and
10. attract foreign investment.

These factors have been referred to by the well-known professional organisations mentioned earlier, and **Table 2-1** lists the sources from which the list has been compiled.

Table 2-1 Publications identifying economic importance of civil engineering infrastructure projects

Source(s)	***Economic importance***									
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Garemo et al. (2015)	✓									
Pisu and Bottini (2015)		✓				✓	✓		✓	✓
World Bank (2015)	✓									
World Economic Forum (2015)	✓									
World Economic Forum (2014)	✓					✓				
Dobbs et al. (2013)	✓	✓			✓	✓				
National Audit Office (2013b)	✓									
World Bank (2013)	✓				✓		✓			
World Economic Forum (2013)	✓						✓	✓		
OECD (2012)	✓	✓	✓	✓	✓	✓	✓	✓		
Institution of Civil Engineers (2010)	✓					✓				
Infrastructure UK (2010)	✓	✓	✓	✓	✓					

Identifying the economic importance of civil engineering infrastructure projects reveals that these projects actually address economic problems. For example, civil engineering infrastructure projects provide solutions to the problems of declining competitiveness, growth and productivity through supporting economic growth and boosting productivity. They also tackle unemployment problems, because investing in civil engineering infrastructure projects often creates hundreds of jobs. Civil engineering infrastructure projects also provide solutions to regional development crisis through integrating the national and international markets allowing the movement of people, goods and resources. This suggests that civil engineering infrastructure projects can be perceived as solutions to economic problems. In this manner, identifying what economic problems to address would help ensure the identification of the right civil engineering infrastructure project to invest in.

2.2.2 Social importance

The social importance of civil engineering infrastructure projects consists in providing the most basic essentials of life, therefore supporting societies and social development. These projects contribute considerably to the improvement of health, education and social outcomes. Civil engineering infrastructure projects play a key role in reducing poverty and income inequalities according to the World Bank (2015). In this section, a list of eight aspects of social importance of infrastructure projects has been compiled, and presented below. Civil engineering infrastructure projects

1. provide the most basic essentials of life;
2. support society and social development;
3. improve health, education and social outcomes;
4. improve quality of life and social well-being;
5. contribute to improved safety and security;
6. reduce poverty;
7. boost prosperity; and
8. reduce income inequity

These factors have been compiled from a number of publications, **Table 2-2**.

Table 2-2 Publications identifying social importance of civil engineering infrastructure projects

Source(s)	**Social importance**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
World Bank (2015)						✓	✓	
World Economic Forum (2014)				✓	✓		✓	
Dobbs et al. (2013)			✓					
National Audit Office (2013b)	✓	✓			✓			
World Economic Forum (2013)						✓		✓
OECD (2012)		✓	✓	✓	✓			
Institution of Civil Engineers (2010)				✓				
Institution of Civil Engineers (2009b)	✓	✓						

The social importance of civil engineering infrastructure projects suggests that these projects actually address social problems encountered by communities, societies or even an entire nation. For example, investing in water and waste infrastructure projects underpins the basic quality of life. Civil engineering infrastructure projects provide us with clean water, with electricity, with transport network and more. Therefore, without these projects there would be poor health conditions, poverty, ignorance, etc. This implies that infrastructure projects are actually solutions to social problems, and identifying what social problems exist within a community would help identify the right civil engineering infrastructure project to tackle them.

The lists of economic and social importance of civil engineering infrastructure projects presented in this section are not meant to be exhaustive. They represent the importance of civil engineering infrastructure projects as perceived by the organisations involved in the production of the publications from which the lists were compiled. Other sources may contain other importance that are not included in these lists.

This section demonstrated that civil engineering infrastructure projects are at best solutions to economic and social problems facing communities, societies or even an entire nation. The next section, by contrast, provides a philosophical arguments upon which this contention is predicated.

2.3 Civil engineering infrastructure projects as solutions to problems

The philosophy of recognising infrastructure needs as problems is predicated upon the approach of well-known organisations. The idea of infrastructure needs as problems facing communities, societies and nations has been developed by leading international organisations, such as the Institution of Civil Engineers, the United Nations and the World Economic Forum. The World Economic Forum positions infrastructure in second place on its list of crucial drivers of global competitiveness. The Forum's rationale:

> *Well-developed infrastructure lowers transportation and transaction costs, and facilitates the movement of goods and people and the transfer of information within a country and across borders. It also ensures access to power and water – both necessary conditions for modern economic activity (World Economic Forum, 2018, p.39).*

According to the World Economic Forum, the quality and extensiveness of infrastructure networks significantly impact economic growth and reduce income inequalities and poverty in a variety of ways. The Forum's rationale suggests that infrastructure projects can been seen as solutions to economic and social challenges.

The idea of infrastructure as solutions to address global challenges is also established upon the United Nations' 2030 Agenda for Sustainable Development and its Sustainable Development Goals. In 2015, world leaders adapted the 2030 Agenda for Sustainable Development and its Sustainable Development Goals to address global challenges including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice (United Nations, 2019). One of these goals is "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" (United Nations, 2015, p.20). One of this goal's targets is

> *Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all (ibid).*

This implies that investments in infrastructure is considered as crucial to achieving sustainable development and empowering communities around the Globe. The United Nations recognises that growth in productivity and incomes, and improvements in health and education requires investment in infrastructure. This indicates that infrastructure projects can be perceived as solutions to global economic and social challenges.

Furthermore, the philosophy of infrastructure projects as solutions to economic and social challenges is also predicated upon the approach of the institution of Civil

Engineers Shaping the World. Shaping the World uses the knowledge and experience of civil engineers to help find solutions to some of the world's most pressing problems (Institution of Civil Engineers, 2019). These global challenges range from population pressures and growing urbanisation, climate change effects, energy and water shortages, to natural and human disasters. Shaping the World provides a platform to discuss some of these global challenges, help find solutions and deliver improvements. According to the Institution of Civil Engineers, civil engineering can address many of these global challenges, and make a direct contribution to the achievement of the UN Sustainable Development Goals for example:

- ensure availability and sustainable management of water and sanitation for all;
- ensure access to affordable, reliable, sustainable and modern energy for all;
- build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation;
- make cities and human settlements inclusive, safe, resilient and sustainable; and
- take urgent action to combat climate change and its impacts (ibid).

Consequently, it can be argued that identifying what problems to address would help ensure the identification of the right civil engineering infrastructure project to invest in. In other words, if civil engineering infrastructure projects are accepted to be solutions to problems, these projects can be identified, developed and delivered through a problem solving process. It is the author's contention that if civil engineering infrastructure projects are viewed as solutions to problems, problem solving process can be adapted as a means for identify infrastructure needs/projects. The research presented in this thesis is built upon this contention, and the following section provides an overview of the components of a generic life cycle of civil engineering infrastructure projects in order to show where the focus of the research fits in.

2.4 A generic life cycle of civil engineering infrastructure projects

One of the most cited definitions of a project life cycle is that by the Project Management Institute (PMI). PMI defines a project life cycle as "the series of phases that a project passes through from its initiation to its closure" (Project Management Institute, 2013, p.554). Project phase is, in turn, defined as one of a series of distinct steps in carrying out a project that together constitute the project life cycle (British Standards Institution, 2000b). The PMI's definition of a project life cycle is in line with other definitions

developed by leading international organisations such as the British Standards Institution (BSI) and the International Organisation for Standardisation (ISO):

- The BSI ISO 21500: 2012 Guidance on Project Management contains that project life cycle is “a defined set of phases from the start to the end of the project” (British Standards Institution, 2012, p.2).
- The BSI 6079–1: 2010 Principles and Guidelines for the Management of Projects contains that a project life cycle is “a collection of generally sequential, time-based, project phases whose name and number are determined by the control needs of the organization(s) involved in the project” (British Standards Institution, 2010, p.22).

The definitions above imply that different organisations will have different versions of project life cycle depending on their business sectors. In fact, different organisations identify from 5 to 8 distinct phases (see, for example, Royal Institute of British Architects, 2013; British Standards Institution, 2000b). Similarly, different academics identify from 4 to 6 separate phases of project life cycle (see, for instance, Turner, 2007; Ward and Chapman, 1995; Corrie, 1991; Adams and Barndt, 1988; Pinto and Prescott, 1988).

Here, it is noteworthy that there is no agreed terminology (different authors/organisations give project phases different names). However, general consensus exists to indicate that phases differ from each other in terms of the management considerations and the tasks to be performed within each phase (Adams and Barndt, 1988). This is supported by Smith et al. (2006) which states that each phase of a project life cycle has a predetermined aim and hence a specific work scope. Despite the differences in terminology and in number of phases identified, Smith et al. (2006) argue that the essence in all cases is the same. This implies that a generic project life cycle can be derived.

Academics and professional organisations have developed numerous civil engineering infrastructure project cycle models. The present study identifies 12 project life cycle models, as illustrated in **Table 2-3**. The table outlines the phases within each model, and provides a definition for each phase based on the perspective of the source from which the project life cycle model was identified. Providing phase definitions helps overcome the problem of differences in terminology. It facilitates the identification of similarities and differences between the identified project life cycle models, thereby enables the development of a generic life cycle of civil engineering infrastructure projects.

Table 2-3 Project life cycle models

No	*Source(s)*	*Phases*	*Description*
1.	Royal Institute of British Architects (2013)	Strategic definition	Identifies client's business case and strategic brief and other project requirements.
		Preparation and brief	Develops project objectives and undertakes feasibility studies.
		Concept design	Prepares concept design, agrees alterations to brief and issues final project brief.
		Developed design	Prepares developed design including coordinated and updated proposals.
		Technical design	Prepares technical design in accordance with design responsibility matrix and project strategies.
		Construction	Onsite construction in accordance with construction programme.
		Handover and closeout	Handover of building and conclusion of building contract.
		In use	Undertakes In Use services in accordance with schedule of services.
2.	Network Rail (2012)	Output definition	Establishes the scope of the investment in terms of the incremental network capability required by the client.
		Feasibility	Ensures that investment is aligned with organisational strategy and contributes to targets.
		Option selection	Develops options, assesses them and selects the most appropriate one.
		Option development	Develops the selected option to the point that allows finalisation of the business case and scheduling of implantation resources.
		Detailed design	Produces a complete robust engineering design.
		Construction test and commission	Delivers the asset change/renewal to the appropriate specification.
		Scheme hand back	Transfer asset responsibility from the project contractor back to the operator and brings the asset into beneficial use.
		Closeout	Ensure the project is closed out.
3.	Turner (2007)	Concept	Possibility of beneficial change is first identified, and the outcome (desired benefit) and possible outputs (deliverables) to achieve that outcome are identified.
		Feasibility	Possible means of obtaining the outputs are identified, their feasibility and comparative values assessed, and one chosen for further development.

No	*Source(s)*	*Phases*	*Description*
		Design	Definition of the desired outputs and outcomes is refined, the means of achieving them defined and the value to the owner proven.
		Execution	The work to deliver the output is undertaken and performance monitored.
		Closeout	The output is commissioned and handed to the owner or users for them to operate to produce the desired outcome.
4.	Association for Project Management (2006)	Concept	Establishes the need, problem or opportunity for the project. Project feasibility is investigated and a preferred solution identified.
		Definition	Evaluates the preferred solution and options to meet that solution, and prepares implementation plans for the project.
		Implementation	Implements the project strategy and plan.
		Handover and closeout	Delivers the project to the sponsor and the organisation.
		Operations	Includes the on-going support and maintenance of the project deliverables.
		Termination	Concludes the operational life of the deliverables and completes their disposal in an effective manner.
5.	Chapman and Ward (2003)	Conceptual	The time frame at which a strategic need has been recognised, and preliminary goals and alternatives are established.
		Planning	Formal set of plans to accomplish the initially developed goals are set up.
		Execution	The actual work of the project is performed. Materials and resources are procured and transformed into the intended project result.
		Termination	Resources assigned to the project must be released, project team is usually reassigned to other duties and the project is transferred to its intended users.
6.	Muriithi and Crawford (2003)	Initiation and concept	The project concept is developed.
		Design and development	Project solutions are tested, appraised and one selected.
		Implementation	The project plan is carried out.
		Commissioning and handover	The completed facility is commissioned and handed over to the owner.
7.	British Standards Institution (2000b)	Conception	Triggers and captures new ideas or opportunities and identifies potential candidates for further development in the feasibility phase.

No	*Source(s)*	*Phases*	*Description*
		Feasibility	Demonstrates that the client's requirement can be achieved and identifies and evaluates options to determine the one preferred solution.
		Development	Designing a product that conforms the specifications.
		Implementation	Develops the chosen solution into a complete deliverable.
		Operation	Period when the completed deliverable is used and maintained in service for its intended purpose.
		Termination	Completion of the project upon formal acceptance of its deliverables by the client or the disposal of such deliverables at the end of their life.
8.	Ward and Chapman (1995)	Conceptual	The time frame at which a strategic need has been recognised, and preliminary goals and alternatives are established.
		Planning	Formal set of plans to accomplish the initially developed goals are set up.
		Execution	The actual work of the project is performed. Materials and resources are procured and transformed into the intended project result.
		Termination	Resources assigned to the project must be released, project team is usually reassigned to other duties and the project is transferred to its intended users.
9.	Corrie (1991)	Project identification	This comprises the initial appraisal of a potential project, and aims at deciding whether a feasibility study should be carried out.
		Planning and feasibility	The outcome of this phase is the selection of a defined project which meets the stated project objectives. The project plan should be prepared in this phase.
		Conceptual engineering	Creates the design concept in sufficient detail to provide a firm basis for detailed design and engineering.
		Detailed design	-
		Procurement and construction	-
		Commissioning	The sequence of testing, adjustment and bring into operation the project after the construction work is completed.
10.	Adams and Barndt (1988)	Conceptual	The time frame at which a strategic need has been recognised, and preliminary goals and alternatives are established.
		Planning	Formal set of plans to accomplish the initially developed goals are set up.

No	*Source(s)*	*Phases*	*Description*
		Execution	The actual work of the project is performed. Materials and resources are procured and transformed into the intended project result.
		Termination	Resources assigned to the project must be released, project team is usually reassigned to other duties and the project is transferred to its intended users.
11.	Morris (1988)	Feasibility	A project idea is explored for financial and technical feasibility, capacity is decided, locations chosen, financing arranged, overall schedule and budget agreed and preliminary organisation set up.
		Planning and design	The definition of the project is expanded, schedule, budget and finance are reappraised, contracting strategy is defined and permits sought.
		Construction	Actual project work is undertaken.
		Turnover and start-up	Planning all activities necessary for acceptance and operation of the project.
12.	Pinto and Prescott (1988)	Conceptual	The time frame at which a strategic need has been recognised, and preliminary goals and alternatives are established.
		Planning	Formal set of plans to accomplish the initially developed goals are set up.
		Execution	The actual work of the project is performed. Materials and resources are procured and transformed into the intended project result.
		Termination	Resources assigned to the project must be released, project team is usually reassigned to other duties and the project is transferred to its intended users.

In order to facilitate a comparison between the identified project life cycle models, **Table 2-4** has been produced. The table presents the phases within each project life cycle model in a separate row, so they can be simultaneously compared with each other.

Table 2-4 Project phases according to different project life cycle models

No	***Source(s)***	***Phases of project life cycle***							
		Phase 1	***Phase 1***	***Phase 3***	***Phase 4***	***Phase 5***	***Phase 6***	***Phase 7***	***Phase 8***
1.	Royal Institute of British Architects (2013)	Strategic definition	Preparation and brief	Concept design	Developed design	Technical design	Construction	Handover and closeout	In use
2.	Network Rail (2012)	Output definition	Feasibility	Option selection	Option development	Detailed design	Construction test and commission	Scheme hand back	Closeout
3.	Turner (2007)	Concept	Feasibility	Design	Execution	Close-out	-	-	-
4.	Association for Project Management (2006)	Concept	Definition	Implementation	Handover and closeout	Operations	Termination	-	-
5.	Chapman and Ward (2003)	Conceptual	Planning	Execution	Termination	-	-	-	-
6.	Muriithi and Crawford (2003)	Initiation and concept	Design and development	Implementation	Commissioning and hand-over	-	-	-	-
7.	British Standards Institution (2000b)	Conception	Feasibility	Development	Implementation	Operation	Termination	-	-
8.	Ward and Chapman (1995)	Conceptual	Planning	Execution	Termination	-	-	-	-

No	***Source(s)***	***Phases of project life cycle***							
		Phase 1	***Phase 1***	***Phase 3***	***Phase 4***	***Phase 5***	***Phase 6***	***Phase 7***	***Phase 8***
9.	Corrie (1991)	Project identification	Planning and feasibility	Conceptual engineering	Detailed design	Procurement and construction	Commissioning	-	-
10.	Adams and Barndt (1988)	Conceptual	Planning	Execution	Termination	-	-	-	-
11.	Morris (1988)	Feasibility	Planning and design	Construction	Turnover and start up	-	-	-	-
12.	Pinto and Prescott (1988)	Conceptual	Planning	Execution	Termination	-	-	-	-

Comparing and contrasting the different project life cycle models reveals that the term “termination” refers to different phases in two different groups of project life cycle (the project life cycle and the extended project life cycle). In a project life cycle that excludes the operation phase, termination refers to the phase when the actual work of the project has completed and the project is transferred to the intended users (e.g. Chapman and Ward, 2003; Ward and Chapman, 1995; Adams and Barndt, 1988; Pinto and Prescott, 1988). In contrast, in the extended project life cycle that includes the operation phase, the term “termination” refers to the project phase when the operational life of the project deliverables concludes and their disposal in an effective manner is completed (e.g. Association for Project Management, 2006; British Standards Institution, 2000b).

Table 2-4 illustrates a major difference between the identified life cycle models which is the inclusion of the operation phase (during which the desired outcome is produced). It should be noted that according to the Association for Project Management (2006), when a project life cycle includes the operation phase, it becomes an extended project life cycle. Most of the identified models developed by scholars tend to exclude the operation phase, whereas this phase is included in the most of the institutionally developed models. This could be resulted from that organisations/institutions develop life cycle frameworks that cover the extended project life cycle of their projects, whereas authors are often led by the purpose/objectives of their studies which may confine them to particular phase(s) rather than the entire extended project life cycle. Another explanation could be the importance of the cumulative cost of a project over its extended life cycle from an organisational perspective.

Comparing and contrasting the different project life cycle models also shows a consensus on the construction phase in which the actual project work is carried out. All identified life cycle models appear to be in agreement about the start and end of the construction phase as well as the tasks that are carried out during this phase, although different authors/organisations give this project phase different names. The construction phase is also known as build phase (Association for Project Management, 2006) or execution phase (Turner, 2007; Chapman and Ward, 2003; Adams and Barndt, 1988).

Another observation is that the time frame before the construction phase and at which the preferred solution and options to meet that solution are evaluated appears to cover different phases in different models. It covers one phase in most of the identified models, whereas in others it covers two or three phases. This could be brought about by the tendency of some models to divide the same phase into smaller sub-phases in order to reduce complexity and enhance effectiveness. For example, the Governance for Railway Investment Projects (GRIP) divides this time frame between into three phases: option

selection, option development and detailed design (Network Rail, 2012). Critically considering the nature of work carried out during this time frame across all the identified models shows that there is an agreement that it is all about project design. During this phase the preferred solution and options to meet that solution are evaluated, and implementation plans for the project are prepared.

Similarly, the early phase (the phase that precedes the design phase) of the identified models appears to cover one phase in some life cycle models, and is divided into two phases in others. For example, in Ward and Chapman (1995), Adams and Barndt (1988) and Pinto and Prescott (1988) the early phase covers one phase and is called the conceptual phase. The conceptual phase is defined as the time frame at which a strategic need has been recognised, preliminary goals and alternatives are established and feasibility is recognised. This definition indicates that this early phases encompasses project identification and feasibility. This is in line with the *APM Body of Knowledge* which considers this phase as the concept phase and defines it as the first phase in the project life cycle. During this phase the need, opportunity or problem is confirmed, the overall feasibility of the project is considered and a preferred solution identified (Association for Project Management, 2006). In addition, other life cycle models (Network Rail, 2012; Turner, 2007; Association for Project Management, 2006; British Standards Institution, 2000b) are also in agreement on the inclusion of project identification and feasibility in the phase prior to the design phase.

Consequently, in the context of the research presented in this thesis the time frame at which the need, opportunity or problem is identified, the overall strategic feasibility of a potential project is investigated is considered as one distinct phase. This phase is referred to as the pre-design phase, because it covers all informal and formal actions which lead to the design phase. The pre-design phase is defined as the earliest phase in the project life cycle during which the need, opportunity or problem to be addressed is identified, the overall feasibility of the project is considered and a preferred solution defined (Association for Project Management, 2006).

In order to clearly visualise the similarities between the identified project life cycle models discussed in the foregoing paragraphs, and hence produce a generic project life cycle **Table 2-4** is reorganised. The generic civil engineering infrastructure project life cycle comprises five generic project phases:

1. Pre-design phase: the earliest phase in the project life cycle during which the need, opportunity or problem to be addressed is identified, the overall feasibility

of the project is considered and a preferred solution identified (Association for Project Management, 2006);

2. Design phase: evaluates the preferred solution and options to meet that solution, and prepares implementation plans for the project (ibid);
3. Construction phase: the actual work of the project is performed. Materials and resources are procured and transformed into the intended project result (Chapman and Ward, 2003);
4. Operation phase: period when the completed deliverable is used and maintained in service for its intended purpose (British Standards Institution, 2000b); and
5. Disposal phase: the disposal of such deliverables at the end of their life (ibid).

Table 2-5 shows the generic civil engineering infrastructure project life cycle, and clearly matches each generic phase with its counterparts in the identified life cycle models. It should be indicated that the derived generic civil engineering infrastructure project life cycle is an extended project life cycle – includes the project operation phase.

Table 2-5 A generic life cycle of civil engineering infrastructure projects

No	Source(s)	Phases of project life cycle							
		Pre-design phase		**Design phase**			**Construction phase**	**Operation phase**	**Disposal phase**
1.	Royal Institute of British Architects (2013)	Strategic definition	Preparation and brief	Concept design	Developed design	Technical design	Construction	In use	-
2.	Network Rail (2012)	Output definition	Feasibility	Option selection	Option development	Detailed design	Construction test and commission	Scheme hand back	-
3.	Turner (2007)	Concept	Feasibility	Design			Execution	-	-
4.	Association for Project Management (2006)	Concept		Definition			Implementation	Operations	Termination
5.	Chapman and Ward (2003)	Conceptual		Planning			Execution	-	-
6.	Muriithi and Crawford (2003)	Initiation and concept		Design and development			Implementation	-	-
7.	British Standards Institution (2000b)	Conception	Feasibility	Development			Implementation	Operation	Termination
8.	Ward and Chapman (1995)	Conceptual		Planning			Execution	-	-

No	Source(s)	Phases of project life cycle						
		Pre-design phase		**Design phase**		**Construction phase**	**Operation phase**	**Disposal phase**
9.	Corrie (1991)	Project identification	Planning & feasibility	Conceptual engineering	Detailed engineering	Procurement and construction	Commissioning	-
10.	Adams and Barndt (1988)	Conceptual		Planning		Execution	-	-
11.	Morris (1988)	Feasibility		Planning and Design		Construction	Turnover and start-up	-
12.	Pinto and Prescott (1988)	Conceptual		Planning		Execution	-	-

The generic life cycle of civil engineering infrastructure projects has been derived based on comparison of the twelve project life cycle models in terms of the phases they recognise and the sequence of phases they agree on. It is meant for the purpose of the present study, and highlights the phases that the author believes are crucial to effectively manage and deliver civil engineering infrastructure projects. The generic project life cycle comprises the most important phases that a project progresses through from its start to its disposal. The five generic phases are important, thus no phase should be omitted, but some phases may overlap as shown in **Figure 2-1**.

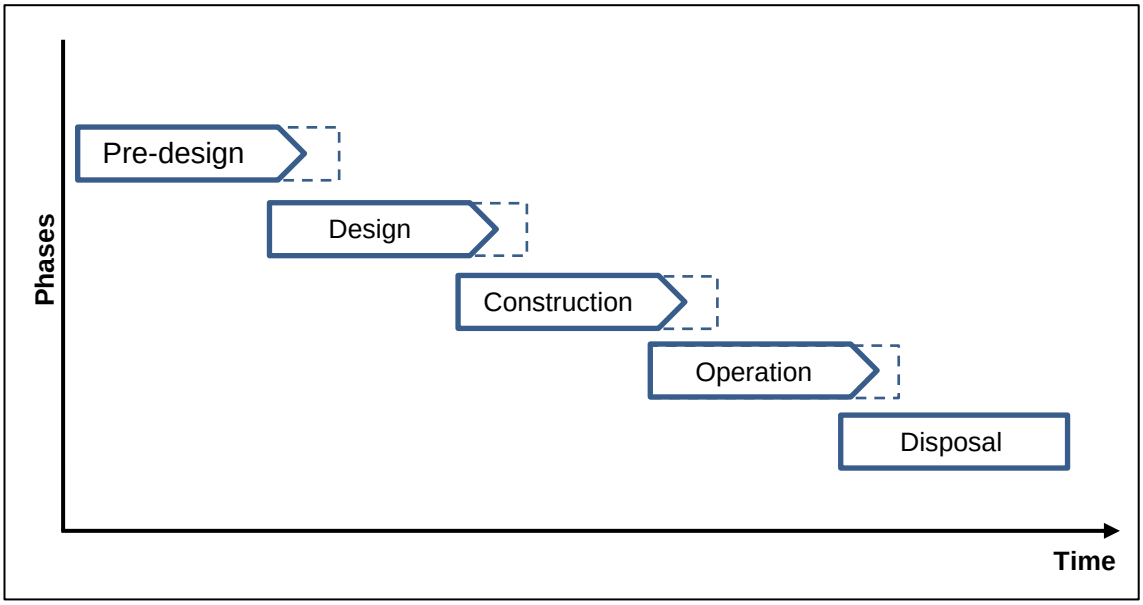

Figure 2-1 A generic life cycle of civil engineering infrastructure projects showing possible overlaps

Through the development of a generic life cycle of civil engineering infrastructure projects this section demonstrated where the pre-design phase (the focus of the present study) fits in. The next section, by contrast, provides justifications for the author's interest in this early project phase.

2.5 The pre-design phase

The pre-design phase is the earliest phase in the project life cycle. It covers all informal and formal actions which lead to the design phase and final investment decision (Matinheikki et al., 2016; Williams and Samset, 2010). During this phase the need, opportunity or problem to be addressed is identified, the overall feasibility of the project is considered and a preferred solution identified (Association for Project Management, 2006). This suggests that the pre-design phase encompasses two stages: project identification and feasibility. Project identification comprises the initial appraisal of a

potential project, and aims at deciding whether a feasibility study should be carried out (Corrie, 1991). Project identification triggers and captures new ideas or opportunities and identifies potential candidates for further development in the feasibility stage (British Standards Institution, 2000a). According to Turner (2007), during project identification possibility of beneficial change is first identified, and the outcome (desired benefit) and possible outputs (deliverables) to achieve that outcome are identified. On the other hand, the feasibility stage identifies possible means of obtaining the outputs (deliverables), assesses their feasibility and comparative values, and choses one output for further development (Turner, 2007). The feasibility stage identifies and evaluates options to determine the one preferred solution (British Standards Institution, 2000a). The outcome of the feasibility stage is the selection of a defined project which meets the stated project objectives (Corrie, 1991). This section justifies the author's interest in the pre-design phase by underlining the importance of this early phase to project performance/success.

Most of civil engineering infrastructure projects will naturally move through a series of distinct phases as demonstrated in the previous section. Generally, the early phases determine the work in the later project phases. Moreover, the outputs of one phase are often the input of another. Therefore, the impact of the failure of one phase can be severe, and lead to failure of the whole project. This suggests that the pre-design phase (the earliest phase) is the most important phase of a project.

The pre-design phase facilitates cost-effective changes, because the easiest time to make changes to a project is at the beginning of its life. If a change needs to be made to the project's objectives, budget, schedule or scope, it is easier to do so before the project is already underway. This is because once the project implementation commences the cost of changing these project parameters increases, and these changes become much harder to manage (Project Management for Non-Governmental Organizations, 2013). According to Project Management Institute (2013), the cost of making changes and correcting errors often increases significantly as the project approaches completion, as shown in **Figure 2-2**. The ability to influence the final project parameters without substantially impacting cost is highest at the start of the project and declines as the project progresses towards completion. Moreover, stakeholder influences, risk and uncertainty are greatest during this early phase, and decrease over the project life cycle (Project Management Institute, 2017; 2013; 2008).

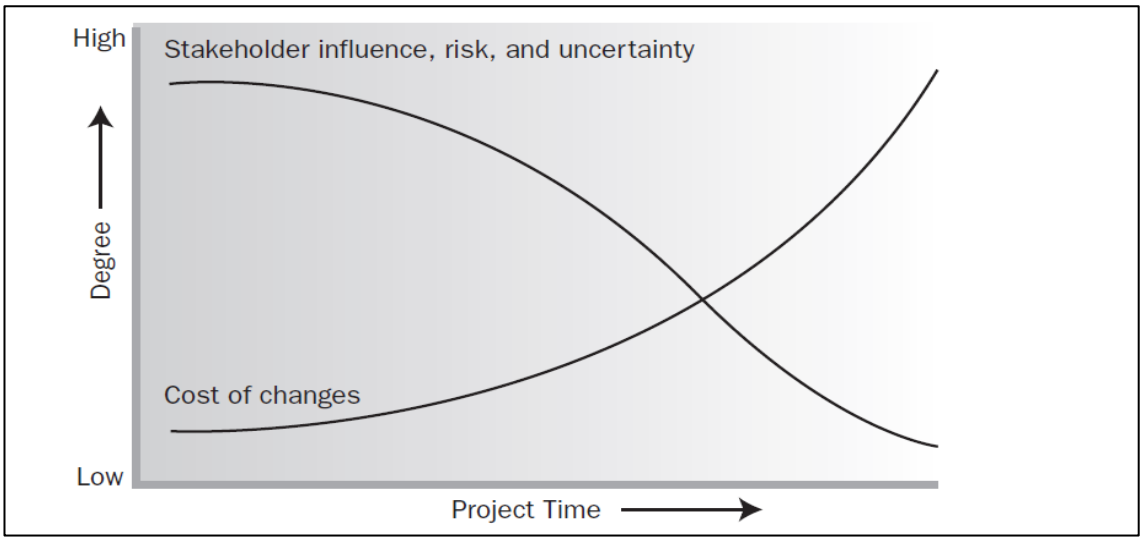

Figure 2-2 Cost of making changes during the project life cycle (Project Management Institute, 2008, p.17)

In addition, the *ICE Client Best Practice Guide* (Institution of Civil Engineers, 2009a) states that resolving problems or changing direction when the project is already underway is far too expensive than extra time spent during the development stage. This is because the expenditure profile is usually at its peak during the construction phase, and any delay to review and clarify the project objectives is always much cheaper to clients during the planning and development phases than during peak periods of construction and operation. It is noteworthy that the present research deems the pre-design phase (which logically precedes the planning phase) as the earliest phase of a project life cycle. Thus, if the cost of change is inexpensive during the planning and development stages, it is then even cheaper during the pre-design phase.

Particular attention needs to be given to the pre-design phase (at which the need for a project is identified) of civil engineering infrastructure projects when considering value for money. This is vital particularly to the UK government, because ninety-five per cent of government policies is delivered through major infrastructure projects (National Audit Office, 2013a). Therefore, accurate identification of infrastructure needs is essential to the government delivering its promises and objectives. This is also supported by the fact that inaccurate identification of the need for infrastructure topped the UK's National Audit Office's list of key risks to value for money (National Audit Office, 2013b).

The foregoing paragraphs suggest that the pre-design phase as the earliest phase of a project life cycle determines the work in the later project phases, facilitates cost-effective changes and enhances value for money. Consequently, any improvement to the pre-design phase of civil engineering infrastructure projects would enhance the chances for a successful project, minimise the risk of inaccurate identification of infrastructure needs

and enhance value for money. Therefore there is a need for the pre-design phase to be carried out systematically and efficiently. The research presented in this thesis is a step in this direction, and the following section examines existing project management guidelines and bodies of knowledge in terms of the inclusion of any advice on how the pre-design phase should be managed.

2.6 Managing the pre-design phase

This section identifies three recognised standards for the project management profession: *BSI 6079: Principles and guidelines for the management of projects, PRINCE2* and *The Royal Institute of British Architects (RIBA) Plan of Work 2013*. It also identifies two well-recognised bodies of knowledge: *The APM Body of Knowledge and The Guide to the Project Management Body of Knowledge (PMBOK Guide).* The section examines what the management of the pre-design phase entails from within the context of these guidelines and bodies of knowledge.

2.6.1 BSI 6079

BSI 6079–1: 2010 *Project Management: Principles and Guidelines for the Management of Projects* provides principles and guidance on: sponsorship, management, planning and delivery of a project. This standard incorporates current technology, techniques and developments in the field of project management, and focuses on the importance of projects being driven by the organisational needs, drawing on cross-functional teams of specialists in pursuit the stated organisational objectives (British Standards Institution, 2010). The BSI 6079 project activities are illustrated in **Figure 2-3**, and comprise:

1. Preparing for a project;
2. Approving a project or a phase within a project;
3. Initiating a project;
4. Directing a project;
5. Managing a project;
6. Managing delivery;
7. Closing a project; and
8. Reviewing project outcome.

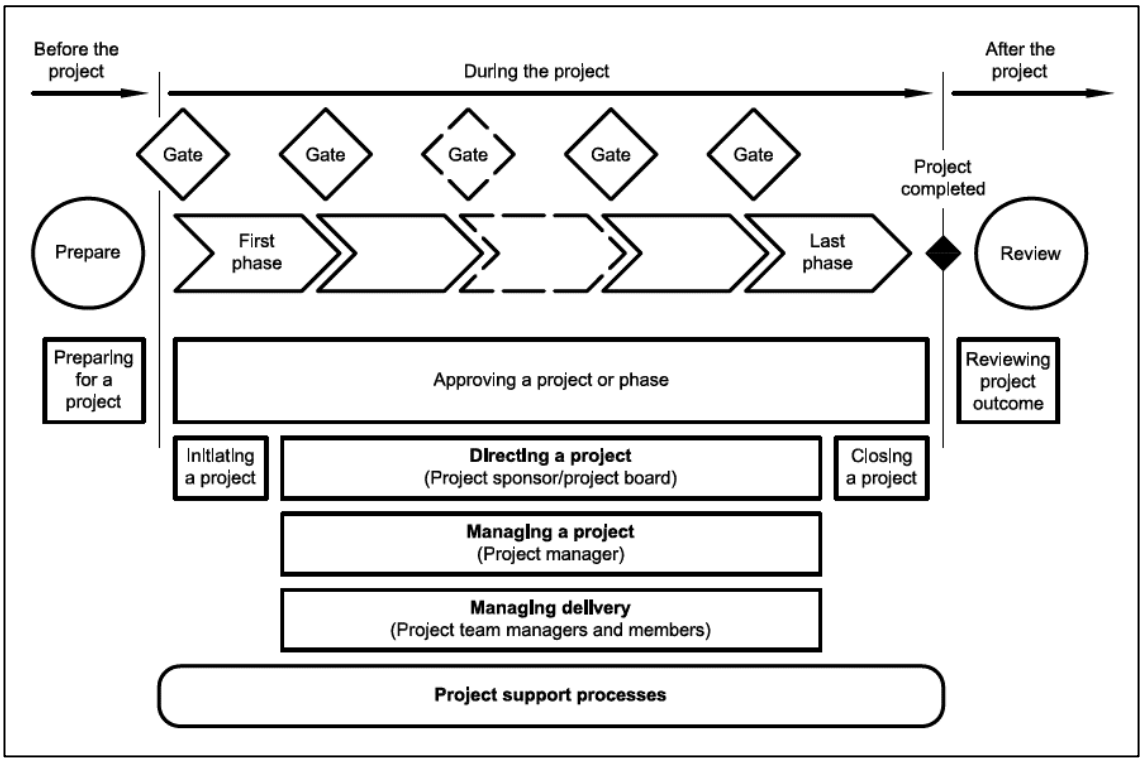

Figure 2-3 BSI 6079 project management processes (British Standards Institution, 2010, p.22)

The BSI 6079 assumes that a project brief is prepared to trigger the project. It assumes preparatory work to prepare a project brief is carried out before the formal start of the project. The only advice BSI 6079 offers about this preparatory work is that such work may take a number of forms. For internal projects, it is part of ongoing corporate management as part of project portfolio management. For programmes, the projects are identified as part of project portfolio management. For contracting organisations, the project would start with the invitation to bid or tender (British Standards Institution, 2010). This suggests that the process through which a project brief is produced lies beyond the scope of the BSI 6079, thus explains the lack of advice and guidance in BSI 6079 on how the pre-design phase should be carried out.

2.6.2 PRINCE2

PRINCE2 is one of the most used project management methodologies in the UK. It is a process-based approach, **Figure 2-4**, that provides the set of activities required to direct, manage and deliver a project (Office of Government Commerce, 2009). PRINCE2 was originally designed in the late 1980s by the Central Computer and Telecommunication Agency (a former UK Government agency), and was based on IT projects at the time. However, it was introduced in 1996 as a standard for project management for public and private sector projects in the UK and other countries. The copyright to PRINCE2 method is held by the Office of Government Commerce (OGC) (Hedeman et al., 2006).

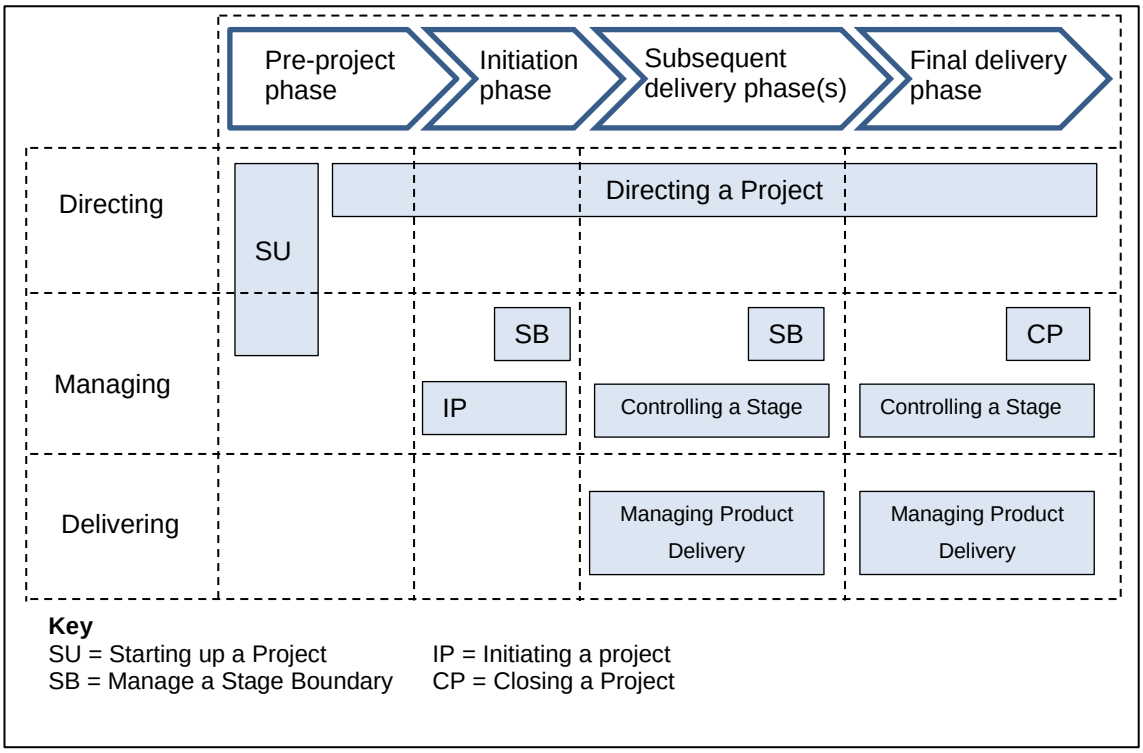

Figure 2-4 The PRINCE2 processes (Office of Government Commerce, 2009, p.113)

In PRINCE2, there are seven processes as follows:

1. Starting up a Project,
2. Directing a Project,
3. Initiating a Project,
4. Controlling a Stage,
5. Managing Product Delivery,
6. Manage a Stage Boundary, and
7. Closing a Project.

PRINCE2 assumes a project mandate exists to trigger its first process (Starting up a Project) and therefore start the project. PRINCES2 calls the trigger for the project a project mandate – an external product generated by the commissioning organisation (Office of Government Commerce, 2009). Although the project mandate is a “product”, PRINCES2 gives little information on the process through which this product is produced. However, it should be indicated that in PRINCES2 terminology the term “project mandate” applies to whatever information used to trigger the project. This suggests that the project trigger can be almost anything. According to PRINCE2, the mandate could be an invitation to tender, the output of a feasibility study or a project brief from a programme (Office of Government Commerce., 2007). This suggests that the process through which a project mandate is developed lies beyond the scope of PRINCE2, thus

explains the lack of advice and guidance in PRINCE2 on how the pre-design phase should be carried out.

2.6.3 The Royal Institute of British Architects Plan of Work

The Royal Institute of British Architects (RIBA) Plan of Work 2013 organises the process of briefing, designing, constructing, maintaining, operating and using building projects into eight work stages. These stages are:

1. Strategic Definition,
2. Preparation and Brief,
3. Concept Design,
4. Developed Design,
5. Technical Design,
6. Construction,
7. Handover and Close Out, and
8. In Use.

As it can be seen from **Figure 2-5**, the RIBA Plan of Work concerns with the briefing, designing, constructing, maintaining, operating and using construction projects. The first stage in the Plan of Work is strategic definition. Critically looking at the tasks performed during this first stage reveals that in this stage a project is strategically appraised and defined before a detailed brief is created. The stage is used to ensure that the client's business case and strategic brief have been considered before the initial project brief is developed. Actually, the core objective of the strategic definition stage is to identify the client's business case and strategic brief. According to the RIBA Plan of Work, the strategic definition of the project is enabled by the client's strategic brief. This suggests that the Plan of Work assumes a strategic brief exists to trigger its first stage (strategic definition).

The author acknowledges the major strength of the RIBA Plan of Work which consists in the simplicity of its stages and the clarity of the stage descriptions. However, although the Plan of Work offers advice on the origins of a project (a strategic brief), the process through which the client's strategic brief is created appears to fall outside the scope of the Plan. This explains the lack of advice and guidance in the RIBA Plan of Work on how the pre-design phase should be carried out.

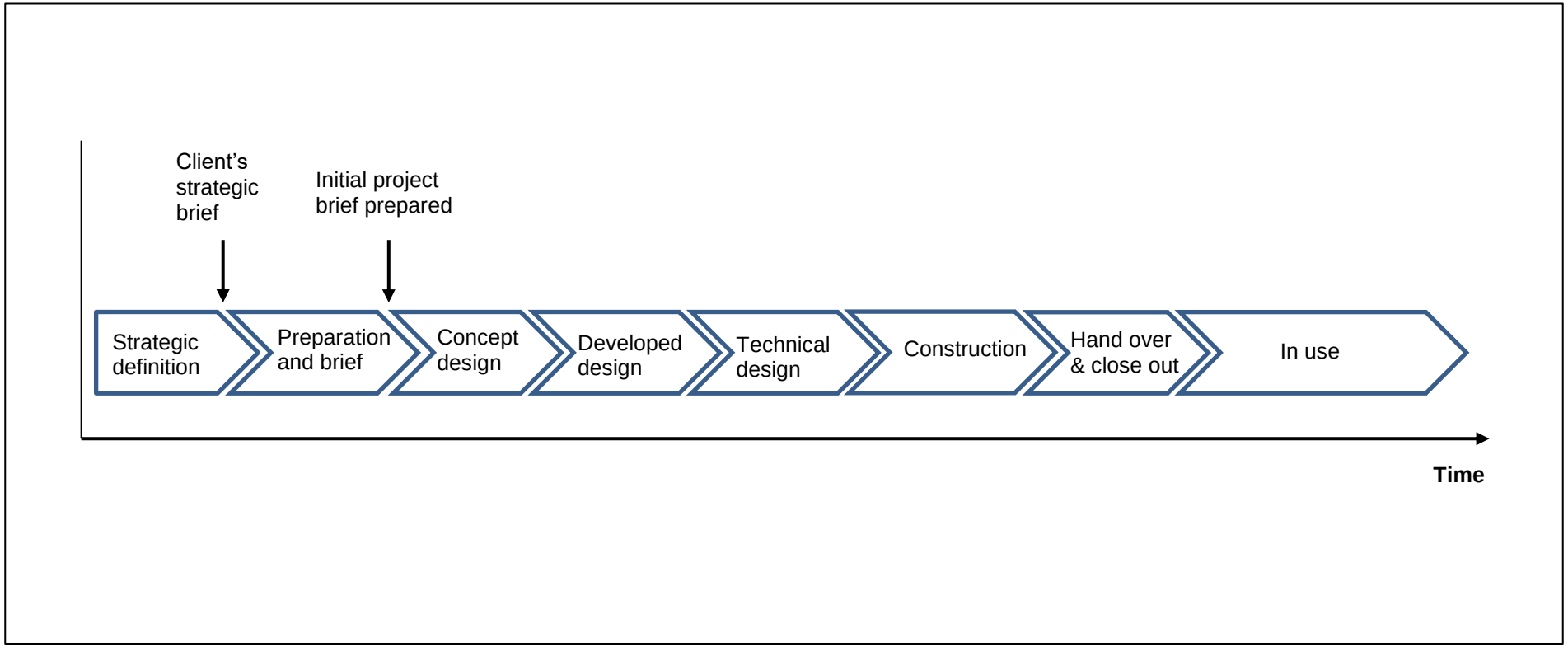

Figure 2-5 The RIBA Plan of Work (the figure adapted from (Royal Institute of British Architects, 2013))

2.6.4 The APM Body of Knowledge

The APM Body of Knowledge is a well-established collection of project management knowledge. It strives to convey the knowledge appropriate to the discipline of managing projects, rather than the processes and practice of project management. The structure of the APM Body of Knowledge is well established in seven sections, and identifies 52 areas of knowledge (Association for Project Management, 2006). According to Association for Project Management (2006, p.82) the pre-design phase of a project life cycle is called concept phase and is defined as:

> *the first phase in the project life cycle. During this phase the need, opportunity or problem is confirmed, the overall feasibility of the project is considered and a preferred solution identified. The business case for the project will be produced in this phase.*

The definition above suggests that the need, opportunity or problem is already identified prior to the concept phase. The APM Body of Knowledge states that triggering and capturing new needs, problems or opportunities is a pre-project activity performed within organisational functions or departments as appropriate. This implies that the project pre-design phase is insufficiently established in the APM Body of Knowledge, because triggering and capturing new needs, problems or opportunities is a pre-project activity falls outside the scope of this body of knowledge.

2.6.5 The Guide to the Project Management Body of Knowledge

The Guide to the Project Management Body of Knowledge (PMBOK Guide) is a recognised standard for the project management profession. It provides guidelines for managing individual projects, defines project management and related concepts and describes the project life cycle and related processes. The Guide identifies ten separate knowledge areas. Each knowledge area represents a complete set of concepts, terms and activities that make up a professional filed, project management filed or area of specialisation (Project Management Institute, 2017). The Guide contains that projects are often authorised as a result of one or more of the following strategic considerations:

- market demand,
- strategic opportunity/business need,
- social need,
- environmental consideration,
- customer request,
- technological advance,
- legal requirement and
- existing or forecasting problem.

The Guide also considers the development of a project charter as the formal authorisation of the existence of a project. Project charter is a document issued by the project initiator or sponsor that formally authorises the existence of a project and provides the project manager with the authority to apply organisational resources to project activities. The inputs to the development of the project charter include the following:

- Project statement of work which is a narrative description of products, services or deliverables to be delivered by a new project. This statement is often provided by the project initiator or sponsor in the case of internal projects, whereas it is received from the customer as a part of a bid document.
- Business case which is a document which describes the necessary business information that determines whether or not the project is worth the investment.
- Agreements which are used to define initial intentions for a project.

These inputs are project-orientated. Therefore, it can be argued that the project charter may constitute the authorisation of the project but it is not the actual start of the project. This suggests that the pre-design phase is insufficiently established in the *PMBOK Guide*, because it falls outside the scope of this guide.

The foregoing paragraphs demonstrated that the pre-design phase is insufficiently detailed in the existing project management guidelines and bodies of knowledge. Project management guidelines, such as *BSI 6079: Principles and guidelines for the management of projects, PRINCE2* and *The Royal Institute of British Architects (RIBA) Plan of Work 2013* assume that a project is already identified, and offer a great deal of advice on project management practice, but not on the process which leads to identifying infrastructure needs and arrive at the final decision of whether or not to finance the project. Similarly, the pre-design phase is not well established in the well-recognised bodies of knowledge: *The APM Body of Knowledge and The Guide to the Project Management Body of Knowledge (PMBOK Guide).* This is because these bodies of knowledge are project-orientated, and exclude the pre-design phase from their scope.

The author acknowledges the major strength of these project management guidelines and bodies of knowledge which consists in providing the knowledge and guidelines appropriate to the discipline of managing projects. This major strength cannot be denied. However, focus on these guidelines and bodies of knowledge has dominated project management practice and attention has to be given to the documents and processes that trigger a project – the pre-design phase.

The examination of existing project management guidelines and bodies of knowledge showed that triggering and capturing new infrastructure needs, problems or opportunities is a pre-project activity performed within organisational functions or departments as

appropriate. It indicates that the pre-design phase at which new infrastructure needs are triggered, captured and moved into a project life cycle starts at a strategic/policy level. Therefore, the following section considers the development of public policy in the UK in order to identify when the pre-design phase of civil engineering infrastructure projects actually begins.

2.7 The pre-design phase and public policy development in the UK

Discussions in the previous section showed that the pre-design phase (which includes project identification and feasibility) is considered as a pre-project activity performed within organisational functions or departments as appropriate. In addition, evidence from the UK (National Audit Office, 2013a) suggests that ninety-five per cent of government policies is delivered through major infrastructure projects. This indicates that the pre-design phase may start during the development of government policies. Therefore, this section looks at the development of public policies in the UK in order to identify when the pre-design phase of civil engineering infrastructure projects begins.

“Policy” is described in the Concise Oxford dictionary as a course or principle of action adopted or proposed by an organisation or individual. Policy making, by contrast, is “the process by which governments translate their political vision into programmes and actions to deliver ‘outcomes’ – desired changes in the real world” (UK Cabinet Office, 1999, p.15). Policies emerge in a variety of ways. They often result from a relatively closed process internal to government from the work of civil servants in major departments of state, but with little external stakeholder involvement. They may also be perceived as the outcome of an overtly political process involving highly public debates between political parties (Leach, 1995). A public policy may be a response to an external event; it may arise from a new idea or initiative such as a party manifesto commitment; or it may be a modified version of a long standing policy (National Audit Office, 2001).

In the UK, government departments do not generally adopt one single approach to design and implementation of policies because of the range of factors involved (ibid). These factors include, but are not limited to, different time pressures, the need for new legislation, shifts in public and political opinions and the wide range of stakeholders affected. This suggests that the need for a new policy may come from a number of sources both from within a department and from external influence (National Audit Office, 2001), as illustrated in **Figure 2-6**.

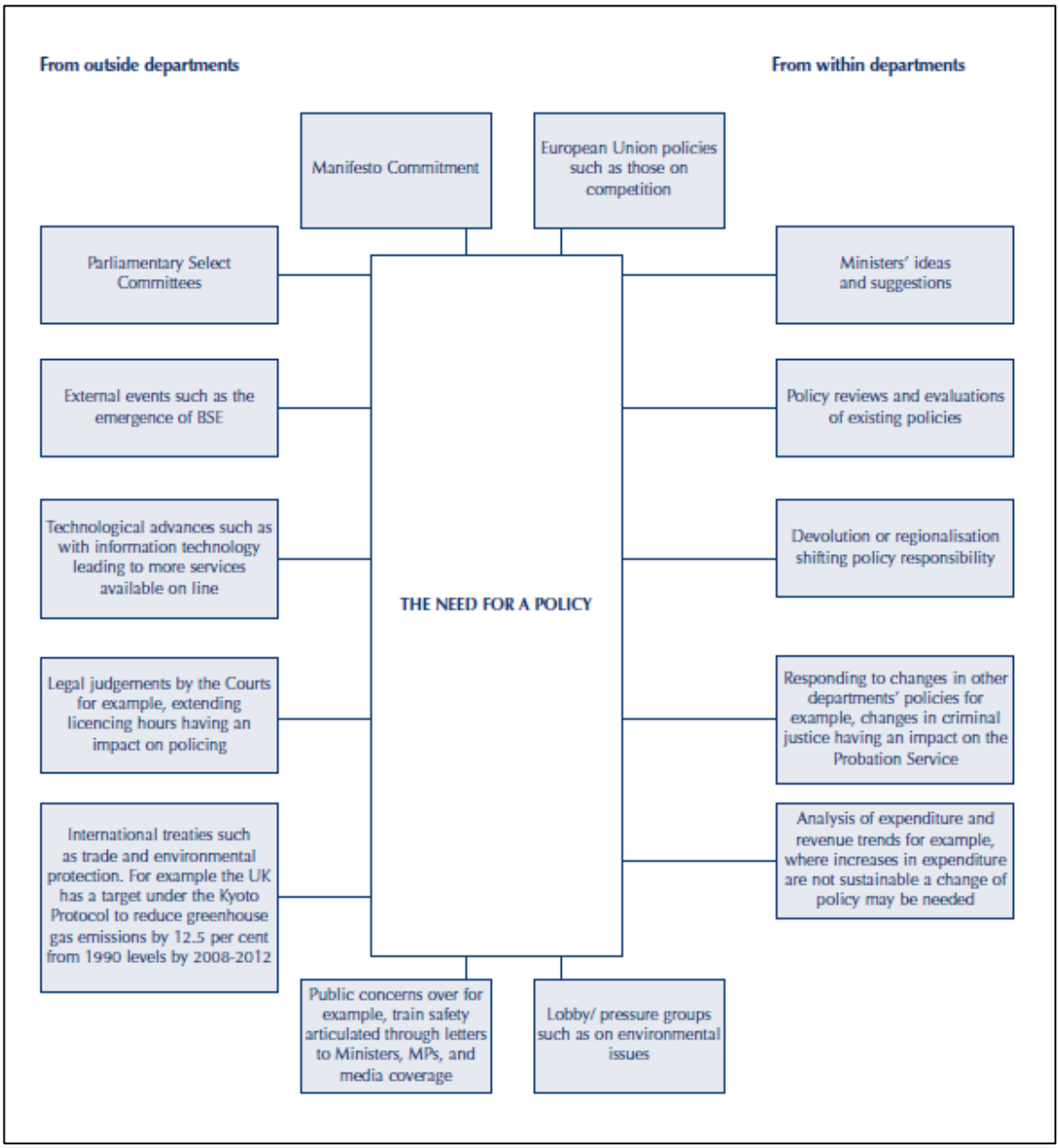

Figure 2-6 How the need for a policy is identified (National Audit Office, 2001, p. 34)

The need for a new policy triggers the policy making process. Policy making does not follow a single set model but is developed in different ways for different issues (Waller et al., 2008). According to National Audit Office (2001), policy making has a number of key stages as illustrated in **Figure 2-7**. These are policy design, policy implementation and policy maintenance.

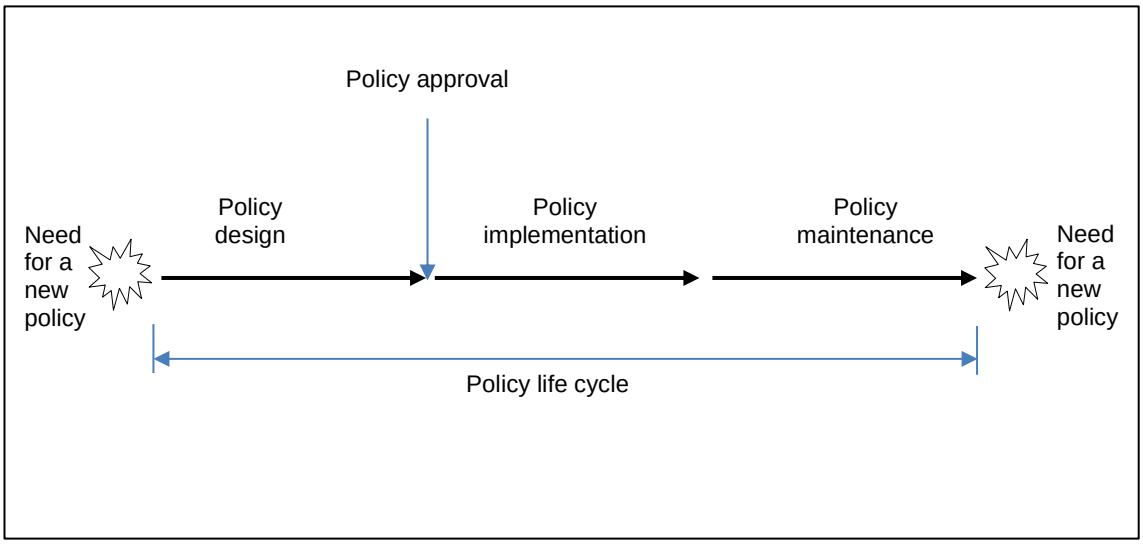

Figure 2-7 A typical model of a policy making process

Key activities in the policy design stage of policy making (ibid) include:

- Identify the need for a policy
- Identify stakeholders and those likely to be affected by the policy
- Determine how best to meet the needs of those intended to benefit from the policy
- Review information and evidence about the problem
- Assess the historical context
- Generate and assess policy options
- Examine how options will play out in the real world
- Set an objective or objectives for the policy
- Identify and assess risks to implementation and delivery
- Identify and allocate time, skills, financial and other resources needed
- Advise Ministers on selection of options
- Consult other departments involved

Key activities in the policy implementation stage of policy making (ibid) include:

- Engage and manage stakeholders
- Determine the right time to launch the policy
- Set key milestones towards overall objectives
- Train staff to acquire the right skills to implement the policy
- Apply and monitor staff effort, time and resources
- Manage the policy to keep it on course
- Market the policy to implementers, to stakeholders and to those intended to benefit
- Engage with partners and other implementers

Key activities in the policy maintenance stage of policy making (ibid) include:

- Collect information about how the policy is working
- Monitor and measure performance
- Evaluate against objectives
- Review resources allocated
- Review skills to maintain effective delivery
- Identify and disseminate good practice
- Review policy effectiveness and lessons learned

In the context of major civil engineering infrastructure projects in the UK, policies are designed and produced by the Government and called the National Policy Statements (NPSs). The NPSs include the Government's objectives for the development of national infrastructure in a particular sector (i.e. energy, transport, water, waste water and waste), and provide the framework within which the Planning Inspectorate makes their recommendations to the responsible Secretary of State (The Planning Inspectorate, 2012d).

Under the Planning Act 2008, the Secretary of State may designate a statement as a NPS for the purposes of this Act if the statement - (a) is issued by the Secretary of State, and (b) sets out national policy in relation to one or more specified descriptions of development. According to The Planning Inspectorate (2012d), there are 12 designated or proposed NPSs, setting out Government policy on different types of national infrastructure development. These include 6 Energy NPSs, 3 Water, waste water and waste NPSs and 3 Transport NPSs.

The 6 Energy NPSs are:

- Overarching energy
- Renewable energy
- Fossil Fuels
- Oil and Gas Supply and Storage
- Electricity Networks
- Nuclear Power

These Energy NPSs (Department of Energy and Climate Change, 2011) were produced by the Department for Energy and Climate Change (DECC), currently the Department for Business, Energy and Industrial Strategy (BEIS), and received designation by the then Secretary of State for Energy and Climate Change in July 2011.

The 3 Water, waste water and waste NPSs, by contrast, are:

- Water Supply
- Hazardous Waste
- Waste Water Treatment

These are produced by the Department for Environment, Food and Rural Affairs (DEFRA). The hazardous waste NPS (Department for Environment Food and Rural Affairs, 2013) was published in June 2013. The waste water NPS (Department for Environment Food and Rural Affairs, 2012) was published in February 2012.

The 3 Transport NPSs are:

- Ports
- Airports
- National networks

These are produced by the Department for Transport. The Ports NPS (Department for Transport, 2012b) was designated in January 2012, the National Networks NPS (Department for Transport, 2014) was designated in January 2015. The Airports NPS (Department for Transport, 2018) was designated on 26 June 2018.

These NPSs set out the need for development of national significant infrastructure. For example, the National Networks National Policy Statement (NN NPS) (Department for Transport, 2014) sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks. It sets out the need for

- development of the national road network,
- development of the national rail network and
- development of Strategic Rail Freight Interchanges.

On addressing the need for development of the national road network, for instance, the NN NPS states that:

> *Without improving the road network, including its performance, it will be difficult to support further economic development, employment and housing and this will impede economic growth and reduce people's quality of life. The Government has therefore concluded that at a strategic level there is a compelling need for development of the national road network.*
>
> *The Government's wider policy is to bring forward improvements and enhancements to the existing Strategic Road Network to address the needs.*
>
> *In some cases … it will not be sufficient to simply expand capacity on the existing network. In those circumstances new road alignments and corresponding links, including alignments which cross a river or estuary, may be needed to support increased capacity and connectivity (Department for Transport, 2014, pp. 14-16).*

The policy also specifies the type of projects to be considered. For example, on addressing the need for development of the national rail network the NN NPS states that:

> *Where major new inter-urban alignments are required, high speed rail alignments are expected to offer the most effective way to provide a step change in inter-city capacity and connectivity, as well as helping to deliver long term sustainable economic growth … Transferring many intercity services to a high speed railway would … release capacity on the conventional network, increasing opportunities for additional commuter, regional and freight services. Given these potential benefits, where major new rail alignments are required, high speed rail will be considered (Department for Transport, 2014, p.19).*

The foregoing paragraphs suggest that the need for new projects is identified by the government and is articulated in the government's NPSs. Infrastructure needs are identified during the design stage of NPSs which provide the framework within which the Planning Inspectorate makes their recommendations on infrastructure project proposals to the responsible Secretary of State. Therefore, it can be argued that the pre-design phase of civil engineering infrastructure projects often begins during the design stage of the NPSs. This is because the pre-design phase commences when the need for a project is first identified. However, because ninety-five per cent of government policies is delivered through major infrastructure projects (National Audit Office, 2013a), the pre-design phase can also start after the approval of an NPS. This suggests that the pre-design phase of a civil engineering infrastructure project can begin before or after policy approval.

In order to clearly visualise when the pre-design phase starts, the author maps the policy making life cycle on the generic life cycle of civil engineering infrastructure projects (derived in **section 2.4**) as illustrated in **Figure 2.8**.

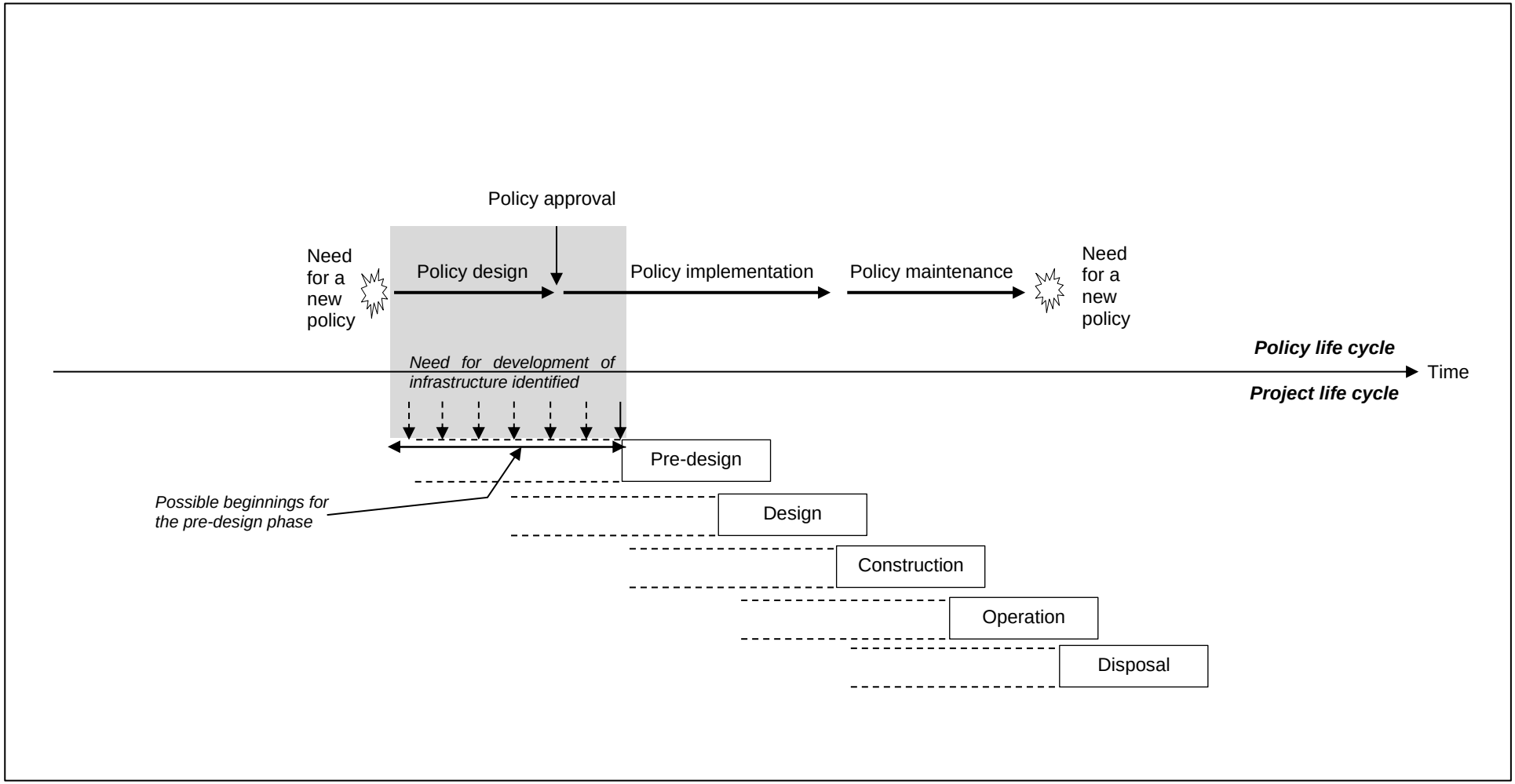

Figure 2-8 Policy life cycle vs infrastructure project life cycle

The mapping of the policy development life cycle on the generic life cycle of infrastructure projects showed that the need for development of infrastructure (which triggers pre-design phase) is often identified at the design stage of an NPS, but can also be identified during the policy implementation stage. This suggests that the pre-design phase can begin before or after the approval of an NPS. The pre-design phase can commence during the design stage of an NPS and continues through the subsequent stage of policy implementation at which it finishes, but can also begin and finish at the policy implementation stage. This implies that the pre-design phase is actually carried out at different management levels by different people. More discussion on who is involved in the UK infrastructure planning process, and thus in the pre-design phase, is provided in the next chapter.

This section considered the development of public policy in the UK, and demonstrated when the pre-design phase of a civil engineering infrastructure project often begins. The next chapter, by contrast, clarifies the stakeholder interaction and pre-design phase.

2.8 Chapter summary

This chapter has provided a philosophical argument upon which the author's contention that infrastructure projects are solution to problems is predicated. The author's contention is that if civil engineering infrastructure projects are accepted as solutions to problems, infrastructure needs/projects can be identified through a problem solving process. However, it was revealed that there is a lack of advice in existing project management bodies of knowledge on how the pre-design phase (during which infrastructure needs/problems are identified) should be carried out. The chapter also considered the UK infrastructure planning process, and has found that the very first seeds of infrastructure projects are first planted in the NPSs. This means that the pre-design phase can commence during the design stage of an NPS and continues through the subsequent stage of policy implementation at which it finishes, but can also begin and finish at the policy implementation stage. The chapter showed that NPSs emerge in a variety of ways. They often result from a relatively closed process internal to government, but with little external stakeholder involvement.

Chapter 3 External Stakeholder Involvement in the Pre-Design Phase

In the previous chapter the author demonstrated that the pre-design phase can commence during the design stage of an NPS and continues through the subsequent stage of policy implementation at which it finishes, but can also begin and finish at the policy implementation stage. However, these policies often result from a relatively closed process internal to government with little external stakeholder involvement. As a result, the extent of external stakeholder involvement in the pre-design phase of infrastructure projects is examined in this chapter. The chapter is divided into eight sections as follows:

- Section 3.1, 'Definitions', provides definitions for stakeholders from the literature and chooses a definition for the purpose of the present study;
- Section 3.2, 'Project stakeholder classification', identifies different stakeholder classification criteria and chooses an appropriate stakeholder classification model for the purpose of the present study;
- Section 3.3, 'Why external stakeholders matter', justifies why external stakeholders matter in the context of managing civil engineering infrastructure projects;
- Section 3.4, 'External stakeholder strategies to influence projects', identifies influence strategies that external stakeholders use to exert their influence upon civil engineering infrastructure projects;
- Section 3.5, 'External stakeholder management process', derives a generic external stakeholder management process in civil engineering infrastructure projects and highlights the importance of early external stakeholder identification and involvement to project success;
- Section 3.6, 'External stakeholder involvement in the pre-design phase', identifies who is involved in UK infrastructure planning process in order to examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects;
- Section 3.7, 'Problem statement', articulates the statement of problem being addressed by the present research; and
- Section 3.8, 'Chapter summary', provides a conclusion to this chapter.

3.1 Definitions

3.1.1 A stakeholder

One of the most cited stakeholder definitions is Freeman's definition which refers to a stakeholder as "any group or individual who can affect or is affected by the achievement of the organisation's objectives" (Freeman, 1984, p.46). This definition leaves the notion of a stakeholder open to include anyone, which makes Freeman's definition of stakeholders one of the broadest definitions in the literature (Mitchell et al., 1997). Nevertheless, Freeman's definition has basically been modified by the Project Management Institute (PMI) to help define stakeholders at a project level rather than an organisation level. Project Management Institute (2017, p.550) defines a stakeholder as:

> *An individual, group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project.*

PMI's definition implies that there are two groups of stakeholders: those who are actively involved in the project, and those whose interests are affected by the projects execution/performance. The definition also refers to the nature of the impact a project may have upon a stakeholder's interest – positive and negative. This, in turn, suggests that in each project there would be opponents and proponents. The ability of a stakeholder to have an influence on the project deliverables is also captured in the PMI definition.

Other professional organisations have developed their own definitions of a stakeholder. Some have defined stakeholders at the project's level, such as The Association for Project Management (APM), while others identified stakeholders at the organisation's level, such as the British Standards Institution (BSI). The APM defines stakeholders as "The organisations or people who have an interest or role in the project or impacted by the project" (2006, p.159). The BSI, on the other hand, states that a stakeholder is "a person or group of people who have a vested interest in the success of an organization and the environment in which the organization operates" (British Standards Institution, 2000a, p.12).

APM and BSI definitions describe stakeholders at a high level, and in an attempt to address project stakeholders McElroy and Mills (2007) slightly modified the BSI's definition in order to incorporate the essence of the APM's, and define stakeholders at the project level as "a person or group of people who have a vested interest in the *success of project* and the environment within which the *project* operates" (2007, p.759, my italics).

The stakeholder definitions presented in this section reveal that there are two levels at which stakeholders can be studied – organisation and project levels. The present work concerns the latter level, and thus adapts PMI's definition of a stakeholder. The present work defines a stakeholder as:

> *An individual, group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project.*

3.1.2 Stakeholder management

Stakeholder management has been defined as "the continuing development of relationships with stakeholders for the purpose of achieving a successful project outcome" (McElroy and Mills, 2007, p.760). This definition emphasises the importance of updating and reviewing the process at different phases of the project life cycle. It underlines the significance of the relationship with stakeholders to project success. The Association for Project Management (APM) defines stakeholder management as "the systematic identification, analysis, planning and implementation of actions designed to engage with stakeholders" (Association for Project Management, 2012b, p.8). Unlike McElroy and Mills (2007), APM's definition highlights the sequence of the main elements of managing stakeholders.

Likewise, the *Guide to the Project Management Body of Knowledge* (Project Management Institute, 2017) also highlights and addresses the sequence of the main elements of managing stakeholders. The guide contains the following:

> *Project Stakeholder Management includes the processes required to identify the people, groups or organizations that could impact or be impacted by the project, to analyse stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution (2017, p.503).*

The PMI's definition of stakeholder management appears to be more detailed than the definitions provided by Association for Project Management (2012b) and McElroy and Mills (2007). It contains the essence of APM's definition, and gives more advice on the three core elements of managing stakeholders - identifying, analysing and engaging stakeholders. What is interesting in the PMI's definition of stakeholder management is that it is clear about the importance of developing appropriate strategies to engage stakeholders in both project decisions and execution. This underpins the importance of engaging stakeholders in project management decision making process. Thus, the present research adopts PMI's definition of stakeholder management.

This section defined what is meant by a stakeholder and stakeholder management in the context of the present research. The next section, by contrast, identifies a number of stakeholder classification criteria, and chooses an appropriate stakeholder classification model for the purpose of the research presented in this thesis.

3.2 Project stakeholder classification

Stakeholders have been classified differently by different scholars using different classification criteria. Stakeholders are often classified based on their relationship with the project as illustrated in **Table 3-1**. Winch (2002), for example, classifies stakeholders based on their relationship with the client organisation into internal and external stakeholders. Winch defines internal stakeholders as those who are in legal contract with the client, and external stakeholders as those who have a direct interest in the project (ibid). Winch's classification of stakeholders appears to have been accepted by other scholars, but with different terminology. Cleland and Ireland (2007), for instance, refers to internal stakeholders as primary stakeholders, and to external stakeholders as secondary stakeholders. Cova and Salle (2005) considers internal stakeholders as business actors, and external stakeholders as non-business actors.

Table 3-1 Project stakeholder classifications

Source	***Classification***	***Sub-classification***	***Stakeholders***
Cleland and Ireland (2007)	Primary	-	Senior managers, customers, suppliers, contractors, sub-contractors, local agencies, federal commissions, judicial organisations, legislative organisations, employees, creditors and shareholders
	Secondary	-	Social institutions, political organisations, environmentalists, competitors, local communities, the public, citizens, tourists, professional organisations and the media.
Cova and Salle (2005)	Business actors	-	Consultants, financial backers, agents, engineering companies and subcontractors.
	Non-business actors	-	Governments, syndicates, lobbies, pressure groups, unions and activists.
Winch (2002)	Internal	Demand side	Client, financiers, client's customers, client's employees, client's tenants and client's suppliers.
		Supply side	Architects, engineers, contractors and materials suppliers.
	External	Private	Landowners, residents, environmentalists, conservationists and archaeologists.
		Public	Regulatory agencies and local and national governments.

Mitchell et al. (1997) identifies seven stakeholder classes based on the possession, or the attributed possession, of one or combination of two or all three of the attributes of power, legitimacy and urgency, as illustrated in **Figure 3-1**. The seven classes are dormant; discretionary; demanding; dominant; dangerous; dependent and definitive stakeholders.

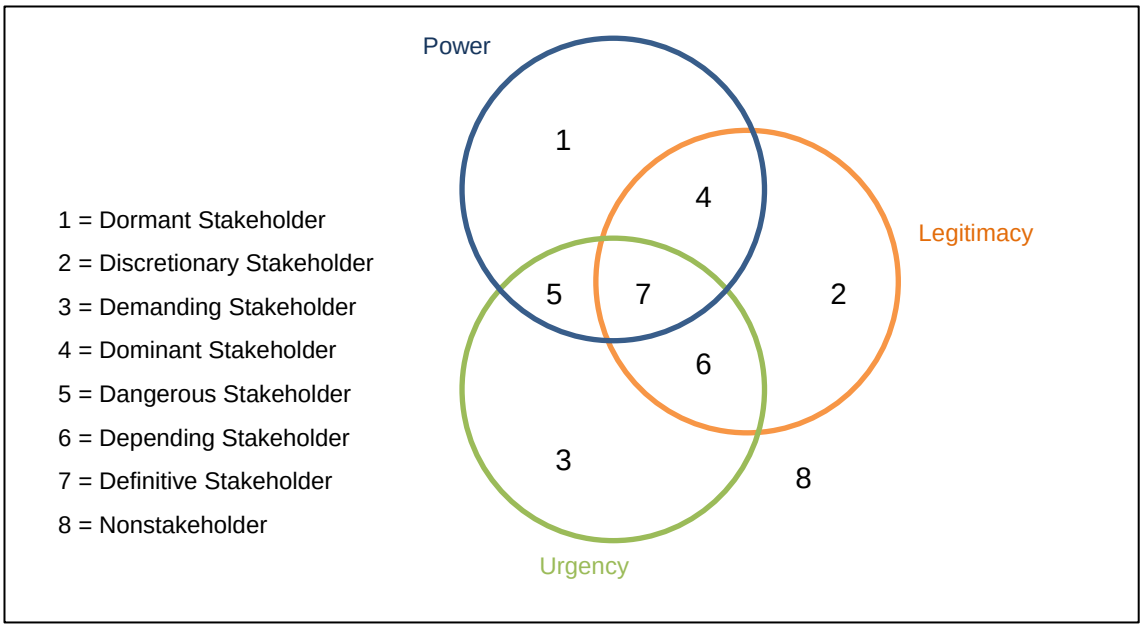

Figure 3-1 Stakeholder topology (Mitchell et al., 1997, p.874)

Another stakeholder classification is that by Savage et al. (1991) which categorises stakeholders based on assessing the stakeholder's potential to threaten or to cooperate with the organisation. Savage et al. (1991) divides stakeholders into supportive, non-supportive, marginal and mixed blessing stakeholders, and suggests a management strategy for each group, as shown in **Figure 3-2**.

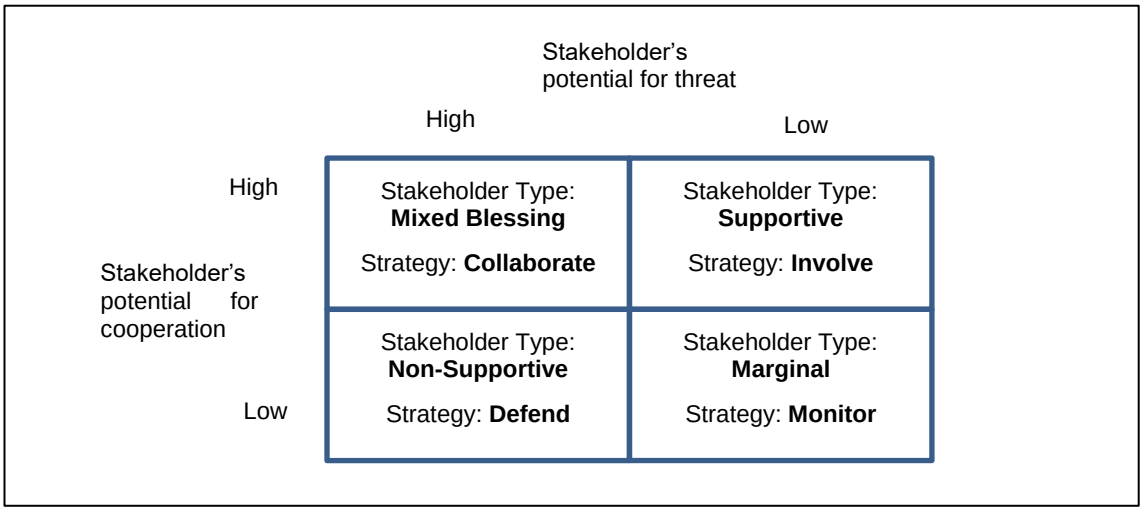

Figure 3-2 Diagnostic typology of stakeholders (Savage et al., 1991, p.65)

Classifying stakeholders based on assessing the stakeholder's potential to threaten or to cooperate with the organisation appears to rely largely on assumptions made by the project's focal organisation on the stakeholder's potential to threaten or cooperate. This might be challenging due to the difficulty in identifying these potentials without actually engaging with stakeholders. The present research argues that organisations need to engage effectively with their stakeholders in order to determine the stakeholders' capacity, willingness and opportunity to threaten or cooperate with the organisation. Once this has been done, stakeholders can be classified based on facts rather than assumptions.

Considering the stakeholder classification criteria presented in this section, the present study adopts Winch's classification in which stakeholders are categorised into internal and external stakeholders. This is because Winch clearly distinguishes between internal and external stakeholders based simply on their relationship with the client organisation - contractual or informal relationship. According to Winch (2002), internal stakeholders are those individuals and organisations who have a contractual obligation to the client, whereas external stakeholders are those who have an interest in the project, but are not in legal contract with the client.

The focus of the present work is on external stakeholders due to the ability of these stakeholders to influence the project and its performance despite the fact that they are outside the project's supporting organisation. Justification for the author's interest in the topic of external stakeholders is provided in the subsequent section.

3.3 Why external stakeholders matter

Although they are not in legal contract with the project's supporting organisation, external stakeholders can have an impact on the project and its performance. According to a comparative study of factors affecting the external stakeholder management process in construction projects (Olander and Landin, 2008), the public and other external stakeholders do have informal power that, when exercised, can press more powerful stakeholders into changing their position towards a project. Thus, it is important for project managers to identify the means through which external stakeholders may attempt to influence the project. A case study research into identifying project stakeholder strategies to increase their salience in global projects (Aaltonen et al., 2008) found that external stakeholder actions (if not properly managed) can increase the project's direct operational costs in the form of legal fees and public relation expenses. The same study also found that these actions may have severe effects on the project's focal organisation

and the companies engaged in delivering the project. Consequently, external stakeholders matter.

In many countries there are legal, statutory and/or regulatory obligations for consulting with the public and other external stakeholders if they are to be impacted by a project (International Finance Corporation, 2007). In the UK, for example, the developer of any nationally significant infrastructure project is required to extensively consult with the affected external stakeholders of their proposals before submitting an application for development consent (The Planning Inspectorate, 2012c). In addition to this, some evidence from the UK (National Audit Office, 2011) shows that initiating successful major infrastructure project requires the involvement of external stakeholders. This puts external stakeholders in a powerful position to influence the project management's decision making in the early stages of the project life cycle. It also increases the power of external stakeholders to make changes to the project plans. Consequently, external stakeholders matter.

As a result of their ability to negatively impact upon civil engineering infrastructure projects, external stakeholders should not be over looked. Brazil, for instance, plans to construct one of the world's largest dams on the Xingu River in the Amazon in order to enhance the country's energy independence. However, between 2004 and 2013 affected external stakeholders filed fifteen lawsuits against the project (Dobbs et al., 2013). In another instance, local residents (external stakeholders) in the city of Lund, Sweden, filed two lawsuits against the expansion of the west coast railway line through the city of Lund. Although they lost both cases, affected external stakeholders delayed the project by eight years resulting in a significant increase in the project's indirect cost (Olander and Landin, 2008). Another example is the Betuweroute rail project, the Netherlands. The project was interrupted by legal objections from many local authorities, local communities and individuals. This led to changing the project scope to cope with external stakeholder demands. The change involved more tunnelling, and thus dramatically raised the project's total costs (Hertogh et al., 2008).

In addition, a public consultation on a proposed new high speed railway (HS2) from London to Birmingham took place in 2011. Although it was one of the largest national consultations ever undertaken by the Department for Transport (DfT) at the time (Department for Transport, 2012a), the project has become subject to controversy once it entered the public arena. One of the consultation questions is that:

> *Do you agree that a national high speed rail network … would provide the best value for money solution (best balance of costs and benefits) for enhancing rail capacity and performance?*

Two-thirds of the respondents to this question (31789) disagree that HS2 would provide the best value for money solution. Their argument is that the economic case for HS2 is insufficient and that investments in the existing rail network would offer better value for money (Department for Transport, 2011). It is yet unknown what the ultimate external stakeholder impact on the project performance will be. However, what is now clear is that the project's necessity and desirability is already being questioned by a significant section of the British society. Consequently, external stakeholders matter.

Previous studies have suggested that external stakeholders can positively contribute to a project. An EU-funded research project (MEGAPROJECT COST Action) found that effective engagement of external stakeholders is very important to ensure good megaproject delivery performance (Brookes, 2015). A qualitative cross-case analysis of 15 large infrastructure projects (Hertogh et al., 2008) shows that knowing external stakeholder interests boosts collaboration and can help avoid misunderstanding. Ethical guidelines of infrastructure projects (International Finance Corporation, 2007) also assume that external stakeholder involvement can help avoid project opposition and other reputational risks, expensive re-design and compensation payments. Moreover, Atkin and Skitmore (2008) state that engaging external stakeholders can help with managing their expectations, reducing unforeseen risk, reducing negative actions or reactions that may have potential drawbacks on project success. According to Ektewan and Ogunlana (2006) conflicts can be alleviated through improved external stakeholder participation since it is advocated to build towards stakeholder consensus and enhance decision making process. Consequently, external stakeholders matter.

The foregoing paragraphs suggest that civil engineering infrastructure project external stakeholders matter despite the fact that they have no formal power to influence the project's decision making process. The real-life examples provided in this section suggested that external stakeholders can negatively impact a project, if they are overlooked by the project management. In contrast, previous studies showed that external stakeholders can positively contribute to the project, if they were effectively identified and involved from the early stages of the project life. This is brought about by the strategies that external stakeholders have available to use in order to influence a project. In order to clarify this point more, the following section discusses the strategies that external stakeholders often utilise to influence civil engineering infrastructure projects.

3.4 External stakeholder strategies to influence projects

External stakeholders have a wide variety of strategies through which they can exert their influence upon a project (Friedman and Miles, 2006). Frooman (1999) used the resource dependence theory, and identified four types of influence strategies that stakeholders often utilise. These are direct withholding; direct usage; indirect withholding; and indirect usage. According to Frooman, withholding strategies refer to those where the stakeholder discontinues providing a resource to an organisation with the intention of making the organisation change a certain behaviour. Usage strategies, in contrast, are those in which the stakeholder continues to supply a resource, but with conditions attached. According to the resource dependence theory, the welfare of both the project and the stakeholder are linked to each other when resource dependence exists. It means that if the welfare of the stakeholder is highly dependent on the welfare of the project, the former will stand for the latter, and will not wish to discontinue providing critical resources. Instead, the stakeholder will tend to use the usage strategies rather than withholding strategies.

In addition to Frooman's strategies, Friedman and Miles (2006) have added two more strategies, which a stakeholder may employ when resource dependency does not exist, namely voice and damage strategies. The former is aiming at making a change in the project through a constructive dialogue or letter-writing campaigns, whereas the latter aims at preventing the project from being carried out through litigation, reputation defamation and demonstrations. Both strategies can be directly or indirectly pursued.

Furthermore, a case study research (Aaltonen et al., 2008), in which the salience of external stakeholders in global projects was investigated, revealed similar strategies that external stakeholders used to increase their salience in a construction project in Uruguay. These strategies are as follows:

1. Direct withholding strategy to increase their perceived power,
2. Indirect withholding strategy to increase their perceived power,
3. Resource building strategy to increase their perceived power,
4. Coalition building strategy to increase their perceived power and legitimacy,
5. Conflicting escalation strategy to increase their legitimacy,
6. Credibility building strategy to increase their legitimacy,
7. Communication strategy to increase their legitimacy and urgency, and
8. Direct action strategy to increase their perceived urgency.

This section suggested that it is not all about resource dependence when an external stakeholder wants to influence a civil engineering infrastructure project. There is a wide variety of strategies through which external stakeholder groups could shape their

salience. External stakeholders will always have the opportunity to impact the project as long as it impacts them. External stakeholders can, therefore, be a great source of support, if appropriately identified and managed, or pose a major threat, if they are overlooked. This implies that external stakeholder management is critical to project success/performance, and thus should begin during project identification phase and continue throughout the project. The following section therefore discusses the process of managing external stakeholders in civil engineering infrastructure projects.

3.5 External stakeholder management process

Stakeholder management process enjoys support from a growing community of researchers since the major contribution of Freeman to the project management literature in 1984 (Littau et al., 2010). There is a recognition among project management scholars that stakeholder management is crucial part of the infrastructure project management process (Hyoungbae et al., 2017; Yang and Shen, 2015; Aaltonen et al., 2008; Atkin and Skitmore, 2008; Olander and Landin, 2008; Walker et al., 2008; Cleland and Ireland, 2007; Olander, 2007).

Previous studies have underlined the importance of managing external stakeholders to the success of infrastructure projects. A participatory action research on the usability of current stakeholder analysis guidelines in the real world by Jepsen and Eskerod (2009) underlines the importance of identifying stakeholders and understanding their expectations to know how they can be influenced, so that they positively contribute to the project. A European research on the best practices and lessons learnt in large infrastructure projects (Hertogh et al., 2008) concludes that external stakeholder management is a critical factor to project success. An empirical case study (Aaltonen and Kujala, 2010) considers the management of external stakeholders by taking into account their interests and demands as an essential element of project success. Another study (Eskerod and Huemann, 2013) (that analysed how various approaches to stakeholder management are included in internationally-used project management standards) regards stakeholder management as a core activity for creating project success.

The foregoing sample of previous research and literature underpins the usefulness of managing external stakeholders in civil engineering infrastructure projects. Therefore, this section discusses external stakeholder management process. It identifies external stakeholder management approaches proposed in previous studies, and then compares and contrasts the identified approaches in order to derive a generic external stakeholder management process for the purpose of the present research.

3.5.1 Previous external stakeholder management approaches

One of the earliest approaches of managing stakeholders is that developed by Cleland in 1986 in which the main elements of the process were highlighted (Littau et al., 2010). Since then, the discourse on stakeholder management process has been evolving resulting in developing a number of different stakeholder management approaches. The present research identifies ten stakeholder management approaches as illustrated in **Table 3-2.**

Table 3-2 Stakeholder management approaches proposed in previous studies

No	***Approaches***	***Origin***	***Description***	***Source(s)***
1	Project Stakeholder Management	USA	It consists of: • Identify stakeholders: internal and external. • Plan stakeholder engagement: to develop management strategies to engage stakeholders throughout the project lifecycle. • Manage stakeholder engagement: communicate and work with stakeholders to fulfil their demands, and promote appropriate stakeholder engagement in the project activities. • Monitor stakeholder engagement: to monitor overall stakeholder relationships and adjust strategies for stakeholder engagement.	Project Management Institute (2017)
2	Framework for Stakeholder Participation	Switzerland	It is designed to implement stakeholder participation in environmental projects. It consists of: • Identification: of all stakeholders internal and external. • Characterisation: to characterise stakeholders in order to understand the power relations between them. • Structuring & Degree of involvement: to divide stakeholders into homogeneous groups, and to give each a specific degree of involvement. • Choice of participatory tactics: to determine a specific participatory tactic for each degree of involvement. • Implementing participatory tactics: this starts once the participatory tactics decided. The early involvement of stakeholders and the establishment of clear rules are crucial to the success of such a participation process • Evaluation.	Luyet et al. (2012)

No	*Approaches*	*Origin*	*Description*	*Source(s)*
3	Stakeholder management	UK	The process includes the following: • Identifying stakeholders: to identify and analyse all stakeholders, and determine their importance to the project, and understand relationships between them. • Planning stakeholder engagement and communications: to determine how each stakeholder will be engaged in the project, and identify what is required to do this work. • Communicating: to address the target audience with a specific message in a way that they are likely to find acceptable. • Monitoring stakeholder engagement.	British Standards Institution (2010)
4	A framework for successful stakeholder management in construction projects	Hong Kong	It is based on 5 factors groupings which are: • The precondition (social responsibilities). • Information inputs (project mission, and list of stakeholders' interest/needs). • Stakeholder estimation (attributes, behaviour, influence, conflicts and coalitions). • Decision-making (compromising conflicts, formulating strategies, predicting reactions). • Sustainable support (change of influence, a steady relationship, and communicate and engage with stakeholders). The information should be inputted on which stakeholders could be estimated. After assessing stakeholders, decisions could be made. Sustainable support needs to be conducted during the whole process.	Yang et al. (2009)

No	*Approaches*	*Origin*	*Description*	*Source(s)*
5	Project Stakeholder Management Process	USA	Five management functions are executed in this model namely planning, organising, motivating, directing, and controlling. Its management process consist of the following phases: • Identification of stakeholders: internal and external. • Gathering stakeholder information: to collect information on the project's stakeholders, internal and external. Obtaining such information is according to the highest standard of ethical conduct. • Identification of stakeholder mission: to determine the nature of their stake in the project. • Determining stakeholder strengths and weaknesses: to develop a summary of the most important strengths on which a stakeholder bases their strategy and the most significant weaknesses they will avoid in exerting their interest on the project. • Identification of stakeholder strategy: which is a series of prescriptions that provides the means for accomplishing stakeholder objectives. • Prediction of stakeholder behaviour: to help develop specific strategies to deal with the impact of adversary stakeholders. • Implementing stakeholder management strategy: to develop implementation strategies for dealing with stakeholders.	Cleland and Ireland (2007)

No	*Approaches*	*Origin*	*Description*	*Source(s)*
6	Stakeholder Management Process	UK	The process consists of six key steps as follows: • Identifying project success criteria: to develop comprehensive project success criteria that are not limited to the iron triangle, but exceed it to include other issues that could probably affect stakeholders. • Identify resource requirements: to evaluate the accessibility to both tangible resources: materials and finance; and intangible resources: support and emotion to effectively carry out the project. • Identify stakeholder groups and level of interests: to identify the project key stakeholders, and then record them on a register in order to identify their objectives and level of interest. • Conduct stakeholder analysis: to investigate current and required stakeholder commitment levels. • Develop strategy for each stakeholder: to influence their knowledge base to achieve the required commitment levels. • Monitor and review.	McElroy and Mills (2007)

No	*Approaches*	*Origin*	*Description*	*Source(s)*
7	Comprehensive Stakeholder Management Process Model	USA	A model to facilitate the practice of stakeholder management and consists of: • Stakeholder Identification: primary, public and secondary. • General nature of stakeholder claims: to assess the nature of the claims that stakeholders may have on the project to help identify what type of power a stakeholder holds. • Determine performance gaps: to identify the gaps between the stakeholder objectives and the project objectives. • Prioritise stakeholder demands: to help sort out which stakeholder will be perceived as having priority status. • Develop organisational responses: to develop strategies and reposes to meet the stakeholder expectations and minimise the gaps between the project objectives and those of the stakeholders. • Monitoring and control: to check if programmes are on truck and if strategies are still relevant.	Preble (2005)

No	Approaches	Origin	Description	Source(s)
8	A Project Stakeholder Management Process	Norway	A formal systematic process comprises of six steps as follows: • Initial planning: in which the process initiated, and where the purpose of the stakeholder management process is defined. • Identification: of internal and external stakeholders through brainstorming and checklists. • Analysis: this to evaluate stakeholders based on their potential for threatening or collaboration (Savage et al., 1991). • Communication: to communicate the stakeholder assessment to the management and project teams to help develop strategy to deal with stakeholders. • Action: to develop implementation strategy to manage stakeholders. • Follow-up: focuses on monitoring the strategies and actions that have been done.	Karlsen (2002)

No	*Approaches*	*Origin*	*Description*	*Source(s)*
9	Project Stakeholder Management Process	USA	Five management functions are executed in this model namely planning, organising, motivating, directing, and controlling. Its management process consist of the following phases: • Identification of stakeholders: internal and external. • Gathering stakeholder information: to collect information on the project's stakeholders, internal and external. Obtaining such information is according to the highest standard of ethical conduct. • Identification of stakeholder mission: to determine the nature of their stake in the project. • Determining stakeholder strengths and weaknesses: to develop a summary of the most important strengths on which a stakeholder bases their strategy and the most significant weaknesses they will avoid in exerting their interest on the project. • Identification of stakeholder strategy: which is a series of prescriptions that provides the means for accomplishing stakeholder objectives. • Prediction of stakeholder behaviour: to help develop specific strategies to deal with the impact of adversary stakeholders. • Implementing stakeholder management strategy: to develop implementation strategies for dealing with stakeholders.	Cleland (1998)

No	Approaches	Origin	Description	Source(s)
10	Project Stakeholder Management Process	USA	Five management functions are executed in this model namely planning, organising, motivating, directing, and controlling. Its management process consist of the following phases: • Identification of stakeholders: internal and external. • Gathering stakeholder information: to collect information on the project's stakeholders, internal and external. Obtaining such information is according to the highest standard of ethical conduct. • Identification of stakeholder mission: to determine the nature of their stake in the project. • Determining stakeholder strengths and weaknesses: to develop a summary of the most important strengths on which a stakeholder bases their strategy and the most significant weaknesses they will avoid in exerting their interest on the project. • Identification of stakeholder strategy: which is a series of prescriptions that provides the means for accomplishing stakeholder objectives. • Prediction of stakeholder behaviour: to help develop specific strategies to deal with the impact of adversary stakeholders. • Implementing stakeholder management strategy: to develop implementation strategies for dealing with stakeholders.	Cleland (1986)

The identified stakeholder management approaches have been developed since the birth of stakeholder theory in 1984. Two of them were developed by well-known international institutions, British Standards Institution (BSI) and Project Management Institute (PMI), whereas the rest were developed by individual scholars. The most recent approach was introduced to the project management canon in 2017, while the earliest approach was introduced in the mid-1980s by Cleland (1986) which underlined the importance of identifying, classifying and analysing stakeholders to the project success at the time.

All the outlined approaches are meant to manage internal and external stakeholders in construction. They are aiming at facilitating the actual practice of stakeholder management in the real world, although each approach adopts specific tools, techniques and engagement strategies to do so. In addition, they classify stakeholders and divide them into groups according to individual criteria in order to allow precise targeting of actions. Each approach then suggests a management strategy to each group of stakeholders through which interests and expectations can be fulfilled. A critical review of the outlined approaches reveals that although each approach adopts individual tools, techniques and stakeholder classification criteria to facilitate the execution of the process, all of them are similar in terms of the process followed.

In order to clarify more, **Table 3-3** lists the processes of each approach in a way that they can be simultaneously compared. As it can be seen from the table, each row represents the process of a specific approach, whereas each column represents a step within the approach. The table shows that the number of the steps followed is not always the same in all approaches. Some approaches consist of four steps while others comprise of six steps, because some approaches attempt to divide the same step into two or even three tasks. For example, “Analysis” step is considered as one step in Karlsen (2002), whereas in Cleland and Ireland (2007) and Preble (2005) it is divided into three steps. Furthermore, additional steps, such as initial planning, are included in two approaches, McElroy and Mills (2007) and Karlsen (2002), that are not encompassed in the others. The additional steps are kind of preparation to perform the process.

Table 3-3 Stakeholder management process

Approaches	***Steps***						
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**Step 6**	**Step 7**
1	Identify stakeholders	Plan stakeholder engagement	Manage stakeholder engagement	Monitor stakeholder engagement	-	-	-
2	Stakeholder Identification	Stakeholder Characterisation	Stakeholder Structuring and Degree of Involvement	Choice of Participatory Techniques	Implementation of Participatory Techniques	Evaluation	-
3	Identifying stakeholders	Planning stakeholder engagement and communications	Communicating	Monitoring stakeholder engagement	-	-	-
4	The precondition	Information inputs	Stakeholder estimation	Decision-making	Sustainable support	-	-
5	Identification of stakeholders	Gathering stakeholder information	Identification of stakeholder mission	Determining stakeholder strengths and weaknesses	Identification of stakeholder strategy	Prediction of stakeholder behaviour	Implementing stakeholder management strategy
6	Identifying project success criteria	Identify resource requirements	Identify stakeholder groups and level of interests	Conduct stakeholder analysis	Develop strategy for each stakeholder	Monitor and review	-
7	Stakeholder Identification	General nature of stakeholder claims	Determine performance gaps	Prioritise stakeholder demands	Develop organisational responses	Monitoring and control	-
8	Initial planning	Identification	Analysis	Communication	Action	Follow-up	-
9	Identification of stakeholders	Gathering stakeholder information	Identification of stakeholder mission	Determining stakeholder strengths and weaknesses	Identification of stakeholder strategy	Prediction of stakeholder behaviour	Implementing stakeholder management strategy
10	Identification of stakeholders	Gathering stakeholder information	Identification of stakeholder mission	Determining stakeholder strengths and weaknesses	Identification of stakeholder strategy	Prediction of stakeholder behaviour	Implementing stakeholder management strategy

The author identifies that the approaches share many similarities in terms of the process followed to manage stakeholders. In order to clearly visualise the similarities the different approaches do share, and produce a generic stakeholder management approach **Table 3-3** is reorganised. The generic approach has been derived from comparing and contrasting the eight approaches to identify which aspects they share and which sequence of steps they agree on. It has been found that the eight approaches agree on four generic steps namely *identification; analysis; engagement* and *evaluation*. **Table 3-4** illustrates the generic approach and clearly matches its steps with their counterparts in the eight identified approaches. As it can be seen from the table, some steps appear as a single step in particular approaches, and as sequence of two or three steps in others. This could be in order to reduce the complexity involved when carrying out the task, or to enhance efficiency and effectiveness.

McElroy and Mills (2007) and Karlsen (2002), for example, consider “stakeholder analysis” as one step in which every stakeholder is evaluated in relation to selected issues, and therefore help develop an appropriate strategy for managing such a stakeholder. BS 6079-1 (2010) also considers “stakeholder analysis” as a single step in which stakeholders are classified into homogenous groups, and a means to engage each stakeholder is planned. In contrast, Luyet et al. (2012) divided the same step into two smaller steps namely “stakeholder characterisation” and “stakeholder structuring and degree of involvement”. The purpose of these two steps is to assess stakeholders and place them in homogenous groups to help engage them effectively. Once again, the same step is divided into three steps in both Cleland and Ireland (2007) and Preble (2005).

It also appears that the same step has different names in different approaches, although its overarching aim is the same. Moreover, the agreement on including the four generic steps mentioned above indicates their significant importance to the success of the whole process. The following section describes the generic approach in more detail and considers it when dealing with external stakeholders in civil engineering infrastructure projects.

Table 3-4 A generic stakeholder management approach

No	Identification		Analysis			Engagement			Evaluation
1	Identify stakeholders		Plan stakeholder engagement			Manage stakeholder engagement			Monitor stakeholder engagement
2	Stakeholder Identification		Stakeholder Characterisation	Stakeholder Structuring and Degree of Involvement		Choice of Participatory Techniques	Implementation of Participatory Techniques		Evaluation
3	Identifying stakeholders		Planning stakeholder engagement and communications			Communicating			Monitoring stakeholder engagement
4	The precondition	Information inputs	Stakeholder estimation			Decision-making			Sustainable support
5	Identification of stakeholders		Gathering stakeholder information	Identification of stakeholder mission	Determining stakeholder strengths and weaknesses	Identification of stakeholder strategy	Prediction of stakeholder behaviour	Implementing stakeholder management strategy	-
6	Identify stakeholder groups and level of interests		Conduct stakeholder analysis			Develop strategy for each stakeholder			Monitor and review
7	Stakeholder Identification		General nature of stakeholder claims	Determine performance gaps	Prioritise stakeholder demands	Develop organisational responses			Monitoring and control
8	Identification		Analysis			Communication	Action		Follow-up
9	Identification of stakeholders		Gathering stakeholder information	Identification of stakeholder mission	Determining stakeholder strengths and weaknesses	Identification of stakeholder strategy	Prediction of stakeholder behaviour	Implementing stakeholder management strategy	-
10	Identification of stakeholders		Gathering stakeholder information	Identification of stakeholder mission	Determining stakeholder strengths and weaknesses	Identification of stakeholder strategy	Prediction of stakeholder behaviour	Implementing stakeholder management strategy	-

3.5.2 A generic external stakeholder management approach

This section describes the generic external stakeholder management approach derived in the previous section. The generic approach comprises four steps as follows:

1. External stakeholder identification;
2. External stakeholder analysis;
3. External stakeholder engagement; and
4. Evaluation.

The following sub-sections discuss each of these steps in greater details.

3.5.2.1 External stakeholder identification

Stakeholder identification is the first step in the process of managing stakeholders. It is the process of identifying stakeholders in a project (Association for Project Management, 2006). It is also defined as the process of identifying all individuals or organisations affected by the project, and gathering as well as documenting relevant information regarding their stakes, involvement and impact upon project success (Project Management Institute, 2013). The PMI's definition of stakeholder identification suggests that it is not enough to only identify who the project's stakeholders are, but the stakeholder identification process should also determine the stakeholder's interest, expectations and any potential impact upon the project. This is also supported by the British Standards Institution (2010) which contains that when identifying stakeholders, a greater understanding of each stakeholder should be gained, and the importance of all of them to achieving the project objectives determined. This underlines the importance of stakeholder identification to the successful achievement of the project objectives.

The importance of stakeholder identification lies in its vital output which enhances the effectiveness of the subsequent step in managing stakeholders - stakeholder analysis. Accordingly, when managing external stakeholders in civil engineering infrastructure projects, the main purpose of external stakeholder identification should be to produce a comprehensive list of external stakeholders that contains relevant information regarding their stakes, involvement and impact upon project success. However, it is believed that external stakeholders can be large in number (Chinyio and Akintoye, 2008), and it is fact that they do not always belong to the project supporting organisation (Cleland and Ireland, 2007). Therefore, it could be hard to identify all of them in advance.

In an attempt to overcome the challenge of identifying external stakeholders Luyet et al. (2012) advocates using a combination of stakeholder identification techniques, such as brainstorming, group meetings, interviews with experts and the use of checklists. In

contrast, King et al. (1998) recommends the use of a specific identification technique, such as the snowball technique in which a list of stakeholders is produced, and then submitted to one of the already identified stakeholders to add further stakeholders. However, a special attention should be given to those who perform such a process, because their judgement may be subjective. They could also fail to identify some stakeholders that may appear later and introduce a level of risk in the subsequent stages of the process (Luyet et al., 2012).

Another challenge that could be encountered during the identification process of external stakeholders is the evaluation of the stakeholder's interest in relation to the project objectives (Olander, 2007). This is because these interests are often diverse and not always static but dynamic and depend mainly on individual knowledge bases (Olander and Atkin, 2010). The stakeholder identification tools and techniques could identify who the external stakeholders are, but their effectiveness to gain greater understanding of the external stakeholders' interests can be debatable. This is because the stakeholder identification techniques appear to obtain information on external stakeholders from other resources rather than the external stakeholders themselves. This is particularly the case in brainstorming, checklists, snowball technique, group meeting, and expert interviews. In other words, the project management team will have gained knowledge of their external stakeholders by hearsay rather than facts, and thus basing their management strategies on assumptions instead of facts. Furthermore, the objectives of external stakeholders may not always be obvious (McElroy and Mills, 2007), and they may have hidden agendas of what they expect to gain from the project (Young, 2006).

The author argues that combinations of stakeholder identification techniques should be used when identifying external stakeholders in the context of civil engineering infrastructure projects. External stakeholder identification should start at the very early stage of project identification. Project management teams need to engage with all external stakeholders upon their identification in order to determine the stakeholders' needs, concerns and expectations. In this manner, decisions made by the management team in relation to managing external stakeholders will be informed decisions. This shall also enhance the effectiveness of the subsequent step in managing external stakeholders - stakeholder analysis.

3.5.2.2 External stakeholder analysis

Stakeholder analysis is a main task in stakeholder management process (Jing et al., 2011), and is considered as a necessary step for successful stakeholder management (Olander, 2006). Stakeholder analysis establishes the stakeholder's position in relation

to the project (Association for Project Management, 2006), and understands stakeholder relations to enhance project success (British Standards Institution, 2010). Accordingly, analysing external stakeholders requires sufficient information about them based on which their interests can be evaluated, and the relationships between them can be understood. Therefore, the effectiveness of this step will depend largely upon the quality of the information obtained from the previous step, stakeholder identification, because stakeholder analysis takes as its starting point the output of stakeholder identification.

Previous studies have used different strategies aiming at dividing stakeholders into homogeneous groups to manage them easily. McElroy and Mills (2007), for example, classifies stakeholders based on their individual motivational drivers into three groups: Beneficiary; Loss; and Regulatory Stakeholders. Karlsen (2002) adopts Savage et al. (1991) typology which categorises stakeholders (based on their potential for threat and potential for cooperation) into four groups. These are supportive, marginal, non-supportive, mixed-blessing stakeholders. British Standards Institution (2010) classifies stakeholders into two broad groups namely positive, who are in favour of the project, and negative stakeholders, who are against it. Cleland and Ireland (2007) divides stakeholders into internal and external stakeholder groups.

In the construction industry, there is a tendency to classify stakeholders when managing them, however the diversity of stakeholder interests (Chinyio and Akintoye, 2008; Johnson et al., 2008) could hinder the project management team from adopting sufficient criteria to classify them into homogeneous groups. Adopting a particular classification strategy seems as imposing a rigid detailed control over the stakeholders which is considered as “a mistake for project management” by Karlsen (2002, p.19). Furthermore, the stakeholders themselves could form coalitions which often change over time as different stakeholders may be important at different stages in the project life cycle (Jepsen and Eskerod, 2009). Consequently, the author argues that the analysis of external stakeholders should not be based on information obtained from other sources rather than the stakeholders themselves. In addition, instead of dividing external stakeholders into groups, the project management team need to engage with all stakeholders in order to identify the correct position of those stakeholders in relation to the project objectives. Once this has been done, the appropriate stakeholder involvement strategy can be chosen.

3.5.2.3 External stakeholder engagement

Stakeholder engagement is a practice undertaken to communicate with stakeholders and involve them in a positive manner in organisational activities (Greenwood, 2007). Stakeholder engagement in construction according to Mathur et al. (2008) can be conceptualised in three ways. It can be seen from a strategic management perspective aimed at capturing knowledge, increasing ownership of the project by external stakeholders, reducing conflict, encouraging innovation and facilitating partnerships. From an ethical perspective, meaningful stakeholder engagement can be seen to enhance inclusive decision making, promote equity, enhance local decision making and build social capital. From a social learning perspective, stakeholder engagement can be seen as an opportunity for social learning where diverse stakeholders share a common forum, learn about each other's values, reflect upon their own values and create a shared vision and shared objectives.

The main purpose of stakeholder engagement is to give each external stakeholder a level of power that allows them to participate in the project and its decision making process. Scholars have identified different engagement strategies for dealing with stakeholders based on specific typologies. Luyet et al. (2012), for instance, uses five degrees of involvement namely information, consultation, collaboration, co-decision and empowerment. They also determine several participatory techniques for each degree of involvement including distributing newsletter, public hearing, workshops, focus group and consensus conference. Luyet *et al*. argued that the selection of a specific technique depends mainly on the degree of involvement. For example, they suggest the use of newsletters and reports to inform, whereas focus group technique is used to collaborate with and empower stakeholders. Luyet *et al*. also emphasised the attribution of more than one technique to each stakeholders in order to avoid the risk of applying an inadequate technique (ibid).

In contrast to Luyet et al. (2012), McElroy and Mills (2007) identifies the motivational drivers for each stakeholder group, and then influence individuals within each group in order to allow precise targeting of actions. This strategy focuses on determining current and required commitment levels as well as the knowledge base of stakeholders. It aims at achieving the required commitment level by influencing the stakeholder's knowledge base, which would vary from full awareness to total ignorance. The strategy relies on communication and negotiation with stakeholders in order to gain the required level of commitment. Although McElroy and Mills' approach does not offer a specific participation technique, it emphasises the importance of influencing stakeholder knowledge bases.

Similar tactic is followed by British Standards Institution (2010) which advises to determine strategies to engage stakeholders in order to either neutralise their negative impact or harness their positive commitments.

Karlsen (2002), on the other hand, seems quite straightforward in attributing a degree of involvement for each stakeholder. This could be brought about by its specific stakeholder classification approach (Savage et al., 1991) which is based on the collaborating and threatening potentials. This approach recommends a specific strategy to deal with each group as follows:

- supportive stakeholders to be involved;
- marginal stakeholders to be monitored;
- non-supportive stakeholders to be defended against; and
- mixed-blessing stakeholders to be collaborated with.

In fact, this approach advocates that supportive stakeholders, who are low on potential threat but high on potential for cooperation, are informed and involved in relevant issues, so that cooperation potential with them is maximised. Marginal stakeholders are monitored especially when making decisions that may negatively affect them. Non-supportive stakeholders are defended against. Mixed blessing stakeholders due to their high potential for both threat and cooperation, are collaborated with. It appears that this approach explains the selection of the participatory techniques, but does not offer much advice on how to implement them.

According to Manowong and Ogunlana (2010), the success of defining stakeholder engagement procedure requires the project management team to effectively assess the influence and thoroughly understand the expectations of their stakeholders. However, the dynamism of the influence of external stakeholders (Aaltonen and Kujala, 2010; Chinyio and Akintoye, 2008; Olander, 2007) and the complexity of the process in which the attribution of the degree of involvement will take place (Jepsen and Eskerod, 2009) could together result in attributing an inappropriate degree of involvement to an external stakeholder. According to Luyet et al. (2012), this could give too much or not enough power to the stakeholder and thereby lead to selecting an inadequate engagement technique. As a consequence, attributing a specific degree of involvement to an external stakeholder is always circumspect (Chinyio and Olomolaiye, 2010), and will depend mainly on the outputs of the previous steps, stakeholder identification and analysis.

It is the author’s contention that if the outputs of external stakeholder identification and analysis processes were based on information obtained from the external stakeholders themselves, the chance for attributing an inadequate engagement technique would be

low. What is important here is to evaluate the implementation of the involvement techniques to ensure they are appropriate and lead to the desired outcome. The following sub-section expands a bit more on the evaluation of the external stakeholder management process.

3.5.2.4 Evaluation

The purpose of evaluation is to monitor the procedures, and to review the actions taken and strategies implemented in order to ensure they lead to the desirable outcomes. It is agreed that evaluating and reviewing the process of managing stakeholders must be conducted throughout the entire project life cycle, and need to be updated at regular intervals (Olander and Atkin, 2010; McElroy and Mills, 2007; Olander and Landin, 2005). McElroy and Mills (2007), for instance, emphasises that monitoring and reviewing the steps should be carried out at regular intervals. In the evaluation step, McElroy and Mills investigate the stakeholders' level of commitment and monitor satisfaction. If the level of commitment has changed, a different strategy should be considered. Moreover, British Standards Institution (2010) highlights the importance of validating the attitudes of stakeholders throughout the project as they will change over time.

3.5.3 Comments about external stakeholder management process

The four steps of the generic external stakeholder management approach outlined and discussed in this section are important to the success of managing external stakeholders in civil engineering infrastructure projects. No step should be omitted but they may overlap. The importance of these four steps is underpinned by the agreement between various scholars and professional project management institutions on including them in the process of managing stakeholders in construction. Because information gathered in one step is used as input to another, impact of failure of a step can be severe and lead to a failure of the whole process.

Discussions in **section 3.3** (on why external stakeholders matter), **section 3.4** (on external stakeholder strategies to influence projects) and **section 3.5** (on external stakeholder management process) demonstrated that it is crucial to successfully identify and effectively engage with all affected external stakeholders early in the project. This is vital in order to thoroughly understand both the external stakeholders' expectations and potential impact upon project success, because a negative external stakeholder attitude to the project can be detrimental to the smooth implementation of the project. Therefore, the next section examines the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects.

3.6 External stakeholder involvement in the pre-design phase

Discussions in Chapter 2 **section 2.6** (on the pre-design phase and public policy development) showed that the pre-design phase of a typical civil engineering infrastructure projects can commence during the design stage of an NPS and continues through the subsequent stage of policy implementation at which it finishes, but can also begin and finish at the policy implementation stage. Therefore, in order to examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects, this section identifies who is involved in the UK infrastructure planning process. First, it identifies the extent of external stakeholder involvement in the development consent regime. Second, it identifies the extent of external stakeholder involvement in the development of National Policy Statements (NPSs). Lastly, it identifies the extent of external stakeholder involvement in the National Infrastructure Assessment (NIA).

3.6.1 External stakeholder involvement in the development consent regime

The Planning Act 2008 created a new system for planning for Nationally Significant Infrastructure Projects (NSIPs) (The Planning Inspectorate, 2014). Instead of applying to the local authority for Planning Permission, the developer of any NSIP must apply to the Planning Inspectorate for a Development Consent Order (DCO) (The Planning Inspectorate, 2016a; 2016c). The Planning Inspectorate is the agency responsible for operating the planning process for NSIPs under the Localism Act 2011.

A development consent to build an NSIP is given at national level by the responsible Government Minister (i.e. the Secretary of State). The developer of any NSIP must apply to the Planning Inspectorate for a DCO. The application process begins when the developer informs the Planning Inspectorate that they intend to submit an application in the future (The Planning Inspectorate, 2016c), and involves an examination of major proposals relating to energy, transport, water, waste and waste water (The Planning Inspectorate, 2016a; 2012a). Under the Planning Act 2008 (as amended by the Localism Act 2011) there are 6 stages of the development consent regime for NSIPs. These are:

1. Pre-application: the process begins when the Planning Inspectorate is informed by a developer that they intend to submit an application in the future. Before submitting an application, the developer is required to carry out extensive consultation on their proposals. The length of time taken to prepare and consult on the project will vary depending upon its scale and complexity.

2. Acceptance: the acceptance stage begins when a developer submits a formal application for development consent to the Planning Inspectorate. There follows a period of up to 28 days for the Planning Inspectorate, on behalf of the Secretary of State, to decide whether or not the application meets the standards required to be formally accepted for examination.
3. Pre-examination: at this stage, the public and other external stakeholders will be able to register with the Planning Inspectorate and provide a summary of their views on the application in writing. At this stage, everyone who has registered and made a relevant representation will be invited to attend a preliminary meeting run and chaired by an Inspector.
4. Examination: during this stage, people who have registered to have their say, are invited to provide more details of their views in writing. Careful consideration is given by the Examining Authority to all the important and relevant matters, including the representations of all interested parties, any evidence submitted and answers provided to questions set out in writing and explained at hearings.
5. Decision: the Planning Inspectorate must prepare a report on the application to the relevant Secretary of State, including a recommendation. The Secretary of State then has to make the decision on whether to grant or refuse development consent.
6. Post decision: once a decision has been issued by the Secretary of State, there is a six week period in which the decision may be challenged in the High Court. This process of legal challenge is known as Judicial Review.

In the UK, any developer wishing to construct an NSIP must first apply for a DCO to do so and submit an application to the Planning Inspectorate. The Planning Inspectorate then examines the application and makes a recommendation to the relevant Secretary of State, who will make the decision on whether to grant or to refuse development consent (The Planning Inspectorate, 2012b). For example, in the case of transport NSIPs, after examining an application the Planning Inspectorate makes a report and recommendation on the project to the Secretary of State for Transport. The Secretary of State for Transport then decides whether to grant or refuse development consent. If the decision is to give consent for a project to go ahead, the Secretary of State for Transport will make a DCO. This contains the consent and other authorisations (e.g. to purchase land compulsorily) which the developer needs to construct and operate the project.

Before submitting an application, the developer is legally required to consult with affected stakeholders about their proposals (The Planning Inspectorate, 2016c). The Planning

Act 2008 sets out statutory requirements for developers to engage in pre-application consultation with local communities, local authorities, and those who would be directly affected by the project (Department for Communities and Local Government, 2012). Fundamentally, the 2008 Act process places emphasis on opportunities for people to have their say before a decision is made by the relevant Secretary of State (The Planning Inspectorate, 2016a; 2012a). According to the Department for Communities and Local Government (2015), during the pre-application stage developers are required:

- under Section 46 of the Planning Act 2008 to notify the Secretary of State of the proposed application;
- under Regulation 6 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 to identify whether the project requires an environmental impact assessment; where it does, confirm that they will be submitting an environmental statement along with the application, or that they will be seeking a screening opinion ahead of submitting the application;
- to produce a Statement of Community Consultation, in consultation with the relevant local authority or authorities, which describes how the developer proposes to consult the local community about their project and then carry out consultation in accordance with that Statement;
- under the Planning Act 2008, the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009, the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009 and the Infrastructure Planning (Miscellaneous Prescribed Provisions) Regulations 2010 to make the Statement of Community Consultation available for inspection by the public in a way that is reasonably convenient for people living in the vicinity of the land where the development is proposed;
- under section 42 of the Planning Act and Regulations to identify and consult statutory consultees;
- in accordance with Regulation 4 of the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009 to publicise the proposed application;
- set a deadline for consultation responses of not less than 28 days from the day after receipt/last publication;
- under Section 49 of the Planning Act 2008 to have regard to relevant responses to publicity and consultation; and
- under Section 37 of the Planning Act 2008 to prepare a consultation report and submit it to the Secretary of State.

The requirements above suggest that a key feature of the UK's infrastructure planning regime is front-loading, meaning that developers must fulfil a number of pre-application duties such as consultation and environmental assessment before an application can be submitted (The Planning Inspectorate, 2014). However, the consultation does not start until the developer has prepared their proposal and notified the Planning Inspectorate that they intend to submit an application in the future. This means that external stakeholders are having limited (if any) input into key aspects of the project defined during the pre-design phase, in particular, during the project identification stage.

The consultation during the pre-application stage is actually about the developer's proposal. At this stage, the need for a project is already identified and a project proposal is already developed for consultation. The purpose of this pre-application consultation(s) is twofold: to allow external stakeholders to comment on and influence the project as it evolves and to provide developers with an opportunity to resolve or reduce the impacts caused by the construction and operation of the project in advance of submitting the application for a DCO (The Planning Inspectorate, 2016b). This indicates that at the pre-application stage external stakeholders are invited to comment on a proposal that may constitute an opportunity to the infrastructure developer but neither solve the external stakeholders' problems nor meet their expectations. Therefore, it can be argued that involving external stakeholders at this stage provides limited input into the pre-design phase.

The author acknowledges that the statutory requirements set out by the Planning Act 2008 for infrastructure developers to engage in pre-application consultation with affected external stakeholders of their proposals are still important to fulfil. However, it should be noted that these requirements are met after a project proposal has already been developed. This indicates a limited external stakeholder involvement in the identification process of infrastructure projects.

This section examined the extent of external stakeholder involvement in the development consent regime. The section showed limited external stakeholder involvement in the development consent regime. It also demonstrated that the Planning Inspectorate examines project proposals and makes a recommendation to the relevant Secretary of State, who will make the decision on whether to grant or to refuse development consent. These recommendations are made within a framework that is provided by the National Policy Statements (NPSs). Therefore, the next section examines the extent of external stakeholder involvement in the development of NPSs.

3.6.2 External stakeholder involvement in the development of national policy statements

There is a recognition among political scientists that government departments are the primary loci of the most contemporary policy making within the core executive. Dorey (2005, p.91), for example, states that “even when broad policy objectives and strategy have been determined via the Cabinet and/or the Prime Minister, the detailed formulation of most policies occurs inside individual departments”. Moreover, Smith (2003, p.79) expresses that despite the modernisation of central government, “it is still the case that the majority of policy is made and implemented within departments”.

Even following in-depth interview-based research (in which 191 semi-structured interviews were conducted with ministers, civil servants and interest group representatives) on the various changes and reforms in the core executive, Marsh et al. (2001, p.249) remain convinced that “departments are both the *key actors and institutions at the centre of the policy-making process*. They continue to provide the foci in which policy is made” (italics in original). This is because government “departments are where concentrations of political and bureaucratic resources are located and, as such, they both influence the development of policy and structure the behaviour of other actors within the core executive” (Smith et al., 2000, p.163). Marsh et al. (2001) concludes that departments control most of the policy process and officials within departments have the time, expertise and networks to develop and implement policy.

The core executive is defined as “the heart of the machine” (Rhodes, 1995, p.12). It comprises the key individuals and institutions concerned with developing policy, coordinating government activities and providing the necessary resources for delivering public goods (Smith, 1999). This clearly confirms the central importance of the core executive to the policy making process in Great Britain. In the core executive, key individuals are those who can exercise choice. These are The Prime Minster, senior ministers (secretaries of state), junior minsters, senior civil servants and special advisors. These individuals are part of a network of key institutions which also constitute the core executive. The key individuals both shape and are shaped by these institutions. These key institutions are The Prime Minister’s Office, The Cabinet Office, government departments, The Cabinet and The Parliament (Dorey, 2005).

Under the Planning Act 2008, the Secretary of State may designate a statement as a National Policy Statement (NPS) for the purposes of this Act if the statement - (a) is issued by the Secretary of State, and (b) sets out national policy in relation to one or more specified descriptions of development. Before designating a statement as an NPS

for the purposes of the Planning Act the Secretary of State must carry out an appraisal of the sustainability of the policy set out in the statement. This implies that NPSs are formulated within the core executive inside government departments.

A statement may be designated as an NPS for the purposes of the 2008 Act only if the consultation and publicity requirements set out in section 7, and the parliamentary requirements set out in section 9 of the Planning Act 2008, have been complied with in relation to it. This suggests that NPSs undergo a democratic process of public consultation and parliamentary scrutiny, before being designated, i.e. published. However, such consultation and parliamentary scrutiny do not take place until a public policy is formulated by the relevant government department and presented to Parliament in a form of a Public Bill for approval.

NPSs are formulated within the core executive inside government departments. A public policy may be a response to an external event; it may arise from a new idea or initiative such as a party manifesto commitment; or it may be a modified version of a long standing policy (National Audit Office, 2001). Waller et al. (2008), for example, sets out some of the ways in which policy is developed; and its different origins. These are:

- Manifesto-driven policy: political parties present both their political philosophy and their specific proposals to the electorate in a published manifesto; and the election winner is then given the opportunity to pursue them. Drafting the manifesto is a purely party political matter and civil servants have no role in the process. The main sources of the specific proposals presented in the manifesto are from the politicians themselves, their political advisers and party employees.
- Ministerially-driven policy: ministers remain one of the key drivers of policy proposals. On being appointed as Ministers, they take on responsibility for a specific area of public life and invariably want to take the opportunity to develop the policy or improve the operation of government services. It does not follow that Ministers themselves generate the majority of specific policy ideas, but ministers are critical in deciding which issues to be addressed and which have priority.
- Civil service originated policy: the civil service focus is usually on responding to policy ideas originating elsewhere or improving the delivery of existing policies. However, there are some policy focused issues which civil servants do advocate.
- Civil service-driven policy: if the civil service does not originate policy, it is undoubtedly the main vehicle for taking hold of the policy concept and working out the practical detail of developing that policy into something workable in the necessary detail.

- ‘Events’ driven policy: a significant amount of policy making is generated in real time and in response to external events. Officials can at such times come under pressure to produce a new policy announcement even if there is not a strong objective case for such a development.

Draft NPSs are often introduced in the House of Commons before proceeding to the House of Lords. The sequence of stages that an NPS (Bill) passes through is illustrated in **Figure 3-3**.

Figure 3-3 Parliamentary stages of a Public Bill starting the House of Commons (The UK Parliament, 2016)

Each stage of a Bill’s passage through Parliament serves a particular purpose (The UK Parliament, 2016).

- First Reading: simply entails the title of the Bill being read to the House of Commons by the Clerk;
- Second Reading: considers the principle and purpose of a Bill which usually entails parliamentary debate;
- Committee Stage: in which a Bill is examined in detail, line-by-line, clause-by-clause by a select committee comprising a number of MPs. It is at this stage that amendments to a Bill will be put forward;
- Report Stage: in which an amended Bill is reported back to the House of Commons, whereupon further debate on the revised Bill takes place;
- Third Reading: is a final debate on the Bill before it goes to the House of Lords;
- House of Lords: once a Bill completes these stages in the House of Commons, it is then sent to the House of Lords where it undergoes the same stages as in the Commons; and

- Lords' Amendments: after a Bill has gone through its stages in the House of Lords, it is returned to the House of Common, where MPs debate whether to accept these amendments then it can finally receive its Royal Assent (ibid).

Although NPSs undergo a democratic process of public consultation and parliamentary scrutiny before being designated, the public consultation and parliamentary scrutiny take place at the end of the design stage of policy formulation - after the NPS had already been formulated by the relevant government department, **Figure 3-4**.

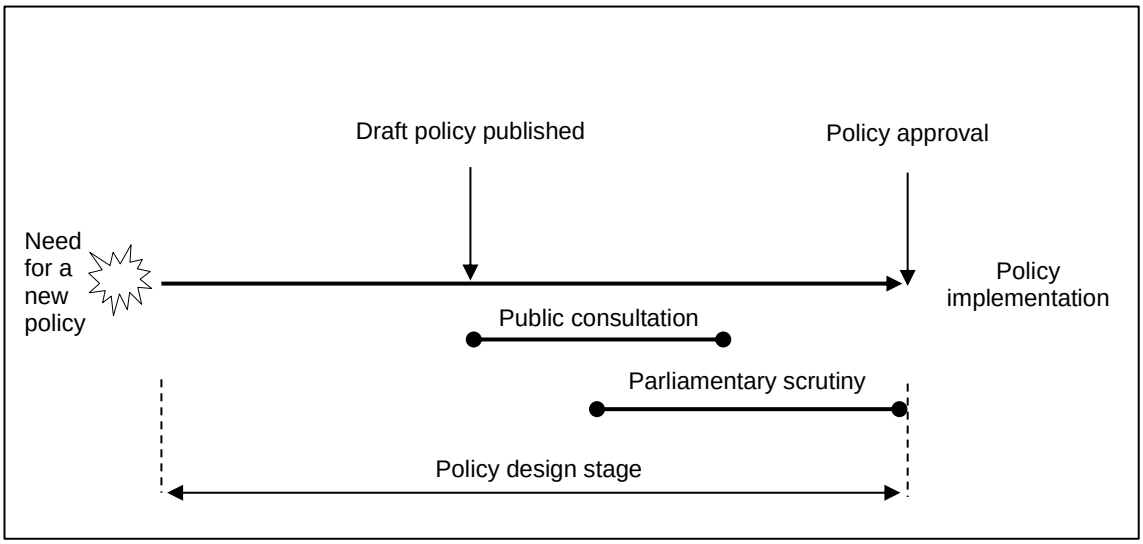

Figure 3-4 External stakeholder involvement in the design stage of NPS

For example, the National Networks National Policy Statement (NN NPS) (Department for Transport, 2014) was published under the 2010 to 2015 Conservative and Liberal Democrat coalition government. The DfT produced a draft NN NPS (Department for Transport, 2013) and published it on 4 December 2013. The draft NN NPS was then subject to a public consultation from 4 December 2013 to 26 February 2014. The main purpose of this consultation was to get views on whether the NN NPS adequately sets out the need for development of nationally significant infrastructure projects on the national networks, the Government's proposals to address that need and detailed guidance on how impacts of developments are to be assessed and impacts mitigated. The public consultation questions were as follows:

1. Does the draft NN NPS clearly establish the need for development of the national networks? If not why not?
2. Does the draft NN NPS adequately explain the Government's policy for addressing the need set out in the NN NPS? If not why not?

3. Do the Assessment Principles provide adequate guidance to the Secretary of State on how he should assess applications for developments of the national networks? If not why not?
4. Does the draft NN NPS give appropriate guidance to scheme promoters?
5. Does the draft NN NPS consider all of the significant potential impacts of national network development? If not, what other impacts should be included and why?
6. Does the draft NN NPS give appropriate guidance on appropriate mitigation measures? If not why not?
7. Do you have any comments on the Appraisal of Sustainability of the NN NPS?
8. Do you have any comments on the Appropriate Assessment on the draft NN NPS?
9. Please provide any further comments regarding any aspect of this consultation.

As it can been seen from the purpose and questions of the consultation, external stakeholders were asked about their views on the government's policy to address the need for development of nationally significant infrastructure projects on the national networks. Because the consultation took place at the end of the policy design stage, inputs from external stakeholders were limited. External stakeholders were merely able to comment and express their views on pre-identified infrastructure needs rather than engaging in the identification process of those needs. The need for development of infrastructure projects was identified by the key individuals and institutions within the core executive, and was then communicated to external stakeholders to comment on it. What infrastructure is needed, and how is it going to be addressed had already been decided by the government when the consultation took place.

Similarly, although the draft NN NPS was subject to parliamentary scrutiny, the parliamentary scrutiny took place after the policy had already been formulated. This suggests that even the Parliament was merely able to comment and express views on the policy rather than actively engage in the articulation of the infrastructure needs identified in the policy. The parliamentary select committee who examined the draft NN NPS was merely able to modify the policy. The select committee published a call for evidence on the draft policy on 7 January 2014. The select committee sought views on the following questions:

1. Has the Government identified a compelling need for development of the national road and rail networks and of strategic rail freight interchanges?
2. Does Government policy on the development of the national road and rail networks, and the investment programme relating to the road and rail networks, meet that need?

3. Does policy on the development of the networks take appropriate account of environmental, safety, sustainability and accessibility issues as well as the impact of new technology?
4. To what extent does the draft NPS provide clear guidance to the Secretary of State about how to assess schemes? Does it help scheme promoters understand the approach the Secretary of State is likely to take to nationally significant road and rail infrastructure projects?
5. How does the draft NPS relate to other aspects of the Government's transport strategy, including HS2, and to integration with local transport networks?

As it can be seen form the questions above, the parliamentary scrutiny aimed at supporting the need for development of the national network which had been already identified by the DfT. This suggests that the parliamentary scrutiny served as a means for supporting the government's policy to address what the government perceives as pressing infrastructure needs.

The author acknowledges the importance of the democratic process of public consultation and parliamentary scrutiny which an NPS would undergo through before being designated. However, more consultation with external stakeholders and more publicity could have taken place during the design stage of the draft policy. Government departments could consult more on what infrastructure needs to be addressed. Identifying what infrastructure is needed should not be confined within the core executive, but should also embrace as many infrastructure stakeholders as possible. The policy design stage in which infrastructure needs are often identified and at which the pre-design project phase often begins, as demonstrated Chapter 2 **section 2.5**, can engage as many infrastructure stakeholders as possible. Therefore, an overarching approach for the pre-design phase is needed.

This section demonstrated that although the NPSs undergo public consultation and parliamentary scrutiny, the detailed formulation of an NPS occurred inside the government departments. It also showed that consultations with external stakeholders take place after a draft NPS has already been formulated and presented to parliament for approval. In addition, the purpose of the consultation and parliamentary scrutiny is often to seek views on the need for development of infrastructure projects and the government's proposed policy to address that needs. This suggests that there is a limited external stakeholder involvement in the development of the NPSs, therefore limited external stakeholder involvement in the pre-design phase of infrastructure projects.

3.6.3 External stakeholder involvement in the National Infrastructure Assessment

On 30 October 2015, the UK government established the National Infrastructure Commission (NIC). NIC was launched to determine Britain's infrastructure priorities and hold governments to account for their delivery (HM Treasury, 2015). The purpose of the commission is to identify the UK's strategic infrastructure needs over the next 10 to 30 years and propose solutions to the most pressing infrastructure issues, in order to:

- foster long-term and sustainable economic growth across all regions of the UK
- improve the UK's international competitiveness
- serve the well-being of UK citizens

NIC is commissioned to analyse the UK's strategic infrastructure needs and priorities over a long-term horizon, and then articulate those needs in a National Infrastructure Assessment (NIA). NIAs produced by NIC are then laid before Parliament and HM Treasury will be required to respond on behalf of the government, detailing how the government will take the recommendations forward. Where the government disagrees with a recommendation on how to meet identified needs, its response will set out the reasons for this disagreement, and outline what other measures it proposes or what its alternative assessment is (HM Treasury, 2016).

On 10 July 2018, NIC published its first ever NIA (National Infrastructure Commission, 2018) which looks at the UK's future economic infrastructure needs up to 2050 and makes key recommendations for how to deliver new transport, low carbon energy and digital networks, how to recycle more and waste less, and how future infrastructure should be paid for. NIC developed its NIA in two key stages:

- Vision and priorities: to identify long-term infrastructure need and highlight priority area for action over the medium-term.
- A National Infrastructure Assessment: containing recommendations for how the identified infrastructure needs and priorities should be addressed.

The Commission began by building a better understanding of the UK's existing infrastructure assets and the pipeline of projects across sectors. It then assessed the key drivers of demand and supply for infrastructure services, such as economic growth and technological change, to better understand their relationship with and impact on infrastructure. Alongside this, sector evidence reviews were also undertaken by the commission allowing the examination of existing plans alongside outputs from the various economic and engineering models which project long-term infrastructure need

(National Infrastructure Commission, 2016). The NIA was developed through an open, transparent and consultative process as illustrated in **Figure 3-5**.

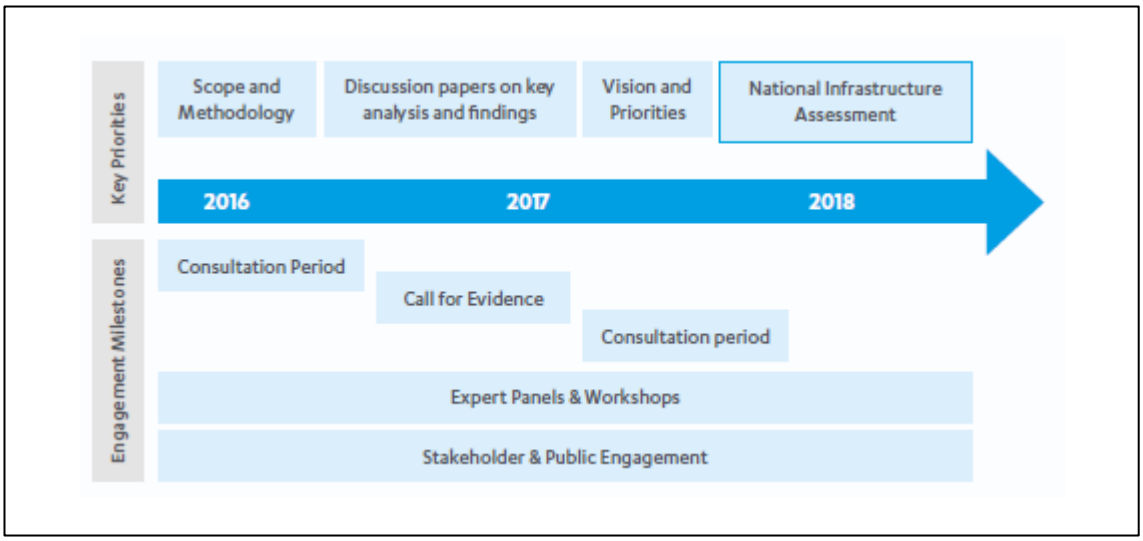

Figure 3-5 Timeline of engagement milestones in the NIA (National Infrastructure Commission, 2016, p.29)

Figure 3-5 shows that the commission's work has been open, transparent and consultative. NIC carried out public consultations to inform the final assessment and recommendations. It also ran a large-scale call for evidence to provide a broad opportunity for stakeholders to input into the NIA process. At key points of the NIA process, NIC consulted expert opinion on specific areas on interest. Social research was also conducted to help understand the views of the public in relation to the UK's infrastructure needs (National Infrastructure Commission, 2016).

The establishment of NIC by the UK government shows that there is an emerging direction of travel consistent with the author's argument that particular attention needs to be given to the process that leads to triggering and capturing new infrastructure needs, problems or opportunities. The commission provides expert, independent advice on pressing infrastructure issues, produces an in-depth assessment of the UK's major infrastructure needs and gives advice on how to meet them (HM Treasury, 2016). However, it is the government who will have the upper hand over what infrastructure projects to be built.

NIC's infrastructure assessment is similar to what government departments do. Before the establishment of NIC infrastructure needs used to be identified by government departments and articulated in what is called National Policy Statements (NPSs), as demonstrated in **section 3.6.2**. The NPSs include the Government's objectives for the development of national infrastructure in a particular sector, and provide the framework

within which the government decides on what infrastructure projects to be built. By contrast, NIC's NIA looks at the UK's future economic infrastructure needs and makes key recommendations for how to deliver new infrastructure projects, and how future infrastructure should be paid for. Although recommendations made by NIC will be based on robust analysis and evidence, and will subject to Parliamentary scrutiny, the government continues to decide and approve what should be built. This suggests that the introduction of NIC changes structure and actors, but not practice of identifying infrastructure needs. Therefore, the potential for NIC to improve the process of identifying and delivering infrastructure needs will be limited, and the research presented in this thesis can be considered as a step for improvement.

This section examined the extent of external stakeholder involvement in the development consent regime, the development of NPSs and in the NIA. The section suggests that there is a lack of overarching approach for identifying infrastructure needs/problems which leads to limited external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects. The next section articulates this problem in more details.

3.7 Problem statement

Discussions in Chapter 2 **section 2.4** indicated that focus on current project management guidelines and bodies of knowledge has dominated project management practice and attention has to be given to the process that leads to triggering and capturing new infrastructure needs/problems (project identification). Therefore, Chapter 2 **section 2.5** considered the pre-design phase in the context of the UK public policy development, and found that the pre-design phase of infrastructure projects often begins during the development of the NPSs. This is because the need for development of infrastructure projects is articulated during the design stage of these policy statements. However, discussions in Chapter 3 **section 3.6** on the development of NPSs and stakeholder interaction and the UK planning process demonstrated a lack of overarching approach for identifying infrastructure needs.

Section 3.6.1 examined the extent of external stakeholder involvement in the UK infrastructure planning regime, and showed that although the developer of any national significant infrastructure project is legally required to consult with affected stakeholders about their proposals, the consultation does not start until the developer has prepared their proposal and notified the Planning Inspectorate that they intend to submit an

application in the future. This suggests that external stakeholders are having limited (if any) input into key aspects of the project defined during the pre-design phase.

Section 3.6.2 examined external stakeholder involvement in the development of NPSs, and showed that the identification of infrastructure needs is carried out with limited (if any) input from external stakeholders outside the core executive. External stakeholder groups are often asked to support the government policy to address infrastructure needs after the responsible government department had drafted its NPS and presented it to the Parliament for approval.

Section 3.6.3 considered the introduction of NIC and the development of the NIA, and found that the establishment of NIC by the UK government shows that there is an emerging direction of travel consistent with the author's argument that there is a need for an overarching approach for identifying infrastructure needs/problems that enables infrastructure developers and stakeholders to identify what infrastructure is needed and define how to meet those needs.

As a consequence, the present research seeks to address the limited external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects in order to facilitate the alignment of the project purpose and external stakeholder expectations. This alignment leads to buy-in from external stakeholders which in turn can maximise project success. The next chapter describes the research design and methods adopted to meet this aim.

3.8 Chapter summary

This chapter began by demonstrating that external stakeholders can have an impact on the project, although they are not in legal contract with the project's supporting organisation. The chapter demonstrated that although the pre-design phase is the first and most important phase of a project life cycle, there is a lack of overarching approach for identifying infrastructure needs/projects. Discussions in this chapter on the UK infrastructure planning process revealed weaknesses in the pre-design phase of civil engineering infrastructure needs. The examination of external stakeholder involvement in the infrastructure planning process showed a limited external stakeholder involvement in the pre-design phase of infrastructure projects, and underlined the need to address this problem.

Chapter 4 Research Design and Methods

Research design means the plan for conducting the study (Creswell, 2013). It is the overall structure and orientation of an investigation which provides a framework within which data are collected and analysed (Bryman, 1995). It is a logical structure of the inquiry (De Vaus, 2001) that links the data to be gathered to the initial research questions (Yin, 2009), and ensures that the evidence obtained enables answering the initial question of the study as clearly as possible (De Vaus, 2001). The purpose of research design is to outline how empirical evidence can be generated to examine research questions (Lee and Lings, 2008). There are several ways of doing research including but are not limited to experiments, surveys, histories and case study (Yin, 2009). Each method has advantages and disadvantages depending on three conditions: the type of research question, the control a researcher has over actual behavioural events and the focus on contemporary as opposed to past phenomena (ibid). This chapter presents the methods that were conducted in order to achieve the research objectives. It also demonstrates the reasons behind the adoption of such methods, and clarifies the procedures of conducting them. The chapter is divided into seven sections as follows:

- Section 4.1, 'The concept of research', defines the concept of research;
- Section 4.2, 'Classifications of research', describes the classification of the research presented in this thesis;
- Section 4.3, 'Research method for research objective 1', describes the research method employed to fulfil the research objective 1 of the present research. It demonstrates the reasons behind the adoption of such a method, and clarifies the procedures of conducting it;
- Section 4.4, 'Research method for research objective 2', describes the research method employed to fulfil the research objective 2 of the present research. It demonstrates the reasons behind the adoption of such a method, and clarifies the procedures of conducting it;
- Section 4.5, 'Research method for research objective 3', describes the research method employed to fulfil the research objective 3 of the present research. It demonstrates the reasons behind the adoption of such a method, and clarifies the procedures of conducting it;
- Section 4.6, 'Ethical considerations and data safeguarding', demonstrates the ethical principles observed in the conduct of the research; and
- Section 4.7, 'Chapter summary', provides a conclusion to this chapter.

4.1 The concept of research

Dane (1990, p.4) simply defines research as “a critical process for asking and attempting to answer questions about the world”, and therefore underlines the research’s fundamental aims which are to formulate questions and to answer them. Kervin (1992) focuses on being systematic and defines research as a systematic process of gathering and analysing information to produce new knowledge and gain understanding. Unlike Dane, Kervin broadens the purpose of the research to include the introduction of new knowledge and understanding. Moreover, Sekaran (2000, p.2) seems to adopt Dane’s approach, and defines research as “the process of finding solutions to a problem after a thorough study and analysis of the situational factors”. However, in contrast to Dane’s definition, Sekaran considers that a problem already exists, and suggests a mechanism to find a solution. Interestingly, all the definitions mentioned in this section appear to be incorporated in one comprehensive definition that research projects analyse existing theories, ideas, and findings of other studies in order to answer a specific question or to contribute new insights to the body of knowledge (Fellows and Liu, 2003). The present research seeks to address the problem of limited external stakeholder involvement in the identification process of civil engineering infrastructure projects, and strives to contribute new insights to the body of knowledge by providing a new approach for identifying infrastructure needs/projects.

4.2 Classifications of research

According to Kervin (1992, p.9), “All research can be placed on a continuum representing the general objectives and intended audience of the work. At one end is *basic* research, at the other is *applied*”. Basic research (which is also known as pure research) is carried out to generate knowledge, to contribute to what already exists. It develops scientific knowledge and questions whether it is true (Fellows and Liu, 2003). Basic research is undertaken without any expectation that its outcomes should be immediately useful, but contribute to general laws and theories (Kervin, 1992). Applied research, on the other hand, contributes to immediate decisions and actions by providing knowledge about a certain problem, and its results are expected to be relevant and useful (Kervin, 1992). Applied research is undertaken to resolve a particular problem currently being encountered (Sekaran, 2000), and uses scientific knowledge and so questions whether it works (Fellows and Liu, 2003). The research presented in this thesis is applied research as it is undertaken to address a particular problem - the limited external

stakeholder involvement in the identification process of civil engineering infrastructure projects.

In addition to the classification of basic and applied research, all research can also be broadly classified into quantitative and qualitative research - concerning the research methods adopted (Fellows and Liu, 2003). Qualitative research undertakes an exploration of a subject without any preconceptions to gain understanding and gather information and data so that theories can be built (Fellows and Liu, 2008). It involves addressing research problems and analysis of data in an inductive reasoning in order to establish patterns or themes (Creswell, 2014). By contrast, quantitative research adopts scientific method in which preliminary study of theory produces hypotheses to be tested (Fellows and Liu, 2008). It is built upon previous work which has developed principles, laws and theories (ibid). For the present research, since the research objectives involve examining the extent of external stakeholder involvement in the identification process of civil engineering infrastructure projects to advise on how the limited external stakeholder involvement can be addressed, quantitative research approaches will be required. Quantitative approach will be used in this research to test ideas and recommend an effective means to address the limited external stakeholder involvement in the identification process of civil engineering infrastructure projects.

4.3 Research method for research objective 1

This section describes the research method employed to fulfil research Objective 1 of the present research. Since the objective is *to examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects*, a case study approach was selected as a research strategy. According to Yin (2014, p.2) a case study:

> *investigates a contemporary phenomenon (the "case") in its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident.*

A case study is a detailed analysis of a single case (Lee and Lings, 2008). It is the study of the particularity and complexity of a single case (Stake, 1995). A case can be an individual; a group; an institution or a community. All these are single cases but can also be considered multiple cases when studying a number of single cases (Gillham, 2000). The case study is a research strategy that focuses on understanding the dynamics present within single settings (Eisenhardt, 1989). For example, Fellows and Liu (2003) states that the case in a case study is the occurrence of the research problem, such as a legal case hearing or the procurement of a construction project.

Critics often question the ability to generalise from case study findings. For many researchers the reliance on a single case poses a problem of how far it is possible to generalise the findings of such research. However, Bryman (1988) suggests a number of solutions to address this problem one of which is the study of more than one case (see Bryman, 1988, pp.87-91). Bryman also underlines the misunderstanding arose from the tendency to approach a case study as if it was a sample drawn from a wider population of such cases. Lee and Lings (2008) agrees with Bryman and states that for many case studies the aim is not to generalise to other settings, but to deeply understand a single setting. Case studies encourage an in-depth investigation of particular phenomenon within the research subject (Fellows and Liu, 2008). This in-depth understanding is aided by the ability of case study to benefit from combination of a variety of data collection methods, such as archival data, interviews, questionnaires, observations, etc. (ibid).

Furthermore, case study method has been commonly used in construction management research. For instance, Aaltonen et al. (2008) carried out a case study research to identify the different strategies project stakeholders use to increase their salience in global projects. Olander and Landin (2005) conducted a case study research into how the problem of managing stakeholders presents itself in two Swedish construction projects. Therefore, case study can be used in the present research to examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects due to the following strengths:

- A case study can yield deep results about the phenomenon studied (Fellows and Liu, 2008).
- Case study evidence may be qualitative (text), quantitative (numbers) or both (Eisenhardt, 1989).
- A case study allows investigators to focus on a case and retain a holistic and real-world perspective (Yin, 2014).
- The case study's unique strength to deal with a full variety of evidence (Yin, 2014; Eisenhardt, 1989).
- A case study inquiry benefits from the prior development of theoretical propositions to guide data collection and analysis (Yin, 2014).

As a result of these strengths, the author chose to examine and provide detailed analysis of external stakeholder involvement in the pre-design phase of two case projects:

- Edinburgh Tram Network (ETN), Edinburgh, UK, and
- Crossrail 1 (Elizabeth line) project, London, UK.

Two cases were selected because according to Yin (2009) it enables the exploration of differences within and between cases. It is also considered more robust than single-case studies, because the evidence from more than one case is often compelling (Herriott and Firestone, 1983). Justification for the author's choice of these two cases is provided in **section 4.3.1.2**, while the following section describes the case study design.

4.3.1 Case study design

Scholars have proposed various case study research designs (Yin, 2014; Creswell, 2013; Yin, 2009; Fellows and Liu, 2008; Fellows and Liu, 2003; Stake, 1995). These studies show how case study research can be conducted successfully. Therefore, the development of the case study research design for the present research was guided by these scholars, and the following steps were adopted:

1. Determine the research problem(s);
2. Decide on the number of cases;
3. Choose data gathering techniques;
4. Prepare to collect data; and
5. Collect and analyse the data.

4.3.1.1 Determine the research problem(s)

It is considered that the initial task in doing a case study research is to precisely clarify the nature of the research questions (Yin, 2014). A well-defined focus is important because without a research focus, it is easy to become overwhelmed by the volume of data (Eisenhardt, 1989). The research presented in this thesis seeks to improve the identification process of civil engineering infrastructure projects in order to facilitate the alignment of project purpose and external stakeholder expectations. Thus, it was essential to examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects.

4.3.1.2 Decide on the number of cases/selection of cases

Cases studied in this research were not studied to understand other cases. The obligation was to understand the cases studied only. Case study research is not sampling research because a sample of one or a sample of just few cases is unlikely to be a strong representation of others (Stake, 1995). Case studies are generalizable to theoretical propositions and not to populations or universes (Yin, 2014). However, the author argues that an appropriate population from which cases can be selected remains important even if generalising findings is not. The concept of a population is considered crucial in hypothesis-testing research, because it defines the set of entities from which

sample is to be drown. However, when building theory from case studies random selection is neither necessary nor desirable (Eisenhardt, 1989).

The author acknowledges that there are two schools of thoughts that guide the selection of cases in case study research. These are probability sampling and theoretical sampling. However, previous work on case study research Yin (2014), Yin (2009) and Eisenhardt (1989) has argued in favour of theoretical sampling in which cases are selected to fill theoretical categories, replicate previous cases, extend emerging theory or provide examples of polar types. Their argument is that case studies are not generalizable to populations and universes. In addition, Flyvbjerg (2006) argues that a representative case or a random sample may not be the most appropriate strategy when the objective is to obtain the greatest possible amount of information on a given problem or phenomenon.

Furthermore, cases selection is often guided by the purpose of the study itself. Scholars (see, for example, Yin, 2014; Yin, 2009; Flyvbjerg, 2006; Eisenhardt, 1989) argue that the purpose of the study/investigation decides the strategy of selecting cases. The present research therefore aligns with the argument for theoretical sampling to fulfil research Objective 1. This is to ensure that cases are selected to answer the research question, especially in terms of examining the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects.

However, due to time constraints it would be unachievable to focus on all projects from all infrastructure sectors (Communication, energy, flood, intellectual capital, transport, waste, and water). Therefore, the present study used the UK's infrastructure investment pipeline 2012 (HM Treasury, 2012) as a sample frame, as it contains a list of current and future UK infrastructure projects from all infrastructure sectors. For effectiveness and efficiency reasons, a research sample frame drawn contains transport and energy infrastructure projects that were already initiated or were under construction. These two sectors were chosen because they comprised most of the UK government's infrastructure investment in 2013 (over £215 billion in energy and over £120 billion in transport) (HM Treasury, 2013, p.25).

The sample frame comprised eighty projects from transport and energy sectors (**Appendix A**). Invitations were then sent to all the client organisations of the eighty projects inviting them to nominate one or two individuals involved in the project to take part in the research through an interview (see **Appendix B** on invitation template to the project's client organisation). Based on the acceptance of the client organisation, the cases (projects) were selected. Although the client organisations of the eighty projects

were invited, only one organisation accepted the invitation and nominated two project management team members to take part in the research project. It was Cross London Rail Links (CLRL) Ltd. Thus, Crossrail 1 (Elizabeth line) project was selected. Because this simple random sampling procedure yielded only one case, another sampling procedure (convenience sampling) was conducted to select more cases. Edinburgh Tram Network (ETN) project was selected using this type of non-probability sampling method because of data availability and willingness of participants from the tram project to take part in the research project.

4.3.1.3 Choose data gathering techniques

A key strength of case study is its ability to use a wide variety of data collection techniques. These techniques include but being not limited to:

- interviews (Fellows and Liu, 2008; Gillham, 2000; Eisenhardt, 1989);
- documents, such as letters, policy statements, regulations or guidelines (Gillham, 2000);
- archival records (Fellows and Liu, 2008; Gillham, 2000; Eisenhardt, 1989);
- questionnaires (Fellows and Liu, 2008; Eisenhardt, 1989);
- observation (Fellows and Liu, 2008; Gillham, 2000; Eisenhardt, 1989);
- reports (Fellows and Liu, 2008); and
- physical artefacts (Gillham, 2000).

In addition, the evidence may be qualitative (text), quantitative (numbers) or a combination of both qualitative and quantitative (Eisenhardt, 1989). According to Yin (2009) the use of multiple sources of data, a case study database and a chain of evidence substantially increase the quality of a case study research. In order to ensure sufficient evidence is captured, the present study used semi-structured face-to-face interviews and publicly available documents as the main sources of evidence. The empirical data consist of publicly available information on the two projects and information obtained through face-to-face interviews with project management team members who were directly involved in interacting with stakeholders in the early stages of the two case study projects. The specific details concerning the data sources for both cases are presented in **Table 4-1**.

Table 4-1 Case data sources

Sources of evidence	***Edinburgh Tram project***	***Crossrail project***
Face-to-face interviews	Two project management team members from within ETN project were interviewed	Two project management team members from within Crossrail project were interviewed
Periodical and newspapers	Electronic articles about Edinburgh Tram project published in the leading British periodical and newspapers between the years 1990 and 2015. Periodical and newspapers include: • The Times, • The Guardian, • The Express, • The Daily Mail, • The Daily Record, • The Herald and • The Evening News (Edinburgh)	Electronic articles about Crossrail project published in the leading British periodical and newspapers between the years 1990 and 2015. Periodical and newspapers include: • The Times, • The Guardian, • The Independent, • The Observer and • The Evening Standard
Internet sites	Public information about the tram project and its stakeholders from various internet sites include: • Transport for Edinburgh (www.transportforedinburgh.com), • City of Edinburgh Council (www.edinburgh.gov.uk), • Audit Scotland (www.audit-scotland.gov.uk), • Scottish Parliament (www.parliament.scot), • Transport Scotland (www.transport.gov.scot) and • The Scottish Government (www.gov.scot).	Public information about the tram project and its stakeholders from various internet sites include: • Crossrail (www.crossrail.co.uk), • Greater London Authority (www.london.gov.uk), • Transport for London (www.tfl.gov.uk), • the Department for Transport (www.dft.gov.uk), • the UK Parliament (www.parliament.uk) and • UK Government (www.gov.uk).
Broadcasted TV documents and news	Broadcasted TV documents and news broadcasts (BBC).	Broadcasted TV documents and news broadcasts (BBC).
Historical Hansard	The Scottish Parliament's Official Report 2002 – 2015. The Official Report is the reliable written record of what is said in public meetings of the Scottish Parliament and its committees.	Historic Hansard 1970 – 2015. Hansard is a substantially verbatim report of what is said in Parliament.

Sources of evidence	***Edinburgh Tram project***	***Crossrail project***
Parliamentary documents	-	Research briefings produced by the House of Commons Library, the House of Lords Library about Crossrail project.
Bills and Legislation	Bills and Legislation include: (Edinburgh Tram (Line One) Bill: As Passed, 2006; Edinburgh Tram (Line Two) Bill: As Passed, 2006; Edinburgh Tram (Line One) Bill: As Introduced, 2004; Edinburgh Tram (Line Two) Bill: As Introduced, 2004).	Bills and Legislation: (Crossrail Bill, 2005; Crossrail Bill, 1991).
Acts of Parliament	Acts of Parliament: (Edinburgh Tram (Line One) Act, 2006; Edinburgh Tram (Line Two) Act, 2006; Transport (Scotland) Act, 2005; Scotland Act, 1998; Local Government etc. (Scotland) Act, 1994).	Acts of Parliament: (Crossrail Act, 2008; Railways Act, 2005; Greater London Authority Act, 1999; Greater London Authority (Referendum) Act, 1998; Railways Act, 1993).
Transport strategies	Edinburgh's local transport strategy 2000.	Mayor of London's Transport Strategy 2001.
Official reports	Reports about the tram project produced by the Audit Scotland Office.	Reports about Crossrail project produced by the UK's National Audit Office.
Transportation studies	-	Transportation studies include: Greater London Plan 1944 (the Abercrombie Plan), London Transportation Study 1969, London Rail Study 1974, A Cross-London Rail Link 1980, Central London Rail Study 1989 and London East-West Study 2000.
Project documents	Project documents include: the project's business case, environmental statement report and progress reports.	Project documents include: the project's business case, environmental statement report, consultation documents and progress reports.

4.3.1.4 Prepare to collect data

Adequate preparations for data collection were made by the author before collecting the case study data. This was necessary in order to ensure that the author does not become overwhelmed by the large volume of data generated from multiple sources, and in order not to lose concentration on the original research question and purpose. The author followed advice and recommendations on data collection process made by well-known scholars in the field of management and social research, such as Yin (2009), Miles and Huberman (1994) and Creswell (2013).

As a preparation, the author conducted extensive review of literature to gain sufficient knowledge and acquire the necessary skills on how publicly available documents are secured and information extracted (Bryman and Bell, 2003; Scott, 1990), and on how interviews are designed and conducted (Lee and Lings, 2008; Sekaran, 2000; Dane, 1990). The data collection preparation included:

- development of a case study protocol;
- production of participant information sheets;
- design of interview log and document log; and
- data codification.

Each of these preparatory procedures is discussed in more detail below.

4.3.1.4.1 Case study protocol

In order to increase reliability of research, a case study protocol for the present research was designed. This was also important because two case studies were conducted. The case study protocol (**Table 4-2**) guided the author in carrying out the data collection from the two cases. It contained procedures, instruments and general rules for the researcher to follow in conducting the case study.

Table 4-2 Outline of case study protocol

Protocol items	***Content***
Objective	To examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects.
Cases	• Edinburgh Tram Network (ETN) project, Edinburgh, UK. • Crossrail 1 (Elizabeth line) project, London, UK.
Data collection procedures (interviews)	• Identify the contact details of the client organisation of the project. • Send the client organisation invitation to take part in the research project, and request them to nominate two to three individuals who have direct experience of stakeholder engagement at the pre-design phase of projects. • Send the nominated participants invitations to take part in the research together with the participant information sheet. • Make arrangements with participants about when and where the interviews are to be held. • Conduct the interviews. • Transcribe the interviews. • Analyse the data.
Other sources of evidence	Periodical and newspapers, internet sites, broadcasted TV documents and news, parliamentary documents, Bills and Legislation, Acts of Parliament, transport strategies, official reports, transportation studies and project documents.
Case study questions	
External stakeholder involvement practice	Who are the project's external stakeholder groups? When did external stakeholders involve in the project? To what extent were external stakeholders involved in the project?
Project identification practice	When was the need for the project identified? What did trigger the need for the project? What was done before a feasibility study was undertaken?
Problem identification practice	What are the problems to be addressed by the project? Who did define the problems? To what extent were external stakeholders involved in defining the problems?

4.3.1.4.2 Participant information sheet

As mentioned earlier in **section 4.3.1.3**, face-to-face interviews were chosen as data collection techniques in addition to the documentary sources. Thus, it was important to give the research interviewees enough information about the research in order for them to make an informed decision about whether they want to take part. Hence, the interviewees were sent a participant information sheets (**Appendix C.1**), the interview questions (**Appendix C.2**), the interview show cards (**Appendix C.3**) and a consent form (**Appendix C.4**). All these documents were sent out to interviewees prior to the interviews. The participant information sheet, in particular, covered the following topics:

- purpose of the research
- what is involved in participating
- benefits and risks
- terms for withdrawal
- usage of the data (e.g. during research, dissemination, storage, archiving, sharing and re-use of data)
- strategies for assuring ethical use of the data
- procedures for maintaining confidentiality
- anonymising data
- details of the research (e.g. sponsoring institution, level of study, project title, contact details for researcher and the research's supervisors)

The information sheet was produced on headed paper with the University of Leeds logo, and was approved by the MaPS and Engineering joint Faculty Research Ethics Committee (MEEC FREC) University of Leeds (reference number of approval is MEEC 14-002), see **Appendix D**.

4.3.1.4.3 Interview log and document log

The present study used face-to-face interviews and publicly available documents as the main sources of evidence. In order to easily manage the large volume of data obtained from these sources especially when it comes to tracing a document/interview transcript from a large volume of information, it was necessary to develop a tracking mechanism to assist in documentation of data sources and data analysis. For interviews, an interview log was designed in order to help in documentation and data analysis without disclosing the identities of the research participants who provide the information. For instance, the reference Int-ETN-281014-FW1 refers to the interview held with a participant from ETN project on 28 October 2014 during Fieldwork 1. For the documentary sources, by contrast, the author used the University of Leeds version of Harvard referencing style.

4.3.1.4.4 Data codification

Codes are efficient data-labelling and data-retrieval devices. According to Miles and Huberman (1994), producing a start list of codes prior to data collection is helpful, and forces the research to tie research questions directly to the data. Therefore, in the present research a codebook was developed in order to manage and make sense of the large volume of unstructured data collected from the interviews and the documentary sources. It should be noted that pre-defined constructs (themes) were used in the development of the codebook. Because data analysis process was supported by the use of a qualitative data analysis computer software package called QSR NVivo 11, these constructs are referred to as nodes in the context of QSR NVivo 11. **Table 4-3** illustrates the codebook used in the present research.

Table 4-3 Codebook

Name	***Description***
Objectives	The project objectives
Participants	Individuals and organisations that are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or project completion; they may also exert influence over the project and its results.
Problems	Any problem that is meant to be addressed by the project
key events in the development of the project	All the events and key milestones that are related to identifying the projects and to its development.
Events relating to external stakeholders	All the events that are related to external stakeholder groups and their management during the pre-design phase of the two empirical case studies. This includes but not being limited to stakeholder consultation, public consultation, stakeholder communication, discussions, disputes and conflicts between the project management teams and the projects external stakeholder groups.

The pre-defined themes were informed by the case study questions (outlined the case study protocol in **section 4.3.1.4.1**). After transcribing the interviews and importing the documentary sources (e-documents) to NVivo 11, the codebook was used during the initial coding process. This involved close reading of text segments from the sources of evidence, making judgements about which text segments pertain to which constructs (themes) and then coding the various text segments to those constructs.

4.3.1.5 Collect and analyse case study data

Case study data were collected from multiple sources of evidence. Empirical data were collected from face-to-face interviews with project management team members (who were directly involved in the two case study projects) and from publicly available documents that outlined in **section 4.3.1.3**. The purpose was to supplement the data obtained from the interviewees, and to ensure that case study findings are more convincing and accurate (Yin, 2009). Data collection process involved a rapid but purposeful reading of each document. Each document was carefully selected and used. Validity of a document was tested before making any use of it by identifying its relevance, credibility, purpose and audience (this is discussed in greater detail in **section 4.3.2.2** on authenticity and credibility of the documentary sources).

Data analysis process was then supported by the use of a qualitative data analysis computer software package called QSR NVivo 11. It was also guided by the case study protocol developed in **section 4.3.1.4.1**.

4.3.2 Case study data accuracy and reliability

According to Scott (1990), the quality of the evidence available for analysis is the foundation of scientific research. Therefore, it was crucial to assess the quality of the sources of evidence used in the present research in order to ensure the accuracy and reliability of data obtained from the sources. This helped ensure that the findings and conclusions drawn from the present scientific research are built on a sound foundation.

In the research presented in this thesis, the empirical case study data were obtained from face-to-face semi-structured interviews with project management team members who have the experience of interacting with stakeholders at the pre-design phase of the case studies projects, and also from a very wide range of different documentary sources. This section, therefore, considers the quality of these sources of evidence in order to demonstrate the accuracy and reliability of the empirical data obtained. The section, first, describes the research participants' information and data accuracy, and then presents the criteria used for assessing the quality of documents used in the present research.

4.3.2.1 Research participants' information and data accuracy

Face-to-face semi-structured interviews with project management team members (who have been directly involved in interacting with stakeholders at the pre-design phase of the case study projects) were conducted. Two project management team members from each case were interviewed. The plan was to interview each participant individually, however, due to change in the interviewees' availabilities, group interviews were

conducted in which every two interviewees from the same case were interviewed at the same time.

The interviews were conducted during Phase 1 of the present research which sought to examine the extent of external stakeholder involvement in the identification process of the case study projects. The purpose of the interviews was to obtain a correct picture of the implementation of external stakeholder identification and involvement during the identification phase of the two cases from those who have been directly involved in such processes.

Once interviewees had been identified, they were sent email invitations to take part in the research project through an interview. The author formally invited (via email) the interviewees to take part in the research project. The interviewees were sent a participant information sheet for Fieldwork 1 (**Appendix C.1**) to inform them about the research and what does it involve. They were asked to read the information sheet and then decide whether to take part or not. In addition to the participant information sheet, the interviewees were able to obtain a copy of the interview questions (**Appendix C.2**) prior to the interview in order to help them decide whether they are the ideal person for the interview purpose.

All interviewees were given sufficient time to decide if they wish to participate. Once the participants have accepted to take part and confirmed their interest in participating, arrangements for the interview date, time and venue were made with them directly. **Table 4-4** illustrates the profile of the interviewees.

Table 4-4 The profile of the interviews from Fieldwork 1

	Interviewee 1	*Interviewee 2*	*Interviewee 3*	*Interviewee 4*
Cases	ETN project		Crossrail project	
Interview label	Int-ETN-281014-FW1		Int-CLRL-121214-FW1	
Interview duration	85 minutes		90 minutes	
Interview date	28 October 2014		12 December 2014	
Interview location	Edinburgh, UK		London, UK	
Interviewer	Mohamed H. Elmahroug		Mohamed H. Elmahroug	
Interviewee's experience in construction	22 years	7 years	18 years	12 years
Years on the project	10 years	-	15 years	12 years

During the interviews, interviewees were asked to answer the interview questions based on their experience of interacting with stakeholders at the pre-design phase of the civil engineering infrastructure projects they were involved in (ETN project or Crossrail project). Because all the participants were actually involved in the two cases, this enabled the accuracy/reliability of the data obtained from them to be assured. Moreover, because every two interviewees were interviewed by the author at the same time, they were able to answer the interview questions together which ensured the accuracy of the answers given to each question.

Furthermore, the semi-structured interviews allowed for in-depth insight into the implementation of external stakeholder identification and involvement processes during the identification phase of the case study projects, and also presented opportunities for secondary questions. The interviews were digitally recorded subject to the participants consent (**Appendix C.4**) and then transcribed and analysed using NVivo 11 software.

4.3.2.2 Authenticity and credibility of the documentary sources

A very wide range of different documentary sources have been used in the present research as illustrated in **Table 4-5**. Publicly available documents that contained information about the two cases were also used as a source of evidence for the research presented in this thesis.

Table 4-5 Types of documents considered in the research

Kinds of documents	***Examples***
Public documents	• Parliamentary documents, • Bills and Legislation, • Acts of Parliament, • Transport strategies, • Official reports, and • Transportation studies
Organisational documents	• Project progress reports, • Consultancy reports, • Minutes of meetings, • Company newsletters, and • Project documents.
Mass media outputs	• Periodical, • Newspapers, and • Broadcasted TV documents and news.
Virtual outputs	• Official internet sites.

Because the foundation of scientific research is the quality of the evidence available for analysis (Scott, 1990) and, therefore the validity and reliability of the data constructed from the evidence, it was imperative to assess the quality of the documents before making any use of them. Therefore, the author used a set of criteria for assessing the quality of documents used in the present research. The author used four criteria that recommended by Scott (1990). These are:

1. Authenticity: soundness and authorship. Is the evidence genuine and of unquestionable origin?
2. Credibility: sincerity and accuracy. Is the evidence free from error and distortion?
3. Representativeness: survival and availability. Is the evidence typical of its kind, and, if not is the extent of its untypicality known?
4. Meaning: literal and interpretative understanding. Is the evidence clear and comprehensible?

It was the criteria above against which the documents used in the present research were assessed. In addition, the author acknowledges that documents are written for some specific purposes and some specific audience (Yin, 2014), and have not been produced at the request of the present research (Bryman and Bell, 2003). The author also understands that the documentary evidence reflects a communication among other stakeholders attempting to fulfil some other objectives. Therefore, advice from (Yin, 2009) regarding identifying these objectives was followed when reviewing the documents. A rapid but purposeful reading of each document was carried out, and each document was carefully selected and used. This ensured that the author was less likely to be misled by documentary evidence and more likely to be correctly critical in interpreting the content of such evidence.

This section demonstrated the accuracy and reliability of the obtained empirical data through describing the quality control criteria used by the author to assess the sources of evidence for the present research. The next section, on the other hand, describes the case study tactics used by the researcher to increase the research's construct validity, internal validity, external validity and reliability.

4.3.3 Reliability and validity of the case study research

Reliability and validity are important criteria in establishing and assessing the quality of any empirical research (Bryman and Bell, 2003). According to Yin (2009) there are four tests according to which the quality of any given research design can be judged. These tests are

- Construct validity: identify correct operational measure for the concepts being studied;
- Internal validity: seeking to establish a causal relationship, whereby certain conditions are believed to lead to other conditions;
- External validity: defining the domain to which a study's findings can be generalised; and
- Reliability: demonstrating that the operations of a study can be repeated with the same results.

The case studies were conducted to examine the extent of external stakeholder involvement in the identification process of civil engineering infrastructure projects (Objective 1). The intention was to obtain a correct picture of how external stakeholder groups are identified and involved during the identification phase of civil engineering infrastructure projects. Because case studies are one form of empirical research, the author employed several tactics for dealing with construct validity, internal validity, external validity and reliability when undertaking the present research. Each of these tactics is considered in turn.

4.3.3.1 Case study tactics to increase construct validity

Construct validity refers to establishing correct operational measures for the concepts, ideas and relationships being studied. Scholars recommended a number of tactics to increase construct validity when undertaking case studies research (Yin, 2009; Gibbert et al., 2008; Bryman and Bell, 2003; De Vaus, 2001; Remenyi et al., 1998). The present research was guided by these scholars, and the following tactics were used:

- Use multiple sources of evidence.
- Maintain a chain of evidence.

4.3.3.2 Case study tactics to increase internal validity

Internal validity is the extent to which the research design enables unambiguous conclusions to be drown from the research results (De Vaus, 2001). Scholars recommended a number of tactics to enhance internal validity when undertaking empirical research (Yin, 2009; Gibbert et al., 2008; Bryman and Bell, 2003; De Vaus, 2001). The author of the present research was guided by the seminal work of these authors, and the following tactics were used:

- Use of triangulation as well as comparing cases.
- Develop a case study protocol.
- Use of pattern matching.

4.3.3.3 Case study tactics to increase external validity

External validity, as stated above, refers to the degree to which findings can be generalised beyond the immediate case. Critics typically argue that single cases offer a poor basis for generalising. However, this is incorrect when dealing with case studies, because case studies rely on theoretical generalisation rather than on statistical generalisation (Yin, 2014; Yin, 2009; Eisenhardt and Graebner, 2007; Remenyi et al., 1998; Bryman, 1988). Theatrical generalisation involves generalising from a study to a theory. Instead of questioning what a study informs us about the wider population, we ask what does this study informs us about a specific theoretical proposition (De Vaus, 2001).

Scholars recommended a number of tactics for dealing with external validity when undertaking empirical research (Yin, 2009; Gibbert et al., 2008; Bryman and Bell, 2003; De Vaus, 2001). The author of the present research was guided by the seminal work of these authors, and the following tactics were used:

- Conduct multiple case studies.
- Develop a case study protocol.
- Select cases strategically.

4.3.3.4 Case study tactics to increase reliability

Reliability test seeks to ensure that if a later case study investigator followed the same procedures as described by an earlier investigator and conducted the same case study all over again (not replicating the results of one study by doing another case study), the later investigator should arrive at the same findings and conclusions (Yin, 2009). Scholars recommended a number of tactics for dealing with reliability when undertaking empirical research (Yin, 2009; Bryman and Bell, 2003; De Vaus, 2001). The author of the present research was guided by these scholars, and the following tactics were used:

- Develop a case study protocol.
- Create a case study database.

To summarise, this **section 4.3** described the chosen research method to fulfil Objective 1 of the present research. The implementation of this method should show the nature of the required improvement to the identification process of civil engineering infrastructure projects. The outcome of implementing this method is presented in Chapters 5 and 6. The next section, on the other hand, describes the method used to fulfil Objective 2 and bring about the improvement required.

4.4 Research method for research objective 2

The implementation of the research method described in the previous section should show the nature of improvement required. This section, by contrast, describes the method implemented to bring about the required improvement. The section describes the method employed to fulfil Objective 2 of the present research. Since the objective is *to develop a means for enabling effective external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects*, a desk study was undertaken.

The desk study involved a review of two problem solving process models, and a comparison of the steps in these models with the project phases in a generic civil engineering infrastructure project life cycle (described in Chapter 2 **section 2.4**). The purpose was to show that if civil engineering infrastructure projects are viewed as solutions to problems, the project life cycle can be mapped onto a problem solving process. Ideas in these models were then adapted and incorporated into the project identification process. This is built on discussions in Chapter 2 **section 2.2** which suggested that identifying what social/economic problems exist within a community would help identify the right civil engineering infrastructure project to tackle these problems. The outcome of this comparison was then integrated with the generic external stakeholder management process derived in Chapter 3 **section 3.5.2**.

This section described the chosen method to fulfil Objective 2 of the present research. The implementation of this method resulted in a proposal for bringing about the required improvement to the identification process of civil engineering infrastructure projects based on recommendations from Objective 1. The outcome of implementing the method described in this section is presented and described in greater detail in Chapter 7. The next section, on the other hand, describes the method used to evaluate the proposal.

4.5 Research method for research objective 3

The implementation of the research method described in the previous section resulted in a proposed means for bringing about the required improvement to the identification process of civil engineering infrastructure projects. This section, by contrast, describes the research method implemented *to evaluate the developed means for improvement* (Objective 3). Evaluation often involves verification and validation. It is worth noting that verification has to do with building the process right, while validation has to do with building the right process (Cesta et al., 2010). Verification and validation are used for confirming that a product, service, or system meets its respective specifications and

fulfils its intended purpose (Maropoulos and Ceglarek, 2010). The following two subsections demonstrate how the proposed means for improvement was verified and validated.

4.5.1 Verification of the proposed means for improvement

Verification is a quality control process that is used to evaluate whether or not a product, service, or system complies with its respective regulations, specifications, or conditions. (Maropoulos and Ceglarek, 2010). The main goals of verification are to ensure the consistency and completeness of the proposed means for improvement (Botten et al., 1989). In this thesis, therefore, verification seeks to ensure that the proposed means for improvement had been developed correctly by assessing its consistency and completeness. A process is complete to the extent that all of its elements are present, while a process is consistent to the extent that its provisions do not conflict with each other or with governing specifications (Boehm, 1984). The verification of the proposed means for improvement is discussed in detail in Chapter 8 **section 8.1**.

4.5.2 Validation of the proposed means for improvement

Validation is a quality assurance process of establishing evidence that provides a high degree of assurance that a product, service, or system accomplishes its intended use requirements (Maropoulos and Ceglarek, 2010). In order to validate the proposed means for improvement, an interview survey with project managers and stakeholder managers who have the experience of interacting with stakeholders at the pre-design phase of infrastructure projects were conducted.

Interviews are a series of questions posed by an interviewer (the researcher in the present research) to obtain response data (Kervin, 1992). Interviews could be conducted either face-to-face or by telephone (Dane, 1990), and can also be unstructured or structured interviews (Sekaran, 2000). Structured interview poses a high degree of structure on the interview, and may comprise of cards given to the interviewees. In this mode, the interviewer provides instructions, records responses, and answers occasional questions raised by the participant (Dane, 1990). The aim of this form of interviews is to obtain information needed about issues that had already been considered relevant to the research problem (Sekaran, 2000). Unstructured interview, on the other hand, encourages the participant to discuss a topic without imposing a rigid detailed set of questions (Dane, 1990). It causes some preliminary factors to surface without the use of a planned set of questions (Sekaran, 2000). Semi-structured interviews were chosen and conducted to validate the proposed means for improvement, because they combine

a pre-determined set of questions with the opportunity for the interviewer to explore particular themes or responses further during the interview.

This section demonstrates the plan for collecting data needed to validate the proposed means for improvement. This involves decisions made by the author to address three elements of research design. These are basic design, specific design and sample design. Each element of these is discussed in detail in the following sub-sections.

4.5.2.1 Basic design

The basic design impacts the ability to investigate relationships. There are three basic designs to choose from (Kervin, 1992):

- true-experimental
- quasi-experiential
- non-experimental

Taking into account the nature of objective 3, which is to evaluate (validate) the developed means for improvement, the basic design chosen was non-experimental design because there were neither manipulated independent variables nor random assignment of cases to groups.

4.5.2.2 Specific design

Specific research design refers to the specific design for a study and takes into account the constraints that the researcher may encounter. Specific designs differ in three ways namely the number of groups; the nature of groups; and the time point (ibid). Because a non-experimental basic design was chosen, there was one group of cases (interviewees), and the time points at which cases are measured was a single measurement point as changes with time were unimportant. Data was collected from each interviewee at one time point.

4.5.2.3 Sample design

A sample is part of a population that provides a representation of the entire population and used to estimate its characteristics. A population is the entire set of cases to which the research conclusions will apply. There are two types of sample: probability and non-probability samples. A probability sample is characterised by random selection; therefore, the probability of choosing each case is known and non-zero, whereas a non-probability sample is characterised by selection procedures in which the probability of choosing a particular case is not known and may be zero (Kervin, 1992).

When fulfilling Objective 3, the probability of choosing a particular interviewee was not known. Therefore, the sample used was a non-probability sample. When drawing the sample, the author used LinkedIn to identify potential interviewees and invite them to take part in the validation process of the means for improvement. The author also invited external stakeholders from the two case studies studied in the present research to assess the means for improvement. The criterion used by the author was that any individual with the experience of interacting with external stakeholders at the pre-design phase of civil engineering infrastructure projects was eligible to participate the validation process.

In addition to using LinkedIn and the identified external stakeholder groups from the two case studies, the author used a snowball sampling technique in which the author asked participants to suggest others who have the same characteristics. These respondents, in turn, suggest others.

Email invitations were sent to the participants inviting them to take part in the research project. The participants were asked to answer based on their experience of interacting with external stakeholders at the pre-design phase of civil engineering infrastructure projects, and requested to evaluate the proposed two-stage project identification process through an interview. It was important to inform the participants about why the research has been undertaken, and about what the validation exercise will involve before they decide. As a result, a participant information sheet (**Appendix E.1**), the interview questions (**Appendix E.2**), show cards describing the proposal for improvement (**Appendix E.3**) and a participant consent form (**Appendix C.4**) were all together sent to the participants with the invitation email.

Once a participant had accepted to participate, arrangements with them about the interview time, date and venue were made. Participants were interviewed at times that were most convenient to them. Some interviews were conducted face-to-face at the interviewees' work places, while other were conducted over the phone.

During the interview, the author described the proposed means for improvement to the participants. The author went through the elements of the proposal, and explained them in great detail. The participants, then had the chance to ask questions and seek clarifications about the proposal. Once the participants' questions and clarifications have been addressed by the author, the validation of the proposal started.

The purpose of the validation process is to assess the extent to which the proposal improves the project identification process of civil engineering infrastructure projects through the means of effective external stakeholder involvement.

During the validation process (interviews), the participants were asked to indicate their perceptions on two elements as follows:

1. Perceptions on the usefulness of the proposal
2. Perceptions of hindrance to applying the proposal

The purpose of seeking comments on these two elements was to determine the proposal's appropriateness to address the issues identified from the empirical studies in Chapters 5 and 6. This was achieved by asking the research participants about what they found most useful about the proposal and what could be a hindrance to applying the proposal. In addition, five variables for assessing the proposal were included in the validation process. These are:

1. perceptions of the effectiveness of the proposal to improve external stakeholder identification practice;
2. perceptions of the effectiveness of the proposal to improve external stakeholder involvement practice;
3. perceptions of the effectiveness of the proposal to address the limited external stakeholder involvement;
4. perceptions of cost-effectiveness of the proposal; and
5. perceptions on the applicability of the proposal.

The first three variables sought to validate the proposal's effectiveness to improve external stakeholder identification practice, external stakeholder involvement practice and address the limited external stakeholder involvement respectively. Responses to each of these variables were recorded based on a Likert scale of: 0 = not at all, 1 = to an extremely small extent, 2 = to a very small extent, 3 = to a small extent, 4 = to a moderate extent, 5 = to a large extent, 6 = to a very large extent, 7 = to an extremely large extent. The last two variables, by contrast, sought to validate that the proposal is practical for application. This was achieved by asking the participants to rate the cost-effectiveness of the proposal and the potential for the proposal to fit within existing formal and informal procedure of identifying infrastructure projects based on the same Likert scale. The analysis of the responses was supported by the use of a qualitative data analysis computer software package called QSR NVivo 11 and IBM SPSS Statistics 22.

This section described the chosen research method used to fulfil Objective 3 of the present research. The outcome of implementing this method is presented in Chapter 8 **section 8.2**. The next section, on the other hand, explains the ethical considerations of the present research.

4.6 Ethical considerations and data safeguarding

The research presented in this thesis has been conducted according to the principles of academic excellence, integrity, inclusiveness and professionalism. This meant that in addition to the satisfactory resolution of issues surrounding consent, confidentiality and data protection, the principles of honesty and openness were observed in both the conduct of the research and the publication of findings.

The research involved participants from the construction industry through face-to-face interviews by which new data were collected. There were two fieldworks in which the interviews were conducted. During the interviews, the interviewees were asked about the implementation of external stakeholder identification and involvement processes within their organisations. In particular, the interviewees were asked about the processes of identifying and involving external stakeholder groups in the identification process of civil engineering infrastructure projects in which they have been involved. In the interviews, no sensitive data or information about the participants was requested. Despite this, confidentiality and anonymity were assured.

Informed consent of participants were obtained and recorded allowing the storage and use of the data collected. Participants were given clear information about the research aim, objectives and the nature of their involvement. They were also given sufficient time to reflect on the information given. A participant's right to withdraw without giving a reason at any time was clearly explained.

All the information provided by the participants remain anonymous, participants will therefore not be able to be identified in any reports or publications. In addition, the interviews were recorded using an audio tape with the permission of the participants. The audio recordings of the interviews were used only for analysis. No other use was made of them, and no one outside the research project allowed access to the original recordings. Furthermore, all the data collected have been stored on one of the university servers, M drive, where it is secure and backed up regularly. Only the research team have access to the data collected.

In order to ensure the present research is conducted according to appropriate ethical, legal and professional frameworks, obligations and standards, the author attended a number of training courses on research ethics and ethical issues. These included “Ethics and Ethical Review”, “Ethical Issues in Online Research” and “Ownership, Confidentiality and Secrecy in Research” which all were provided by the Staff and Departmental Development Unit (SDDU) at the University of Leeds. In addition to this, an ethical

approval for the present research was sought and obtained from the MaPS and Engineering joint Faculty Research Ethics Committee (MEEC FREC) University of Leeds (reference number of approval is MEEC 14-002), **Appendix D**, before collecting data.

4.7 Chapter summary

This chapter has presented the research design and methods for the present research. The chapter described the method/research method used to fulfil each objective of the research objectives set in **Section 1.3**. For Objective 1, a case study approach was chosen as an appropriate approach to fulfil this objectives. Justification of the selection of the case study approach was provided in the chapter. Thorough and rigorous implementation plan of a case study method was undertaken to decide on the case study design for the present research. The chapter also outlined methods to fulfil research's other objectives. It chose a desk study involving the mapping of two problem solving approaches onto a generic life cycle of civil engineering infrastructure projects to fulfil Objective 2, and interview survey to meet Objective 3. Justifications for chosen these methods were also provided. The chapter has also outlined the ethical considerations that the author took into account during the conduct of the research and the publication of its findings.

Chapter 5 Case Study 1: Edinburgh Tram Network Project

In this chapter, the author examines the extent of external stakeholder involvement in the pre-design phase of Edinburgh Tram Network (ETN) project – Case Study 1. The purpose of this examination is to show the nature of improvement required to the implementation of this phase in order to enhance the chances for project success. The chapter is therefore detailed as follows:

- Section 5.1, 'Background to the project', presents the case study project, and gives an overview of the project history;
- Section 5.2, 'Case study pre-design phase', presents the analysis and interpretations of the implementation of the pre-design phase of ETN project based on the empirical evidence from the case study;
- Section 5.3, 'Case study practice of external stakeholder involvement', presents the analysis and interpretations of the implementation of external stakeholder involvement process in the pre-design phase of ETN project based on the empirical evidence;
- Section 5.4, 'Case study practice of problem identification', presents the analysis and interpretations of the practice of problem identification during the pre-design phase of ETN project based on empirical evidence;
- Section 5.5, 'Summary of practice', presents a summary of the findings from sections 5.2, 5.3 and 5.4; and
- Section 5.6, 'Chapter summary', provides a conclusion to this chapter.

5.1 Background to the project

Historically, different models of trams ran in the city of Edinburgh for more than eight decades (1871 - 1956). The first tram was a horse-drawn tram which ran from Haymarket (west of Edinburgh) to Bernard Street in the heart of Leith. It all began in November 1871 by a company called Edinburgh Street Tramways at the time. Seventeen years later, Edinburgh saw a revolution in the trams industry when the first cable-pulled tram was launched by the Northern Tramways Company. The cable-pulled trams operated in Edinburgh until the city gained electric trams in 1922. These electric trams continued to serve the people of Edinburgh until November 1956 (Edinburgh History, 2014). Trams then disappeared from the streets of Edinburgh for nearly six decades (1956 - 2014) before the Scottish Parliament passed two Private Bills in 2006 enabling the city to regain trams again. The passage of the two Bills paved the way for the construction works of the tram project to commence in 2007 (BBC, 2014).

Following years of disruption and problems the first tram service set off at 05:00GMT on 31 May 2014 from the Gyle shopping centre in the west of Edinburgh (ibid). It was a historical day in which Scotland's capital city finally regained a fully-functioning tram line after nearly sixty years (1956-2014). **Table 5-1** illustrates basic project information of ETN project.

Table 5-1 Edinburgh Tram Network basic project information

Features	***Description***	***Source(s) of data/information***
Project title	Edinburgh Tram Network (ETN) project	Transport Initiatives Edinburgh (2006)
Location	Edinburgh, UK	(ibid)
Project purpose	The project's objectives are to: • support the local economy by improving accessibility, • promote sustainability and reduce environmental damage caused by traffic, • reduce traffic congestion, • make the transport system safer and more secure, and • promote social benefits.	Audit Scotland (2011)
Project status	Operation	BBC (2014)
Modality	Rail/tram	Transport Initiatives Edinburgh (2006)
Costs (initial)	In March 2003, £375m	Audit Scotland (2007), Transport Initiatives Edinburgh (2006)
	In January 2004, £473.5m (Phase 1)	Audit Scotland (2007)
	In January 2006, £570m (phase 1)	(ibid)
	In November 2006, £592m (phase 1) Phase 1a at £500m Phase 1b at £92m	Audit Scotland (2007), Transport Initiatives Edinburgh (2006)
	In June 2007, £593.8m (phase 1) Phase 1a at £501.8m Phase 1b at £92m	Audit Scotland (2007)
	In December 2007, £585m (phase 1) Phase 1a at £498m Phase 1b at £87m	Audit Scotland (2011)
	In May 2008, £512m (phase 1a)	(ibid)
	In September 2011, £776m (phase 1a)	The City of Edinburgh Council (2013)
Costs (final)	£776m	The City of Edinburgh Council (2014)
Construction period	2007 - 2014	(ibid)
Sponsor(s)	• Transport Initiatives Edinburgh (tie) • Transport Edinburgh Limited (TEL)	Audit Scotland (2007)

This section provided a background to the first case study in the present thesis – ETN project. The section gave an overview of the project history, and presented basic project information. The next section, by contrast, explores the pre-design phase of ETN project based on the research method demonstrated in Chapter 4 **section 4.3**.

5.2 Case study pre-design phase

This section presents the analysis and the author's interpretation of the implementation of the pre-design phase of ETN project from the empirical evidence. In order to explore how the need for the project was identified, it was necessary to trace the origins of the project and follow the procedures and work that was done to get the project off the ground. This was possible through the identification of a theme of events which the author calls 'key events and milestones in the project'. This theme identifies key events and milestones that are related to the development of ETN project. This includes, but is not limited to, the formation of transport strategies in which the need for the project is identified, feasibility studies, business cases, appraisal process, project decisions, etc. This enables the story of the project to be unveiled and, thus reveals the process through which the project was identified.

Although the present research defines the pre-design phase as the first phase of a project life cycle which commences when the initial idea is conceived and proceeds to generate information, consolidate stakeholders' views and positions, and arrive at the final decision as to whether or not to finance the project, the 'key events and milestones in the project' theme expands beyond the feasibility stage to include the other phases of design and construction. This was to account for the possibility that the pre-design phase may overlap with another phase of the project life cycle – design phase, and also to ensure that activities, tasks and events that are related to the pre-design phase of the project are surely captured in this theme.

Key events and milestones in ETN project have been identified based on the data in **Appendix F** (on key events and major milestones in ETN project). The empirical data consist of publicly available information on the tram project and information obtained through face-to-face interviews with two project management team members who were directly involved in the development of ETN project from the early stages. The key events and milestones in the development of the tram project are illustrated in **Figure 5-1** and detailed in the text that follows.

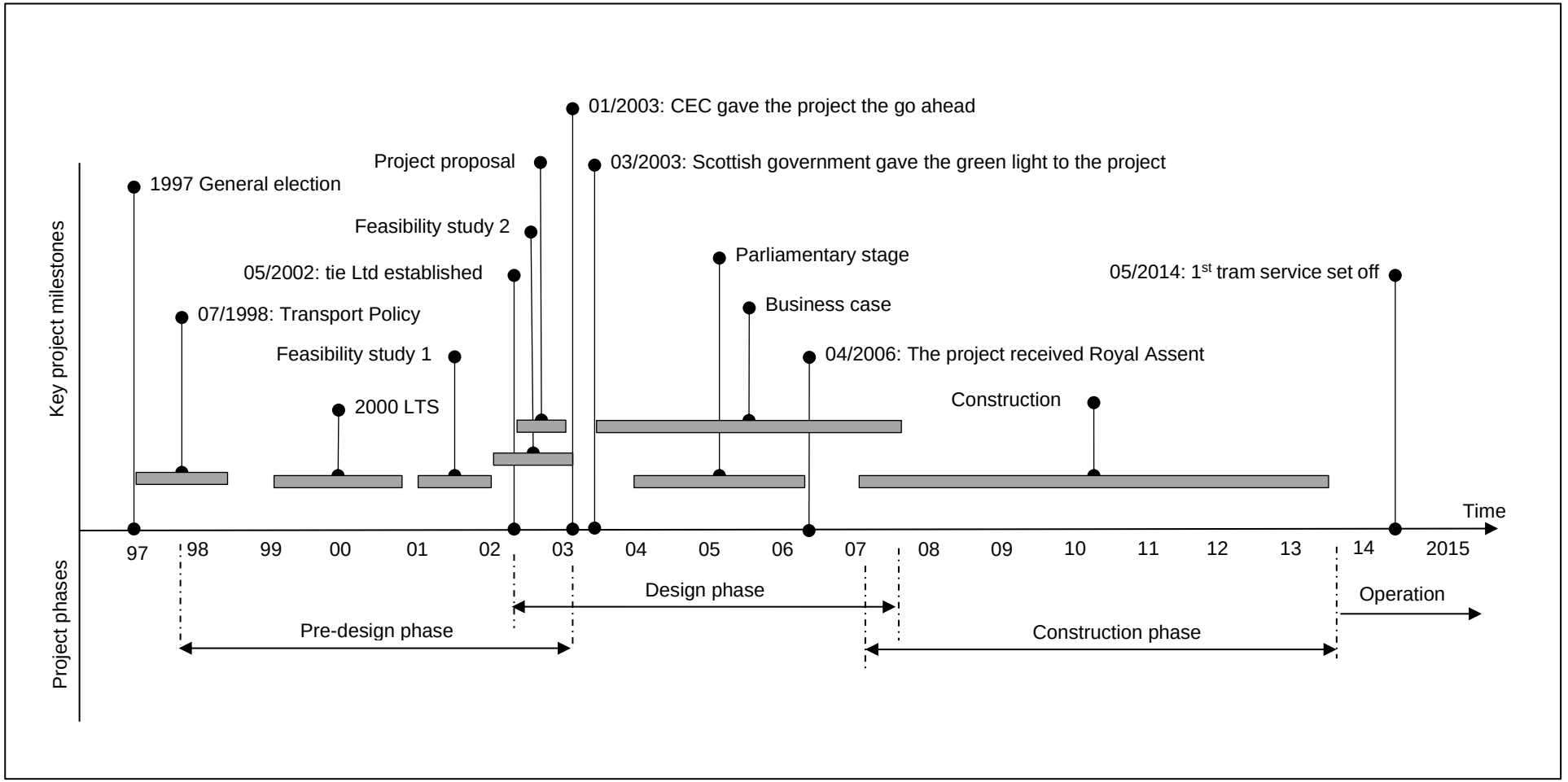

Figure 5-1 Key events and milestones in ETN project

The data in **Appendix F** reveal that the idea of trams in Edinburgh was picked up from a White paper entitled “Travel Choices for Scotland: The Scottish Integrated Transport White Paper” (government policy) which was published in July 1998 (The Scottish Office, 1998). This is also supported by an interview with a project management team member from within ETN project who confirmed that the story of ETN project started in the 1998 White Paper (Int-ETN-281014-FW1).

In the UK, White papers are policy documents produced by the Government that set out their proposals for future legislation (The UK Parliament, 2018). However, the Planning Act 2008 (as discussed in Chapter 3 **section 3.6.1**) created a new system for planning for the development of infrastructure projects (The Planning Inspectorate, 2014) through which national infrastructure policies are designed and produced by the Government. These policies called the National Policy Statements (NPSs). The NPSs include the Government’s objectives for the development of national infrastructure in a particular sector (i.e. energy, transport, water, waste water and waste) (The Planning Inspectorate, 2012d). A White paper (policy) is equivalent to what is currently known as a National Policy Statement.

In line with discussions in Chapter 2 **section 2.5** which suggested that policies can emerge from election manifestos. The 1998 Transport White Paper emerged from the labour’s 1997 manifesto which contains the following statement:

> *A sustainable environment requires above all an effective and integrated transport policy at national, regional and local level that will provide genuine choice to meet people's transport needs. This is what we will establish and develop (Labour Party, 1997).*

The 1998 White Paper was the framework within which the Labour government would develop a transport system that meets its 1997 manifesto for Scotland commitment. The White Paper was the framework within which Scotland would develop its transport system. The paper sets out Scotland’s transport action plan, and contains the following:

> *Local authorities will have a vital role to play in delivering an integrated transport network for Scotland … We shall therefore be encouraging each local authority to develop a Local Transport Strategy … We envisage a Local Transport Strategy being a comprehensive document prepared with input from all local authority departments, and drawing on all forms of local authority provided transport. The Local Transport Strategy will set out the authority's plans and priorities for the development of an integrated transport policy within its area, designed to serve people in that authority in a way which is consistent with our overall sustainable development objectives (1998, sec.4.2).*

The White paper trigger a local transport strategy which, in turn, identified the need for trams in Edinburgh. As a Scottish Local Authority, the City of Edinburgh Council (CEC)

was required to produce a Local Transport Strategy (LTS) in order to bid for transport funds from the Scottish Executive according to the 1998 Transport White Paper. CEC prepared its first interim LTS (The City of Edinburgh Council, 1999) and submitted it to the Scottish Executive in 1999. The strategy sets out the Council's vision for transport in Edinburgh and the policies which it wants to put into action to ensure that the vision is realised.

The first full LTS for Edinburgh (The City of Edinburgh Council, 2000a) was then submitted to the Scottish Executive on 31st October 2000 to support the Council's bids for Government transport funds. The strategy sets out an overall vision for Edinburgh's transport for the next 20 years, and outlines the council's policies and proposals for transport in and around the city.

The data also show that it is the 2000 LTS is where ETN project, at least as we know it today, was arguably born. This is supported by an interview (Int-ETN-281014-FW1) with a project management team member who confirmed that the idea of trams was picked up by the council's 2000 LTS. ETN project that we see today had its roots in this strategy which contains the following:

> *The Vision implies giving Edinburgh a transport system equal to the best in Europe, the key component being a light rapid transit (tram) network for the city. The Council believes that it is ambitious but achievable.*

The CEC identified trams as the preferred way to provide the backbone for a higher quality public transport network to support the local economy by improving accessibility, to promote sustainability and reduce environmental damage caused by traffic, to reduce traffic congestion, to make the transport system safer and more secure and to promote social benefits (Audit Scotland, 2011). Here, it is important to highlight that in the context of the present thesis the publication of the 2000 LTS marked the end of the identification stage of ETN project, as the strategy triggered two feasibility studies into trams in Edinburgh.

The first feasibility study entitled "*Feasibility Study for a North Edinburgh Rapid Transit Solution*" was commissioned in January 2001 by Waterfront Edinburgh Ltd (WEL) (a joint venture between the CEC and Scottish Enterprise Edinburgh and Lothian). WEL commissioned a preliminary technical and economic feasibility study of a tram in north Edinburgh, which would provide a link between the proposed Waterfront redevelopment at Granton and the city centre (Transport Initiatives Edinburgh, 2003b). The purpose of this study was to determine whether a rapid transit scheme linking the proposed Waterfront Development and the city centre was feasible. The study sought to:

- Establish the economics of a solution (tram), considering all practical public transport modes;
- Recommend an appropriate procurement route; and
- Develop an outline business case supporting the recommendations.

The feasibility study considered three scheme scenarios:

- An alignment from Granton Square, through the Waterfront site and then via the disused railway line to Haymarket station;
- A continuation of the first option on-street to St Andrew Square;
- A North Edinburgh Loop from Granton Square to Haymarket and St Andrew Square, Leith via Leith Walk to Ocean Terminal and along the foreshore to Granton Square.

The first feasibility study was published in 2001, and concluded that proposals for a light rail link to connect the Waterfront development to the city centre by means of a 'North Edinburgh loop' should be put forward (Arup, 2003; Transport Initiatives Edinburgh, 2003b). This loop was called later Edinburgh Tram Line One.

The second feasibility study entitled "*Edinburgh LRT Masterplan Feasibility Study*" was commissioned in December 2001 by CEC. This time Arup (an independent firm of designers, planners, engineers, consultants and technical specialists offering a broad range of professional services) was brought on board. Arup was commissioned by CEC to undertake a feasibility study for a Light Rapil Transit (LRT) in Edinburgh. In its study (Arup, 2003), Arup reviewed the opportunities for a tram system along a number of routes in Edinburgh, and identified a number of priorities for developing the network. Arup tested a number of corridors and recommended three lines as illustrated in **Figure 5-2**. These lines are as follows:

- North Edinburgh Loop – connecting Waverley, Haymarket, Granton and Leith Docks;
- West Edinburgh Tramway – via Edinburgh Park, Gyle and Edinburgh Airport to Newbridge; and
- South East Edinburgh Tramway – via Dalkeith Road, New Royal Infirmary to Danderhall.

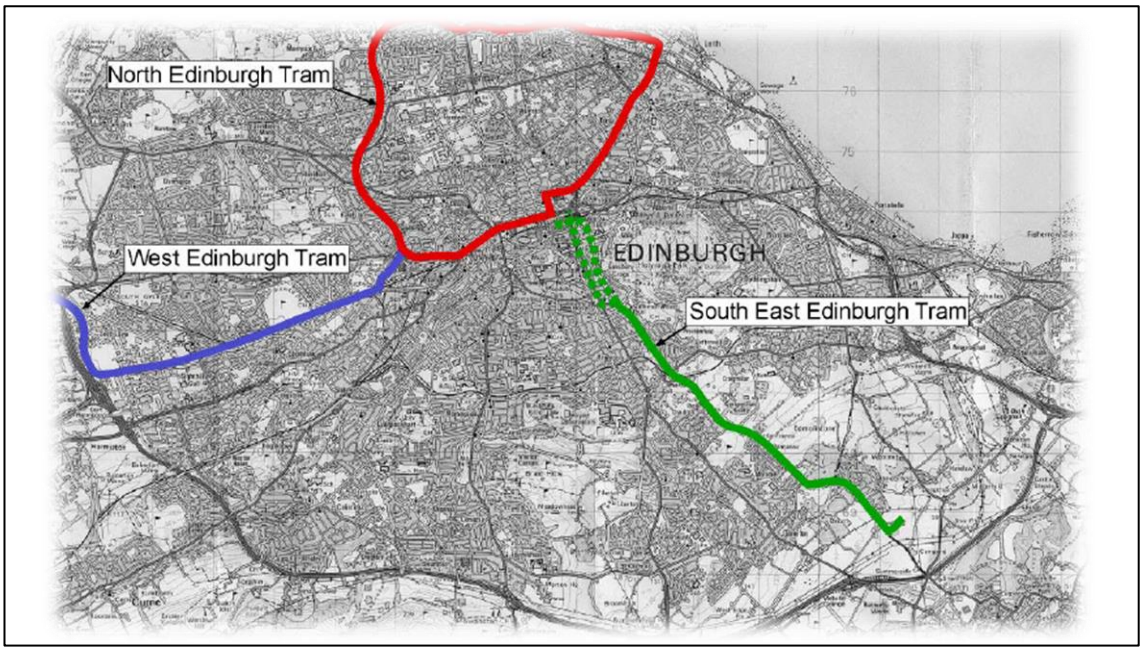

Figure 5-2 Arup's recommended priority tram routes in Edinburgh (Arup, 2003, p.111)

It should be noted that Arup included in its feasibility study a review of the work commissioned earlier by Waterfront Edinburgh Ltd. Arup published its study in January 2003 supporting the 'North Edinburgh loop' identified in the previous feasibility study, and recommending that the North Edinburgh Loop be accorded highest priority in addition to both West and South East lines (Arup, 2003).

Following the commissioning of the two feasibility studies and a review of the strategic benefits of the tram system, and before the publication of the second feasibility study (Arup, 2003), CEC established Transport Initiative Edinburgh (tie) Limited in May 2002 as a non-profit private limited company. The purpose of tie Ltd was to deliver major transport projects for the council. tie Ltd was wholly owned by CEC, and was to provide the procurement, project management and financial management capabilities to ensure the delivery of ETN project and other major transport projects. tie Ltd was also commissioned to conduct investigations into the desirability of constructing a tram network in Edinburgh (Audit Scotland, 2007).

In September 2002 (before the publication of the second feasibility study), tie Ltd submitted its proposals to CEC, identifying three tram lines as the most promising in terms of economic viability and benefits to the city of Edinburgh (Audit Scotland, 2007; Transport Initiatives Edinburgh, 2003b). These lines are as follows:

- A northern loop connecting Granton and Leith to the city centre
- A western line connecting the city centre to Edinburgh Airport
- A south-eastern line connecting the city centre to the new Royal Infirmary.

On 28 January 2003 and after the publication of the second feasibility study, the Council Executive agreed to take forward proposals for ETN project (The City of Edinburgh Council, 2003). In the context of the present thesis this decision markes the end of the pre-design phase of ETN project. In March 2003, following the council's decision to take the project forward, the Scottish Executive announced its support for the construction of the northern loop and western line, **Figure 5-3** (Audit Scotland, 2007).

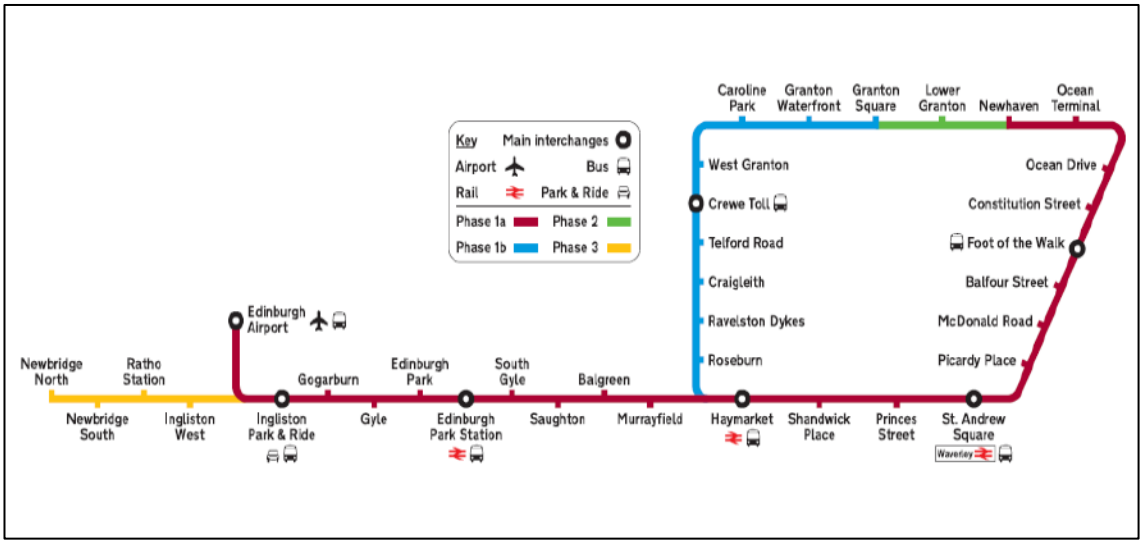

Figure 5-3 Proposed route for the Edinburg trams project (Audit Scotland, 2007, p.10)

On 29 January 2004, two Private Bills were then introduced to the Scottish Parliament – the Edinburgh Tram (Line One) Bill (SP Bill 17) and the Edinburgh Tram (Line Two) Bill (SP Bill 18). A Bill is a draft law. Bills are either: public - seeking to change the general law, or private - seeking powers for a particular individual or organisation that are in excess of or in conflict with the general law (The Scottish Parliament, 2018). The two Private Bills scrutinised in the Scottish Parliament, and eventually passed and received Royal Assent in spring 2006 paving the way for the construction work to start in 2007. Following years of disruption and problems (including disputes between the project promoter and its contractor) the first tram service set off at 05:00 GMT. on 31 May 2014 from the Gyle shopping centre in the west of Edinburgh (BBC, 2014).

The foregoing paragraphs suggested that the pre-design phase of ETN project started in the 1998 Transport Policy, and was carried out by CEC through the development of the 2000 LTS. This is in line with the discussions in Chapter 2 **section 2.5** which suggested that the identification of infrastructure needs (the beginning of the pre-design phase) could start during the design stage of a public policy. The author found that the idea of trams in Edinburgh was picked up from a government policy (The Scottish Office, 1998), which identified the need for an integrated transport system. The policy was the

trigger for the tram project, because the policy required local authorities to produce an LTS setting out the authority's plans and priorities for the development of an integrated transport policy within its areas. The findings showed that the pre-design phase of ETN project was embedded in the development of Edinburgh's 2000 LTS (The City of Edinburgh Council, 2000a). The strategy sets out an overall vision for Edinburgh's transport, and outlines the council's policies and proposals for transport in and around the city. The strategy identified trams as the preferred way to provide the backbone for a higher quality public transport network in Edinburgh.

This section presented the analysis and interpretation of the implementation of the pre-design phase of ETN project based on the data illustrated in **Appendix F**. More discussion on who was involved in the pre-design phase of ETN project is provided next.

5.3 Case study practice of external stakeholder involvement

This section examines the extent of external stakeholder involvement in the pre-design phase of ETN project. It first identifies ETN project's stakeholder groups, classifies them into homogenous groups and then identifies who was involved in the pre-design phase of ETN project demonstrated in the previous section. This examination was done based on empirical evidence from ETN project. The empirical data (as demonstrated in Chapter 4 **section 4.3.1.3**) consist of publicly available information on the tram project and information obtained through face-to-face interviews with two project management team members who were directly involved in interacting with stakeholders during the development of ETN project.

5.3.1 The project's external stakeholder groups

Based on information obtained from interviews with ETN project management team members and related documentary sources, the present research identified 84 stakeholder groups in ETN project, **Appendix G**. The author then analysed the data in the appendix, and classified the identified stakeholder groups according to Winch's stakeholder classification criteria (Winch, 2002) described in Chapter 3 **section 3.2**. The classification of the identified stakeholder groups is illustrated in **Appendix H**. Classifying the identified stakeholder groups revealed that external stakeholder groups (the focus of the present research) comprise approximately 75 per cent of the identified stakeholder groups. Out of the 84 identified stakeholder groups, 63 groups were not in legal contractual relationship with the client but had an interest in the project, **Figure 5-4**.

Internal stakeholder groups, in contrast, comprise around 25 percent of the total number of identified stakeholder groups.

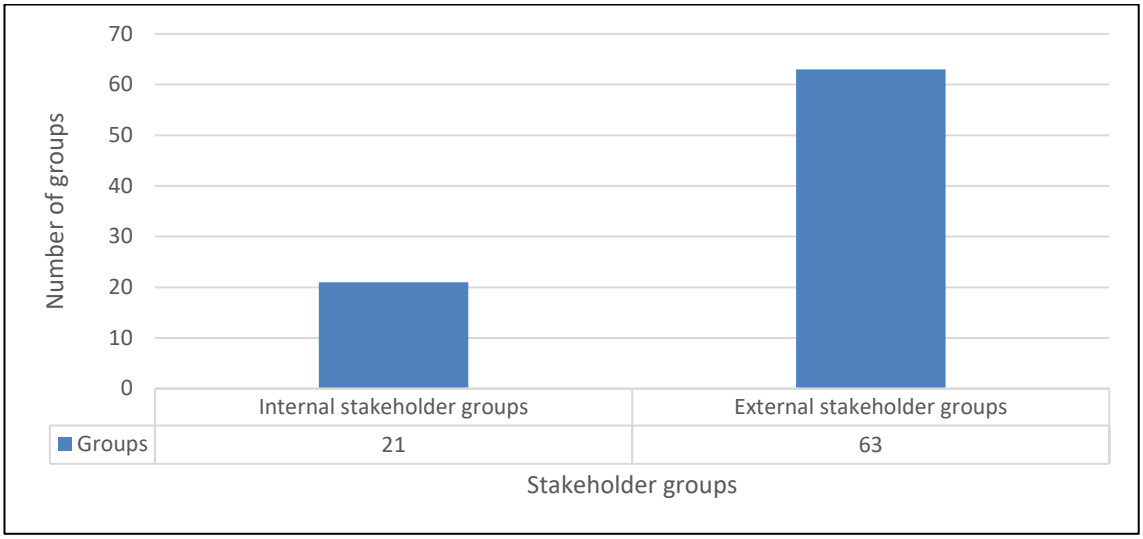

Figure 5-4 Classification of the identified stakeholder groups in ETN project

The large number of external stakeholder groups interested in the project reflects the huge interest external stakeholders had in ETN project. Analysing the identified external stakeholder groups in the project shows that more than 80 per cent of them were private actors compared with only 17% who were public actors, **Figure 5-5**.

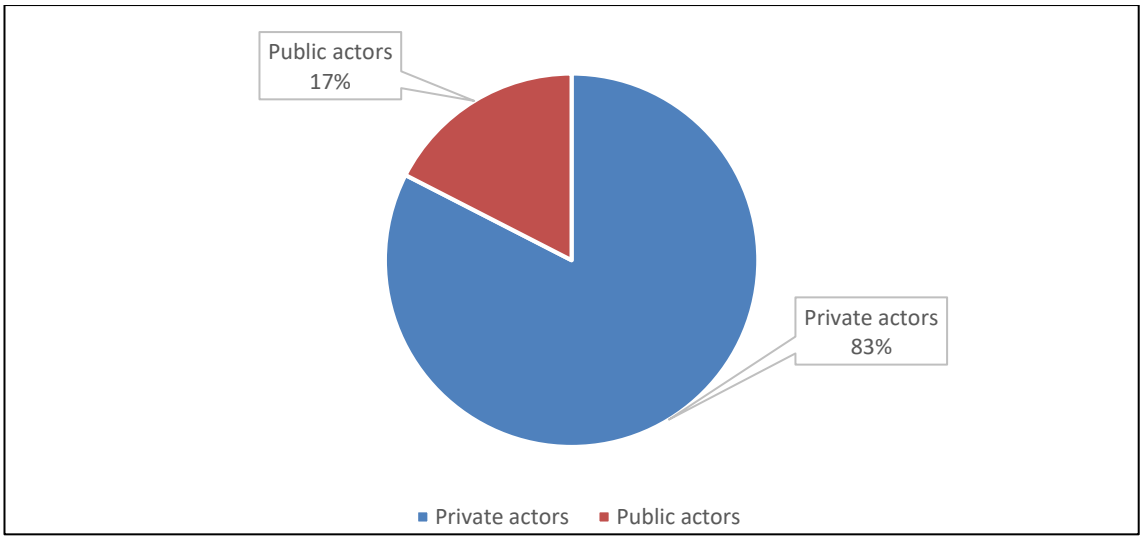

Figure 5-5 Classification of the identified external stakeholder groups in ETN project

The public actors who had an interest in the tram project and identified by the present study include the UK national government, the Scottish government and other nine regulatory agencies, **Figure 5-6**.

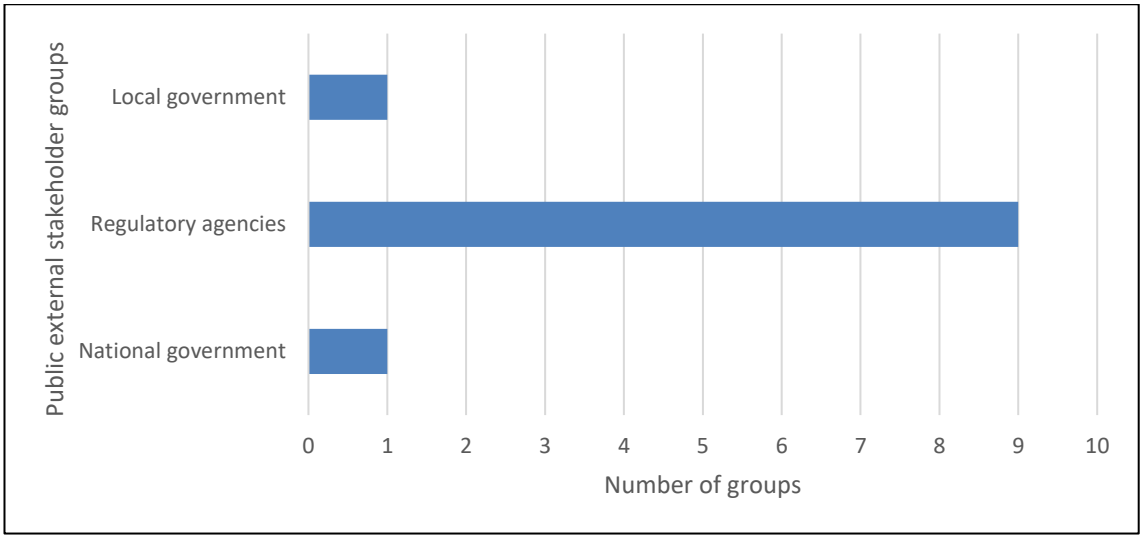

Figure 5-6 Public external stakeholder groups involved in ETN project

The private external stakeholder groups, on the other hand, include environmentalists, conservationists, businesses, politicians, interest groups, Edinburgh residents, non-statutory groups and economists, **Figure 5-7**.

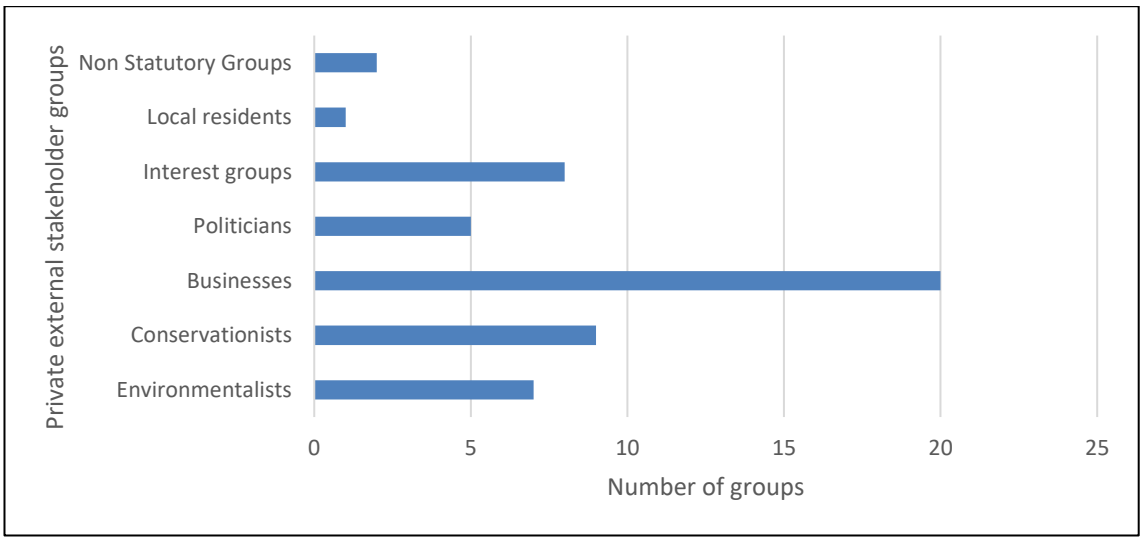

Figure 5-7 Private external stakeholder groups involved in ETN project

It is interesting to note that business actors comprise 15 groups followed by conservationists and interest groups whose comprise 9 and 8 groups respectively. Identifying and classifying the stakeholder groups who either were involved or expressed interest in the tram project reveals that the project had a huge effect on a wide range of stakeholders. The classification of these stakeholders shows the diversity of external stakeholder groups that the project management team had to deal with. It also facilitates the exploration of the involvement of these groups in the pre-design phase of the tram project, which is discussed in the following section.

5.3.2 The extent of external stakeholder involvement in the pre-design phase

This section explores the extent of external stakeholder involvement in the pre-design phase of ETN project. It examines to what extent external stakeholder groups identified in **section 5.3.1** were involved in the pre-design phase of the tram project demonstrated in **section 5.2.** In order to do so, the author identified a theme of events called ‘events relating to external stakeholders’. The theme identifies key events that are related to external stakeholder groups and their management during the development of ETN project. This includes, but is not limited to, stakeholder consultation, public consultation, stakeholder communication, discussions, disputes and conflicts between the project management teams and the projects external stakeholder groups. The ‘events relating to external stakeholders’ theme was derived from data from **Appendix I** (on events relating to external stakeholders in ETN project).

The ‘events relating to external stakeholders’ theme was then mapped onto the ‘key events and milestones in the project’ theme discussed in **section 5.2**. The purpose of this mapping was to produce a project time line in order to visualise external stakeholder involvement in the pre-design phase of the tram project. The mapping of the two themes is illustrated in **Figure 5-8** and detailed in the text that follows.

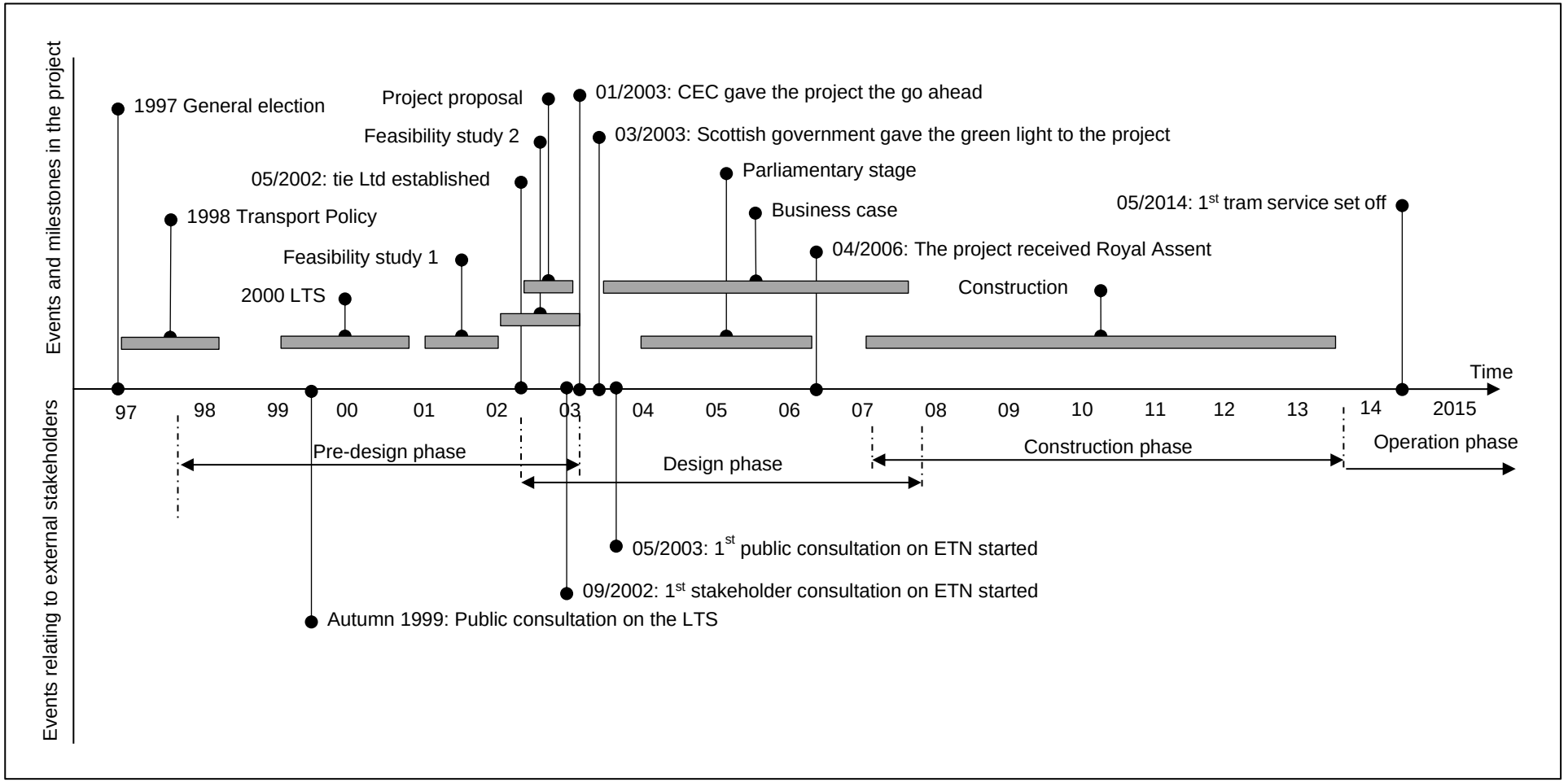

Figure 5-8 ETN project time line

As demonstrated in **section 5.2**, the very first seeds of trams were first planted in the 1998 Transport White Paper (Policy) which emerged from the Labour's 1997 election manifesto. However, discussions in Chapter 3 **section 3.6.2** suggest that drafting a manifesto is a purely party political matter and external stakeholders have no role in the process. The main sources of the specific proposals presented in the manifesto are from the politicians themselves, their political advisers and party employees (Waller et al., 2008). Therefore, it can be argued that the need for a new transport policy was identified by the labour party outside government departments involving the party's politicians, employees or political advisors.

After their 1997 landslide victory, the labour government published the Transport White Paper (The Scottish Office, 1998) in July 1998 to meet their manifesto commitment. The 1998 White Paper was produced by Tony Blair's government and was presented to Parliament in July 1998 by the then Secretary of State for Scotland. As a manifesto-driven policy, the 1998 White paper was produced within the core executive. The key individuals involved in the development of this policy were those who could exercise choice. These were The Prime Minster, senior ministers (secretaries of state), junior Minsters, senior civil servants and special advisors. These individuals are part of a network of key institutions which also constitute the core executive. These key institutions are The Prime Minister's Office, The Cabinet Office, government departments, The Scottish Office, The Cabinet and The Parliament.

The 1998 White paper identified the nature of the solution (an integrated transport network), and required each local authority in Scotland to produce a Local Transport Strategy (LTS). In response to the 1998 White Paper, City of Edinburgh Council (CEC) prepared its interim LTS in 1999. The interim LTS was developed by the council based on data and information that held by the council involving the council's employees and councillors. Other external stakeholder groups were informed about the strategy after it had been published. The interim LST was subject to extensive public consultation in autumn 1999. This, according to The City of Edinburgh Council (2000a), included:

- circulating the 'Edinburgh's Transport Choices' leaflet to almost every address in Edinburgh, with a questionnaire;
- a public opinion survey, using the 'Citizens' Panel';
- a detailed questionnaire for groups/organisations with an interest in transport;
- seminars, meetings with key organisations and two public meetings;
- the Council's Independent Transport Advisory Panel considered the LTS; and
- internet sites contained information on the LTS.

It should be noted that consultees were asked in particular for views on three example scenarios as illustrated in **Table 5-2**. This public consultation was not about the tram project, it was about the council's local transport strategy.

Table 5-2 the three scenarios were asked to the consultees (The City of Edinburgh Council, 2000a)

Option 1	***Option 2***	***Option 3***
Income from road user charges; but not proposing a specific charging scheme.	Charging for workplace parking spaces.	No new charges.
Raises around £30m/yr, funds major improvements.	Raises around £50m/yr, financing a more modest range of initiatives.	Low investment, very limited improvements.
Much more travel choice; less traffic, pollution & congestion than now; fewer accidents.	More travel choice; slowly increasing or stable traffic levels; some improvement in safety; small reduction in pollution.	Some safety improvements. Traffic probably continues growing; congestion & pollution probably increase.

Consultation showed a clear preference for a package of major transport improvements funded by road user charging (option 1) (The City of Edinburgh Council, 2000a). The Preferred Strategy required the introduction of road user charges; impacting directly on traffic levels and providing transport funding. Alternative approaches to investing the funding were investigated. The strategy would balance bus, rail and other improvements and a new light rapid transit (tram) system (ibid).

After the 1999 public consultation, the council published its first LTS (The City of Edinburgh Council, 2000a) in 2000. The strategy document was then submitted to the Scottish Executive on 31 October 2000 to support the council's bids for government transport funds (The City of Edinburgh Council, 2000b). The strategy document contains the following:

> *The Vision [for transport in Edinburgh] implies giving Edinburgh a transport system equal to the best in Europe, the key component being a light rapid transit (tram) network for the city. The Council believes that it is ambitious but achievable.*

This indicates that ETN project at least as we know it today had its roots in Edinburgh's 2000 LTS. However, in an interview with a project management team member from ETN project, it was confirmed that at this stage of the LTS there was no particular tram routes identified. It was just the idea of trams. Consultations on particular transport schemes including the tram proposal presented by the council's LTS took place after the 1999 public consultation (Int-ETN-281014-FW1).

The foregoing paragraphs suggested that the pre-design phase of ETN project started during the design stage of the 1998 Transport White Paper (policy) because the transport policy triggered the 2000 LTS in which the need for trams in Edinburgh was first articulated. The policy, in turn, emerged from the 1997 Labour's manifesto commitment for Scotland, see **Figure 5-9**.

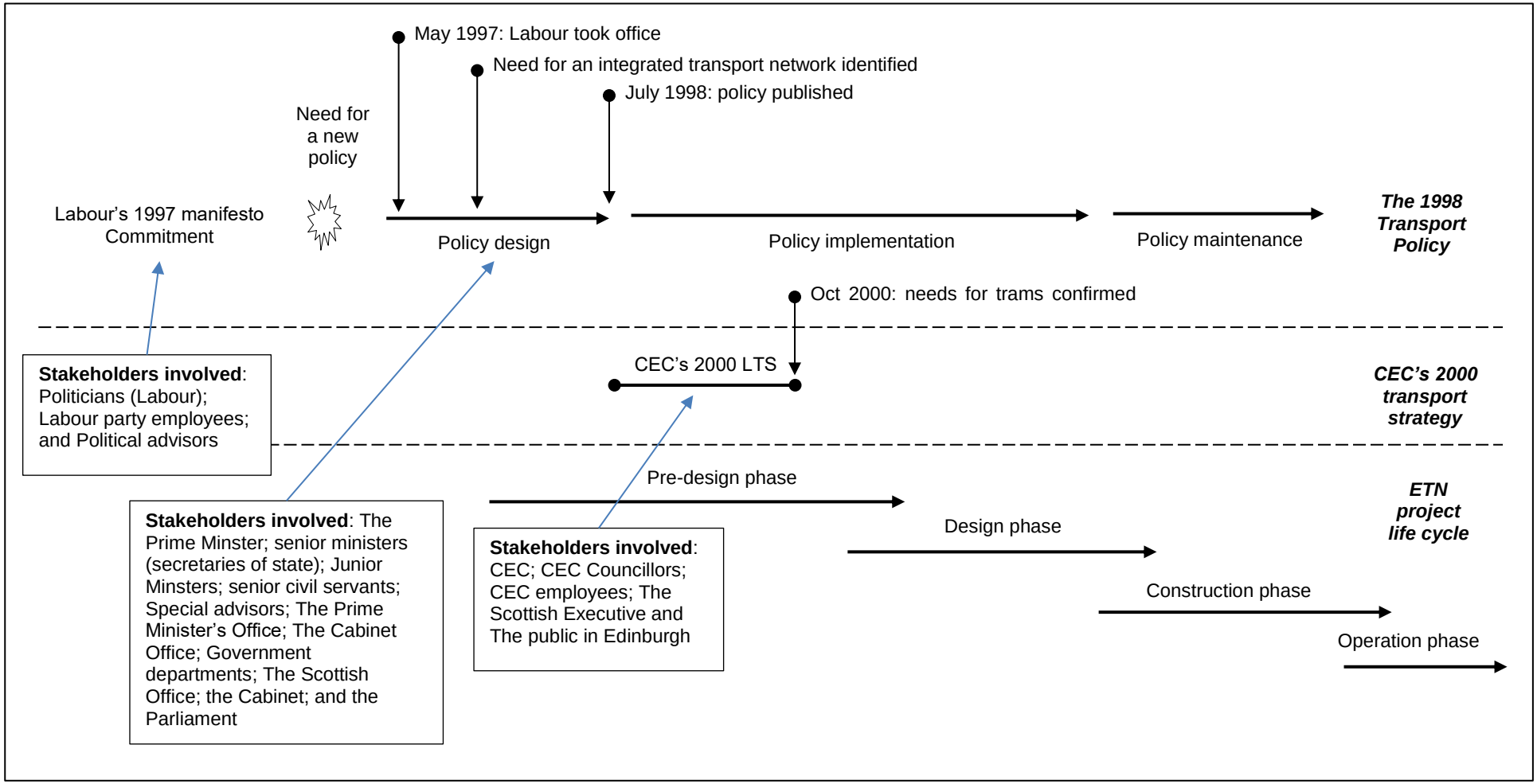

Figure 5-9 External stakeholder involvement in the pre-design phase of ETN project

Because the 1998 White paper was a manifesto-driven-policy, drafting it was a purely party political matter and external stakeholders had limited role in the process. Although the design stage of the 1998 policy involved civil servants and the UK parliament, the main sources of the specific ideas presented in the policy were from the Labour politicians themselves, their political advisers and party employees. The policy identified the nature of the solution (an integrated transport network), thus it can be argued that identification of the nature of the solution were purely party political matters presented by the Labour party's politicians themselves, their political advisers and party employees.

The pre-design phase of ETN project (solution), on the other hand, was carried out though the CEC's 2000 LTS. The 2000 LTS for Edinburgh identified the need for trams in the Scottish capital city of Edinburgh. The LTS was carried out by CEC and was subject to extensive public consultation. However, the consultation was not about the tram project at the time, it was about the council's transport strategy. The strategy was the first time the idea of ETN project, at least as we know it today, was made public. Consultations on the tram project and other transport proposals in the 2000 LTS took place after the publication of the strategy. This suggested limited external stakeholder involvement in the pre-design phase of ETN project, because the identification of the need for the project was a pure political matter carried out within the core executive, and external stakeholders had the chance to get involved in the project only after the feasibility studies had been undertaken.

The first feasibility study of a tram in north Edinburgh was commissioned in January 2001 by Waterfront Edinburgh Ltd (Transport Initiatives Edinburgh, 2003b). Stakeholder groups involved in the feasibly study were all internal stakeholders. These are:

- Waterfront Edinburgh Ltd,
- A multi-disciplinary consortium who carried out the study,
- City of Edinburgh Council, and
- Scottish Enterprise Edinburgh and Lothian.

A second feasibility study was commissioned later in December of the same year (2001) by the CEC. This time Arup was commissioned by the council to undertake a feasibility study for a light rail network in Edinburgh. Arup's feasibility study report (Arup, 2003) was published in 2003.

Following the commissioning of Arup, CEC established Transport Initiative Edinburgh (tie) limited in May 2002 as a non-profit private limited company to deliver major transport projects for the council (Audit Scotland, 2007). Until the establishment of tie Ltd, the tram scheme had evolved within the city council and its consultants. This included the

identification of the problems to be addressed by the tram project, the identification of route alignments, selection of the preferred routes and the feasibility studies. Consultations with external stakeholder groups about ETN project started after when tie Ltd was established.

Evidence (Transport Initiatives Edinburgh, 2003b) from the project's developer (tie) states that consultations about the tram project commenced in September 2002, just after tie Ltd had already submitted its proposals to CEC identifying three tram lines as the most promising in terms of economic viability and benefits to the city (Audit Scotland, 2007). This suggests that there was limited external stakeholder involvement in the pre-design phase of the project and in generation, sifting and development of options which all had taken place before September 2002.

There were two types of consultations: stakeholder consultation and public consultation. According to Transport Initiatives Edinburgh (2003b, p.42):

> *The main objectives of the consultations were to inform stakeholders about the proposals, and to allow stakeholders to express their views on the proposals and therefore contribute to the assessment and preparation of final route designs. The consultation process also aimed to raise awareness, interest and understanding of the proposals amongst stakeholders, and build support where possible. In addition, the consultation process enabled any misconceptions and negative perceptions amongst stakeholders and the wider public to be addressed.*

Actually, a specialist advisor (Weber Shandwick) was appointed by tie Ltd to develop and implement an overall strategy for public relations and communications, including the organisation, monitoring and reporting of the major public consultations exercise carried out covering both Tram Line 1 and 2.

The stakeholder consultation started in September 2002 in which the consultant (Weber Shandwick) team reviewed a range of stakeholders and placed them into broad categories (statutory; council; environmental; heritage; transport; community; business; public utility; emergency services and disability). Then several of the consultants within the team were allocated stakeholder categories with whom they would undertake consultation. The consultations with stakeholders were undertaken by letters, telephone or meetings and often by a combination of these. The consultation strategy was to provide feedback to consultees where possible. For some stakeholder consultees, several meetings were held to clarify issues, exchange views and report back changes to the scheme to accommodate concerns (Transport Initiatives Edinburgh, 2003b).

Following the stakeholder consultation, in January 2003 the CEC Executive agreed to take ETN proposal forward. In the context of the present thesis the decision on 28

January 2003 to take forward proposals for trams in Edinburgh marked the end of the pre-design phase of ETN project. In March 2003, following the council's decision to move ahead with the tram project, the Scottish Executive announced its support for the project.

After the council had already decided to move ahead with the project, the first public consultation about the tram project started in May 2003, and ran for six weeks (BBC, 2003b). The purpose of the public consultation was to raise awareness of the project, and involve the wider public in the process. The methods used included the media, leaflets, website, Freephone number, consultation with political representatives and community organisations, exhibitions and public meetings (Transport Initiatives Edinburgh, 2003b).

Although tie Ltd carried out extensive stakeholder and public consultations, all this took place at a stage where affected external stakeholder groups and the wider public could merely comment/express views on the tram proposals. The stakeholder consultation took place after tie Ltd had already chosen its preferred route options, and the public consultation took place after the decision to go ahead with the project had already been made.

Following the analysis of the responses from the consultations, two Private Bills to promote the construction of Tram Line 1 and 2 were introduced to the Scottish Parliament on 29 January 2004 – the Edinburgh Tram (Line One) Bill (SP Bill 17) and the Edinburgh Tram (Line Two) Bill (SP Bill 18). After introducing the Bills to the Scottish Parliament, there was a sixty day period for objections which ended on 29 March 2004, resulting in 206 admissible objections. Following the consideration of the objections, the Bills passed and eventually received Royal Assent in spring 2006.

The analysis of the data from **Appendices F** and **I** (which involved mapping the two themes of events onto a time line) clearly shows a time lag between the start of project pre-design phase and the beginning of external stakeholder involvement in the project. Plotting the two themes of events on the same time line reveals that external stakeholder groups had limited inputs into key aspects of the ETN project defined during the project pre-design phase.

Taking into consideration the present research's definition of the pre-design phase which states that the pre-design phase is the first phase of a civil engineering infrastructure project life cycle which commences when the initial idea is conceived and proceeds to generate information, consolidate stakeholders' views and positions, and arrive at the final decision as to whether or not to finance the project. Before January 2003 (the end of ETN pre-design phase), only one public and one stakeholder consultation took place.

The public consultation about the council's interim LTS which took place in autumn 1999. However, this consultation was not about the tram project. The consultation sought stakeholder views on three potential new funding scenarios to fund the improvements in the transport system in the city of Edinburgh.

The stakeholder consultation about the tram project was carried out by tie Ltd in September 2002. However, it took place after tie Ltd had already identified its preferred route options for trams in Edinburgh. The purpose of this stakeholder consultation was to seek views and comments on the council's tram proposal to contribute to the final route designs. This suggests that affected external stakeholders had limited input into the pre-design phase of ETN project when they had the chance to do so. The implication of this is that positive external stakeholder inputs into key aspects of the project defined before the establishment of tie Ltd may have been overlooked, thereby compromising the effectiveness of external stakeholder involvement in the pre-design phase. This underpins the need for an overarching approach that enables effectiveness of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects.

This section examined the extent of external stakeholder involvement in the pre-design phase of ETN project. This was done based on empirical data obtained from project management team members from within the tram project and from other documentary sources. The following section, by contrast, examines the external stakeholder involvement in problem identification during the pre-design phase of the tram project.

5.4 Case study practice of problem identification

This section examines the extent of external stakeholder involvement in the identification process of problems to be addressed by ETN project. The section identifies the problems that are meant to be addressed by ETN project, and then identifies those who were involved in the identification of those problems. In identifying the problems, the author searched for evidence and coded where it is stated/perceived/understood that a specific problem is meant to be addressed by the project, **Figure 5-10**.

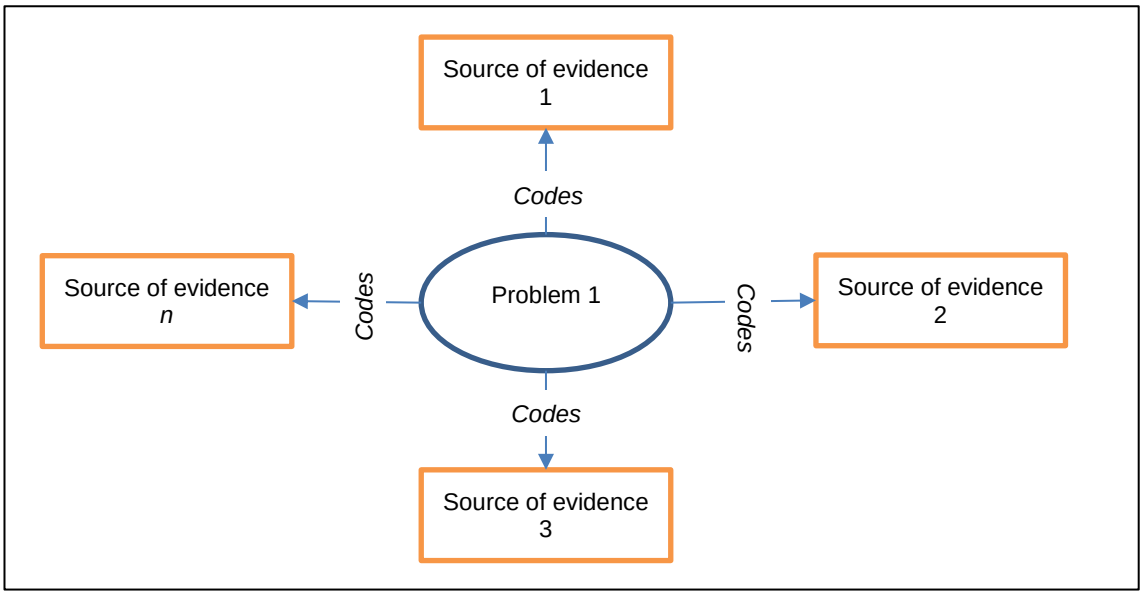

Figure 5-10 Problems coding procedure

The identified problems are then analysed in order to find out how they related to each other, and to identify if they pertain to an overarching problem. The extent of external stakeholder involvement in the identification process of those problems is the examined.

5.4.1 Problems to be addressed by the project

Data obtained from a comprehensive review of publicly available documents and an interview with two project management team members from within the tram project shows that the problem ETN project is meant to address comprises different elements, as illustrated in **Table 5-3**.

Table 5-3 Overarching problem to be addressed by ETN project

Overarching problem	***Main elements***	***Basic elements***
Lack of modern public transport system in Edinburgh	Traffic congestion	Road traffic congestion
	Social exclusion	Accessibility to public transport network Connectivity with and beyond the city centre
	Environmental issues	Urban air pollution Emissions Traffic noise

The author found that the overarching problem ETN project is built to address is the lack of modern public transport system in Edinburgh. It was also found that the overarching

problem pertains to three problems. These three problems are referred to in the present research by the main elements of the overarching problem. These are

- traffic congestion,
- social exclusion, and
- environmental problems.

Each of the three elements are discussed in more details below.

5.4.1.1 Traffic congestion

The first main element of the overarching problem is traffic congestion. Case study evidence from **Appendix J.1** shows that ETN project is meant to tackle traffic congestion problems in the city. The evidence suggests that this problem was severe and required an urgent response. The severity of the traffic congestion problem in Edinburgh was reflected in some of the statements made by different stakeholder groups. For example, the problem was described as ‘chronic’, ‘unpleasant’ ‘excessive’, ‘severe’ and ‘insufferable’. ETN project would offer an alternative to the car for many urban trips, thus reduce traffic congestions. The evidence presented in the appendix demonstrates how the tram project is perceived as a solution to traffic congestion problem by different stakeholder groups.

5.4.1.2 Social exclusion

The second element of the overarching problem is social exclusion. Evidence presented in **Appendix J.2** illustrates that ETN project is meant to address social exclusion problems in Edinburgh. The lack of access to facilities and services was a crucial facet of social exclusion, and the tram project was built to deal with it. Many stakeholder groups are most vulnerable to social exclusion including elderly and disabled people, non-car users, children, women, shoppers and parents with young children. Edinburgh’s 2000 LTS underlined the necessity to address the social exclusion of those without cars and their freedom in car-dominated streets (The City of Edinburgh Council, 2000a). According to the project’s EIA document (Transport Initiatives Edinburgh, 2003a), the social exclusion problem appears to be associated with the north area of Edinburgh. ETN project is meant to address the social exclusion in this area through improving accessibility to the public transport network and connectivity with and beyond the rest of the city.

The problem of social exclusion suggests that there is a lack of integrated, efficient and accessible public transport system in the city. ETN project was meant to contribute to

offering this modern public transport network, and address social exclusion in the north of Edinburgh. This is supported by the evidence presented in appendix J.2.

5.4.1.3 Environmental issues

The third element of the overarching problem is environmental issues in Edinburgh caused by traffic. ETN project is meant to help protect the environment by reducing emissions and the consumption of energy and resources. ETN project is meant to help address environmental problems mainly caused by traffic, and this is supported by evidence illustrated in **Appendix J.3**. The case study evidence shows that the tram project would contribute towards addressing the environmental problems, such as air pollution, climate change, noise and reducing emissions through actually tackling another problem discussed earlier – traffic congestion. This shows how the problems to be addressed by the tram project are related to each other. It also underlines the importance of proper problem analysis in order to identify the most effective solution. The evidence in the appendix also reveals that different stakeholder groups perceived the tram project as a solution to environmental problems.

5.4.1.4 Comments about the problems

The identification of the problems that are meant to be addressed by ETN project demonstrates that different stakeholder groups perceived ETN project as a solution to problems. This is in line with the discussions and the author's argument made in Chapter 2 **section 2.2** that civil engineering infrastructure projects are, at best, solutions to problems, and identifying what problems exist within a community would help identify the right civil engineering infrastructure project(s) to tackle those problems.

The analysis of data from **Appendices J.1**, **J.2** and **J.3** reveals that the identified problems are related to each other and pertain to the same overarching problem (the lack of modern public transport system in Edinburgh). This suggests that if civil engineering infrastructure projects are accepted to be solutions to problems, they can be identified through a problem solving process.

This section demonstrated that ETN project was perceived a solution to problems. The next section, on the other hand, explores the extent of external stakeholder involvement in problem identification during the pre-design phase of the tram project.

5.4.2 The extent of external stakeholder involvement in problem identification

This section identifies who was involved in the identification of the problems to be addressed by ETN project. The limited external stakeholder involvement during the pre-design phase demonstrated earlier in **section 5.3.2** meant that external stakeholder groups had limited input into activities that led to the identification of the tram project. This would include problem identification, if any problem analysis was ever done. In seeking to identify who was involved in identifying the problems to be addressed by the tram project, the author looked at the pre-design phase of ETN project (**section 5.2**) in order to find out whether problem analysis was carried out during this phase.

The author found that the Labour's 1997 election manifesto identified infrastructure problems at a national level. The manifesto contains that Britain's infrastructure is dangerously run down: parts of our road and rail network are seriously neglected, and all too often our urban environment has been allowed to deteriorate (Labour Party, 1997). However, the identification of these issues was a purely party political matter and external stakeholders have no role in the process. The 1998 White paper (The Scottish Office, 1998), by contrast, identified infrastructure challenges at a Scottish level, however this was also a purely party political matter and external stakeholders have limited role in the process. This is in line with discussions in Chapter 3 **section 3.6.2** which suggest that there is a limited external stakeholder involvement in the development of the public policy, therefore limited external stakeholder involvement in the identification of infrastructure needs/projects often articulated in those polices.

The author also found that problems in the city of Edinburgh were identified in Edinburgh's LTS 2000 (The City of Edinburgh Council, 2000a; The City of Edinburgh Council, 1999) which triggered the need for trams in Edinburgh. The problems identified include travel patterns and level of service, road safety, environment, social exclusion and local economy. These issues were discussed in chapter 3 of Edinburgh's LTS (The City of Edinburgh Council, 1999). The problems were identified based on data held by the council and were presented as issues that the city had to deal with.

Although the 2000 LTS was subject to extensive consultation in autumn 1999, consultees were asked in particular about the council's transport policy at the time. The consultation was not about the problems faced by the city/stakeholders. However, because the consultation document contains the problems faced by Edinburgh, affected stakeholders were informed about the problems. This suggests that there was limited external

stakeholder involvement in the identification of those problems presented in the council's LTS.

Furthermore, external stakeholder groups were consulted about the strategy, but not about the problems identified by the council. This suggests that those problems were actually identified and defined solely from the CEC's perspective. External stakeholder groups were asked to endorse the council's policies to address those problems with limited contributions to the identification of the problems. This informs the need to redesign the pre-design phase in order to enable infrastructure developers and affected stakeholders to get involved in problem solving process as a means for identifying, developing and delivering civil engineering infrastructure projects.

5.5 Summary of practice

The examination of the extent of external stakeholder involvement in the pre-design phase of ETN project reveal that:

- The pre-design phase of ETN project began during the design stage of a public policy, and was embedded in the development of a local transport strategy.
- The project identification process of ETN project was to some extent a party political matter, as the project was a government means to deliver a government policy.
- There was limited external stakeholder involvement in the pre-design phase of ETN project – before the council's decision to take the project forward in January 2003.
- There was a time lag (delay) between the start of the pre-design phase (during the design stage of the 1998 Transport Policy) and beginning of external stakeholder involvement.
- The time lag prevented external stakeholder groups from having input (if any) into key aspects of the project defined before the establishment of tie Ltd.
- Attention was given to external stakeholders after the need for the project is identified and preferred options had already been specified.
- Consultations with external stakeholders on the tram project started after when tie Ltd had already submitted its proposal for trams in Edinburgh to CEC.
- The purpose of consultations was to raise awareness of the project proposals, and seek stakeholder comments about the council's predefined route options.

- Although ETN project was perceived as a solution to transport problems in Edinburgh, there was a lack of external stakeholder involvement in a problem solving process during the pre-design phase.

As a consequence, it can be argued that the pre-design phase of ETN project (the project phase prior to the council's decision to go ahead with ETN project in January 2003) was carried out with limited external stakeholder involvement. External stakeholder groups were merely asked to support a proposal that suited the project promoter/developer rather than engaging in the identification process of the project. The implications of this insufficient project external stakeholder involvement could have been a misalignment of project purpose with external stakeholder expectations which, in turn, could have limited the project success. The implications could have been similar to the examples provided in Chapter 3 **section 3.3** on the negative impact external stakeholders could have upon a project. As a consequence, any improvement sought needs to consider recommendations for improvement of the effectiveness of the pre-design phase through the means of effective external stakeholder involvement in project identification. This suggests that an overarching, systematic approach for project identification is desirable.

5.6 Chapter summary

This chapter has examined the extent of external stakeholder involvement in the pre-design phase of ETN project. The findings from the empirical study of ETN project illustrated weaknesses in the pre-design phase of ETN project resulted from insufficient external stakeholder involvement in project identification. The chapter showed that external stakeholder groups had limited (if any) input into key aspects of the tram project defined during the pre-design phase. This informs the need for improving the pre-design phase through the means of effective external stakeholder involvement in project identification.

Chapter 6 Case Study 2: Crossrail 1 (Elizabeth Line) Project

In this chapter, the author examines the extent of external stakeholder involvement in the pre-design phase of Crossrail 1 (Elizabeth line) project – Case Study 2. The purpose of this examination is to show the nature of improvement required to the implementation of this phase in order to enhance the chances for project success. The chapter is therefore detailed as follows:

- Section 6.1, 'Background to the project', presents the case study project, and gives an overview of the project history;
- Section 6.2, 'Case study pre-design phase', presents the analysis and interpretations of the implementation of the pre-design phase of Crossrail project based on the empirical evidence from the case study;
- Section 6.3, 'Case study practice of external stakeholder involvement', presents the analysis and interpretations of the implementation of external stakeholder involvement process in the pre-design phase of Crossrail project based on the empirical evidence;
- Section 6.4, 'Case study practice of problem identification', presents the analysis and interpretations of the practice of problem identification during the pre-design phase of Crossrail project based on empirical evidence;
- Section 6.5, 'Summary of practice', presents a summary of the findings from sections 6.2, 6.3 and 6.4; and
- Section 6.6, 'Chapter summary', provides a conclusion to this chapter.

6.1 Background to the project

Crossrail 1 (Elizabeth line) project (hereafter referred to as Crossrail) is Europe's largest underground civil engineering infrastructure project. The Fifteen Billion Pound railway project will run over 100km from Reading and Heathrow in the west, through new tunnels under central London to Shenfield and Abby Wood in the east (Crossrail, 2018).

Crossrail project is not a new idea. Plans for a new surface railway across London began in the eighteenth century. Although permission to build the scheme was granted by the UK Parliament in 1880s, the development of the route eventually came to nothing at the time (Crossrail, 2017). The project idea then resurfaced in Greater London Plan 1944 (Abercrombie et al., 1945), Greater London Development Plan 1969 (Greater London Council, 1969), London Rail study 1974 (Greater London Council and Department of the Environment, 1974), A Cross-London Rail Link: A British Railways Board discussion paper 1980 (British Railways Board, 1980), Central London Rail study 1980 (Department of Transport, 1989) and London East West study 2000 (Strategic Rail Authority, 2000). Despite all the efforts in these studies to get Crossrail off the ground, only London East West study (Strategic Rail Authority, 2000) succeeded in doing so.

Following the publication of London East-West Study, the UK Government announced that work would commence immediately on project definition and design development of the tunnel section of Crossrail (HC Deb, 03 May 2001). As a result, a new joint company owned by the Strategic Rail Authority (SRA) and Transport for London (TfL) called Cross London Rail Links (CLRL) Ltd was established in 2001 for this purpose (Butcher, 2005).

In July 2003, CLRL Ltd submitted the business case for Crossrail 1 to the Government. CLRL Ltd estimated that the base cost of Crossrail would be between £7bn and £10bn at 2002 prices, and the benefit cost ratio of the benchmark scheme was 1.99:1 (Cross London Rail Links Ltd et al., 2003). In February 2005, a Hybrid Bill (*Crossrail Bill*, 2005) was presented to parliament to secure powers necessary to build Crossrail. Crossrail Bill was then scrutinised by committees in both Houses of Parliament and eventually received Royal Assent in July 2008.

After years of planning and development, Crossrail finally broke ground on 15 May 2009 at Canary Wharf at the site of a new Canary Wharf station (Crossrail, 2017). The first new state-of-the-art Elizabeth line train entered passenger service between Liverpool Street Main Line and Shenfield on the TfL Rail route on 22 June 2017, whereas the Elizabeth line will fully open in December 2019 (Transport for London, 2017). **Table 6-1** illustrates basic project information of Crossrail project.

Table 6-1 Crossrail basic project information

Features	***Description***	***Source(s) of data/information***
Project title	Crossrail 1 (Elizabeth line) project	Mayor of London Press Office (2016)
Location	London, UK	Crossrail (2017)
Project purpose	The objectives of the new railway are to: • relieve congestion to the transport network in and around London; • accommodate future travel demand growth; • improve connectivity and reduce journey times; and • deliver wider economic impacts, including supporting economic growth.	National Audit Office (2014)
Project status	Under construction/partly in service	Crossrail (2018)
Modality	Rail	(ibid)
Costs (initial)	In January 2003, £10bn In September 2007, £15.9bn In January 2010, £17.8bn In December 2010, £14.8bn	Cross London Rail Links Ltd et al. (2003) National Audit Office (2014) (ibid) (ibid)
Costs (final)	£14.8bn	Crossrail (2017)
Construction period	2009 – present	(ibid)
Sponsor(s)	• Department for Transport (DfT) • Transport for London (TfL)	National Audit Office (2014)

This section provided a background to the second case study in the present thesis – Crossrail project. The section gave an overview of the project history, and presented basic project information. The next section, by contrast, explores the pre-design phase of Crossrail project based on the research method demonstrated in Chapter 4 **section 4.3**.

6.2 Case study pre-design phase

This section presents the analysis and the author's interpretation of the implementation of the pre-design phase of Crossrail project from the empirical evidence. In order to explore how the need for the project was identified, it was necessary to trace the origins of the project and follow the procedures and work that was done to get the project off the

ground. This was possible through the identification of a theme of events which the author calls ‘key events and milestones in the project’. This theme identifies key events and milestones that are related to the development of Crossrail project. This includes, but is not limited to, the formation of transport strategies in which the need for the project is identified, feasibility studies, business cases, appraisal process, project decisions, etc. This enables the story of the project to be unveiled and, thus reveals the process through which the project was identified.

Although the present research defines the pre-design phase as the first phase of a project life cycle which commences when the initial idea is conceived and proceeds to generate information, consolidate stakeholders’ views and positions, and arrive at the final decision as to whether or not to finance the project, the ‘key events and milestones in the project’ theme expands beyond the feasibility stage to include the other phases of design and construction. This was to account for the possibility that the pre-design phase may overlap with another phase of the project life cycle – design phase, and also to ensure that activities, tasks and events that are related to the pre-design phase of the project are surely captured in this theme.

Key events and milestones in Crossrail project have been identified based on the data in **Appendix K** (on key events and major milestones in Crossrail project). The empirical data consist of publicly available information on the tram project and information obtained through face-to-face interviews with two project management team members who were directly involved in the development of Crossrail project from the early stages. The key events and milestones in the development of the Fifteen Billion Pound railway project are illustrated in **Figure 6-1** and detailed in the text that follows.

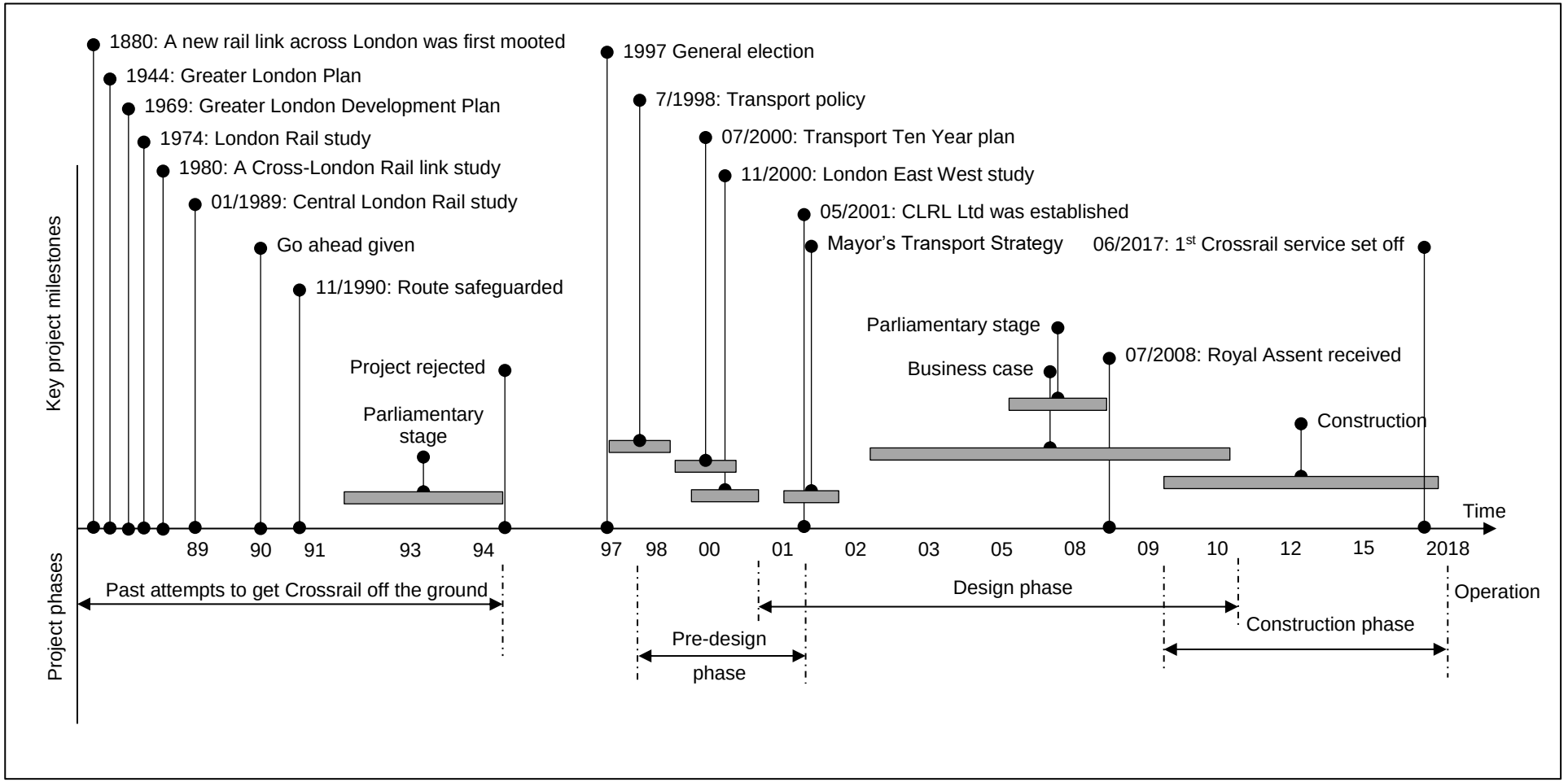

Figure 6-1 Key events and milestones in Crossrail project

The data in **Appendix K** reveal that Crossrail project had several false starts. It started in 1880s, 1940s, 1960s, 1970s, 1980s and 1990s. Plans for a new surface railway across London began in the eighteenth century. Although those plans eventually came to nothing, the idea of the project was not forgotten as London continued to grow and flourish (Crossrail, 2017). The Crossrail project idea resurfaced in Greater London Plan 1944 (Abercrombie et al., 1945), Greater London Development Plan 1969 (Greater London Council, 1969), London Rail study 1974 (Greater London Council and Department of the Environment, 1974), A Cross-London Rail Link: A British Railways Board discussion paper 1980 (British Railways Board, 1980), Central London Rail study 1989 (Department of Transport, 1989) and London East West study 2000 (Strategic Rail Authority, 2000). Despite all the efforts in these studies to get Crossrail off the ground, only London East West study (Strategic Rail Authority, 2000) succeeded in doing so.

In fact, the 1989 Central London Rail study (Department of Transport, 1989) was also successful in getting Crossrail to the parliamentary stage in 1990s. According to a House of Commons research paper by Butcher (2005), the UK government gave the green light to the East-West Crossrail scheme in 1990. This would provide through train services from Reading and Aylesbury in the west, running through a new rail tunnel under central London from Paddington to Liverpool Street, to Shenfield and Romford in the east. As a result, the initial safeguarding directions for the East-West Crossrail route came to force on 5 November 1990 (HC Deb, 08 November 1990). A Private Bill (*Crossrail Bill*, 1991) seeking powers to construct East-West Crossrail was then presented to Parliament in November 1991 (Butcher, 2005). The Bill was promoted by London Underground (LU) Ltd and the British Railways Board (BRB), and was supported by the government and opposition as indicated in the House of Commons (HC Deb, 08 June 1993). However, a Select Committee rejected the Bill in May 1994 by a 3-1 majority. No reasons were given (Butcher, 2005).

In May 1997, after their election victory, Tony Blair's government began a review of rail regulation (Poole, 1999), and the conclusions of the review were published on 20 July 1998 in a White Paper, *A new deal for transport: better for everyone* (Department of the Environment; Transport and the Regions, 1998). White papers are policy documents produced by the Government that set out their proposals for future legislation (The UK Parliament, 2018). A White paper (policy) is equivalent to what is currently known as a National Policy Statement (NPS).

The 1998 White Paper is a manifesto-driven policy, as it emerged from the Labour's election manifesto (Labour Party, 1997). This is in line with discussions in Chapter 2 **section 2.5** which suggested that policies can emerge from election manifestos. The

policy was formulated to meet the government's 1997 manifesto commitment to create a better, more integrated transport system to tackle the problems of congestion and pollution. The Labour's manifesto stated that:

> *A sustainable environment requires above all an effective and integrated transport policy at national, regional and local level that will provide genuine choice to meet people's transport needs. This is what we will establish and develop (Labour Party, 1997).*

The *new deal for transport* policy was the framework within which the government would develop its transport system. This policy led to new legislation being brought forward. In September 1998, the then Deputy Prime Minister John Prescott announced that he would set up a 'shadow' authority - the Strategic Rail Authority (sSRA). The Labour government established SRA on 1 April 1999 to provide an element of stability and certainty to the rail industry to plan its activities effectively (Butcher, 2010). The *new deal for transport* policy also triggered the government's Transport Ten Year Plan (Department for Transport, 2000) published in July 2000. The Ten Year plan was designed to deliver the Government's priorities at the time: reduced congestion, better integration, and a wider choice of quicker, safer, more reliable travel on road, rail and other public transport.

The new legislation and the Transport Ten Year Plan revived the idea of Crossrail. The Transport Plan proposed Crossrail project for adding 15% to rail and tube capacity in central London. The Strategic Rail Authority, by contrast, conducted London East West study (Strategic Rail Authority, 2000) and strongly recommended Crossrail. The study was commissioned in December 1999 to review the issues relating to rail travel on an East West axis across London, and was published in November 2000. The study contains the following:

> *The sSRA identified three possible major schemes that would provide significant additional passenger capacity across Central London. These schemes are based on the safeguarded routes through Central London for the CrossRail and Chelsea-Hackney lines … They are all economically viable with the most promising being a network based on* ***a new tunnel from Paddington to East of Liverpool Street****. We propose that this project is taken forward to the project definition and design development stage immediately (2000, p.1).*

The London East West study concluded that Crossrail should progress to the project definition stage to provide significant relief to overcrowding in Central London and on the Great Western and Great Eastern Main lines, to provide direct access from the West to the West End and the City, to provide direct access from the East to the West End, to assist the regeneration of West London and to reduce social exclusion on both sides of Central London.

Crossrail project was also identified in the Mayor's Transport Strategy published in July 2001 (Greater London Authority, 2001) as one of three major projects that would provide new infrastructure to significantly expand the rail network system in London. The Mayor's strategy contains that early progress should be made on proposals to significantly increase the capacity, and extend the provision of, London's public transport system. The following groups of major projects should be taken forward.

- New cross-London rail links (Crossrail).
- Improvements to London's orbital rail network.
- New cross-river links in London's Thames Gateway.
- Possible new (intermediate mode) tram or bus based projects (2001, p.320).

Following the publication of its Ten Year Transport Plan and the London East-West study, the Government announced that work would commence immediately on project definition and design development of the tunnel section of Crossrail (HC Deb, 03 May 2001). London East-West study, the UK government's Ten Year Plan 2000 and the Mayor's Transport Strategy 2001 culminated in setting up a high-level group (consists of the Minister for Transport, the Mayor of London, the Commissioner of Transport for London (TfL) and the Chairman of the Strategic Rail Authority (SRA)) to oversee the project. A new joint company owned by the SRA and TfL (Cross London Rail Links Ltd) was as a result established in 2001 for this purpose (Butcher, 2005).

Cross London Rail Links (CLRL) Ltd took Crossrail scheme to the definition stage, and developed a number of route options (corridors) based on the original Crossrail plan in the London East West Study (Crossrail, 2002). Therefore, in the context of the research presented in this thesis and taking into consideration the definition of the pre-design phase, the establishment of CLRL Ltd in May 2001 marks the end of the pre-design phase of Crossrail project.

In 2001, Crossrail Board agreed on the broad corridors in east and west of London as a starting point for route selection. All selected corridors provide new services to link Heathrow, Stratford and the Isle of Dogs (the core Crossrail route). Following a preliminary evaluation of the options and the Crossrail Board decision to discard some of the options, five options were shortlisted for the next stage (appraisal). These corridors are shown in **Figure 6-2** and described in greater detail in *Crossrail line 1: Stakeholder Consultation* (Crossrail, 2002, pp.12-19).

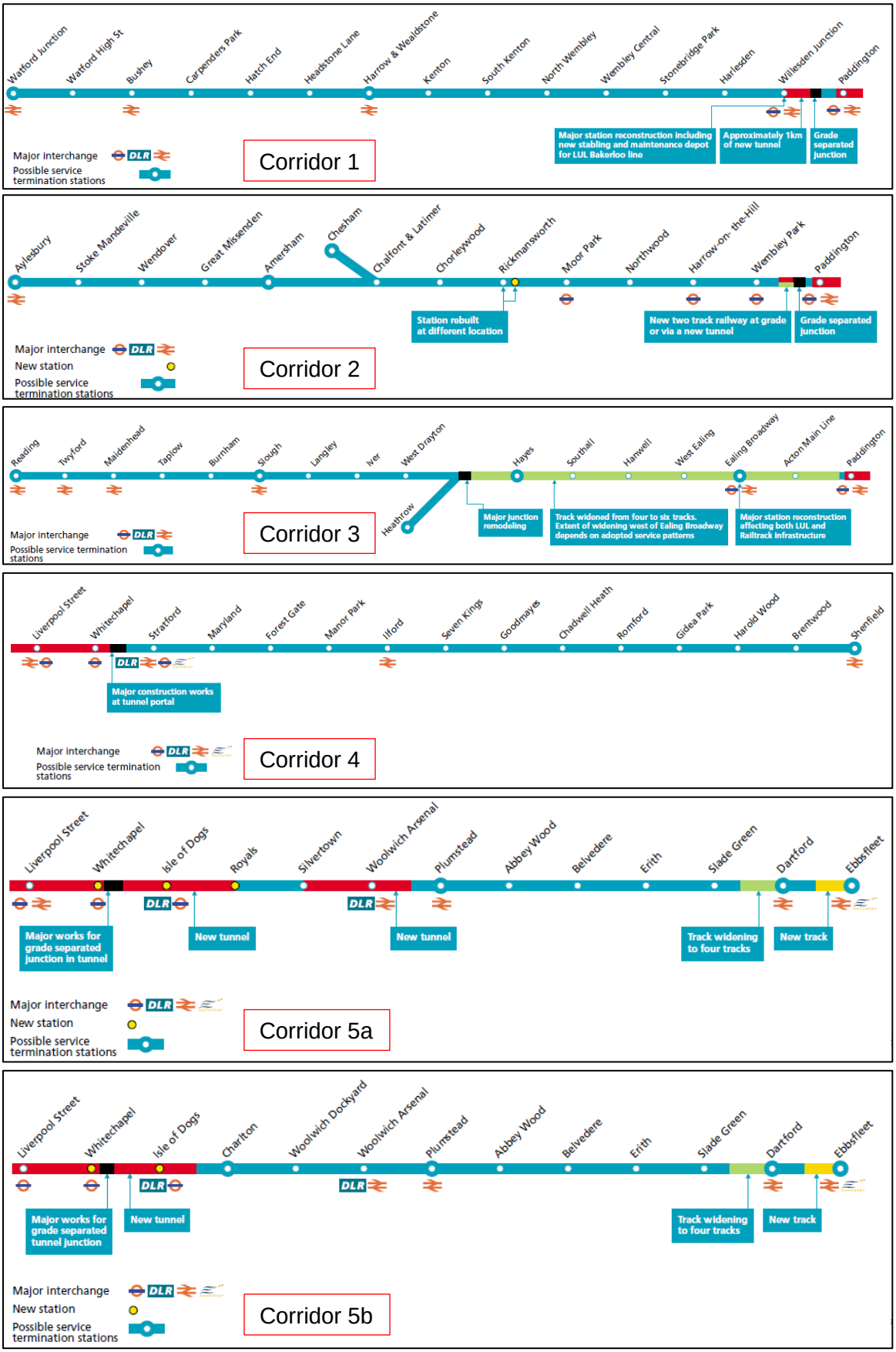

Figure 6-2 The Crossrail 1 shortlisted corridors (Crossrail, 2002, pp.12-19)

In July 2003, CLRL Ltd submitted the business case for Crossrail 1 to the Government, and estimated that the base cost of Crossrail would be between £7bn and £10bn at 2002 prices (Cross London Rail Links Ltd et al., 2003). In a written Ministerial Statement to the House of Commons (HC Deb, 14 July 2003), the then Secretary of State for Transport welcomed the proposals for East-West London Crossrail and stated that:

> *Following analysis of a range of route options, CLRL have now proposed the adoption of what they have termed the benchmark scheme, involving a central East-West tunnel across London, with services extending to two branches to the East and two to the West.*

In February 2005, a Hybrid Bill (*Crossrail Bill*, 2005) was presented to Parliament to secure powers necessary to build Crossrail. In the UK, a Bill is a proposal for a new law, or a proposal to change an existing law that is presented for debate before Parliament. There are three different types of Bill: Public, Private and Hybrid Bills. The changes to the law proposed by a Hybrid Bill would affect the general public but would also have a significant impact for specific individuals or groups (The UK Parliament, 2016).

Crossrail Bill was then scrutinised by committees in both Houses of Parliament and eventually received Royal Assent in July 2008. After years of planning and development, Crossrail finally broke ground on 15 May 2009 at Canary Wharf at the site of a new Canary Wharf station (Crossrail, 2017). The first new state-of-the-art Elizabeth line train entered passenger service between Liverpool Street Main Line and Shenfield on the TfL Rail route on 22 June 2017, whereas the Elizabeth line will fully open in December 2019 (Transport for London, 2017).

The foregoing paragraphs suggested that the pre-design phase of Crossrail project had several false starts. However, it can be argued that the pre-design phase of Crossrail project, at least as we know it today, has its root in the 1998 White Paper, *A new deal for transport: better for everyone* (Department of the Environment; Transport and the Regions, 1998), which identified the need for intervention to address the infrastructure problems. This is in line with the discussions in Chapter 2 **section 2.5** which suggested that the pre-design phase of a civil engineering infrastructure project could start during the design stage of a public policy.

The findings showed that the need for Crossrail was identified and articulated in the government's Transport Ten Year Plan (policy) which was published in July 2000. At the same time, the SRA was carrying out a review of the issues relating to rail travel on an East West axis across London. The SRA strongly recommended Crossrail being taken forward in its London East West study published in November 2000, just a few months after the publication of the government's Transport Plan. Therefore, the author argues

that the pre-design phase of Crossrail project, as we know it today, started during the design stage of the 1998 transport policy and was embedded in the development of the government's Transport Ten Year Plan and London East West study. In addition, the Mayor of London included Crossrail project in his Transport Strategy published in July 2001 as one of his proposals to expand the rail network in London giving Crossrail project a significant boost.

This section presented the analysis and interpretation of the pre-design phase of Crossrail project based on the data illustrated in **Appendix K**. More discussion on who was involved in the pre-design phase of Crossrail project is provided next.

6.3 Case study practice of external stakeholder involvement

This section examines the extent of external stakeholder involvement in the pre-design phase of Crossrail project. It first identifies Crossrail project's stakeholder groups, classifies them into homogenous groups and then identifies who was involved in the pre-design phase of Crossrail project demonstrated in the previous section. This examination was done based on empirical evidence from Crossrail project. The empirical data (as demonstrated in Chapter 4 **section 4.3.1.3**) consist of publicly available information on the project and information obtained through face-to-face interviews with two project management team members who were directly involved in interacting with stakeholders during the development of the project.

6.3.1 The project's external stakeholder groups

Based on information obtained from interviews with Crossrail project management team members and related documentary sources, the present research identified 148 stakeholder groups in Crossrail project, **Appendix L**. The author then analysed the data in the appendix, and classified the identified stakeholder groups according to Winch (2002) as illustrated in **Appendix M**. Classifying the identified stakeholder groups revealed that external stakeholder groups (the focus of the present research) comprise approximately 85 per cent of the identified stakeholder groups. Out of the 148 identified stakeholder groups, 126 groups were not in legal contractual relationship with the project's client organisation but had an interest in the project, **Figure 6-3**. Internal stakeholder groups, in contrast, comprise just under 15 per cent of the total number of identified stakeholder groups.

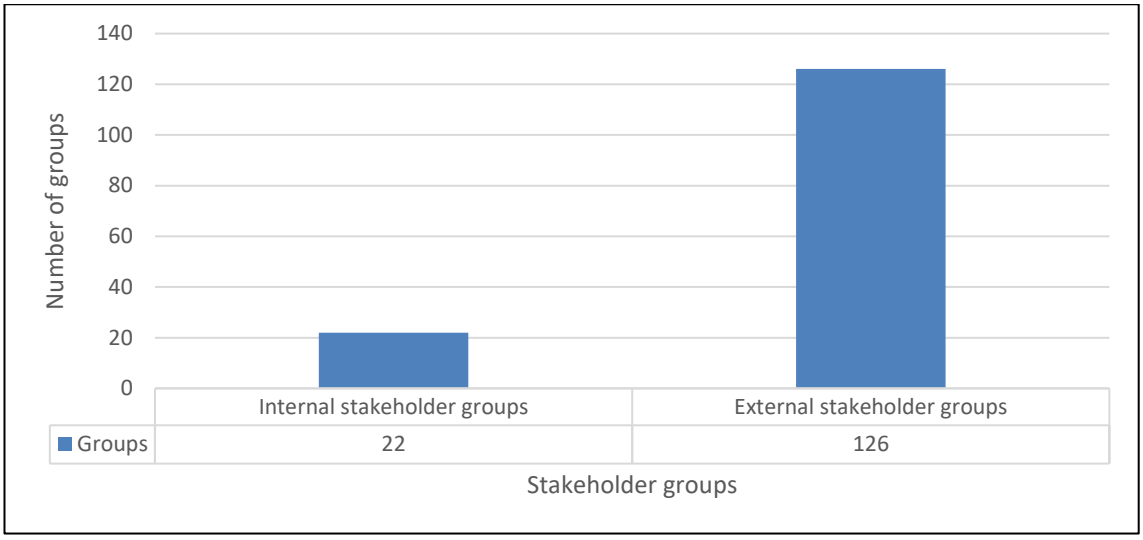

Figure 6-3 Classification of the identified stakeholder groups in Crossrail project

The large number of external stakeholder groups interested in the project reflects the huge interest external stakeholders had in the Crossrail project. Analysing the identified external stakeholder groups in the project shows that 60 per cent of them were private actors compared with 40 per cent who were public actors, **Figure 6-4**.

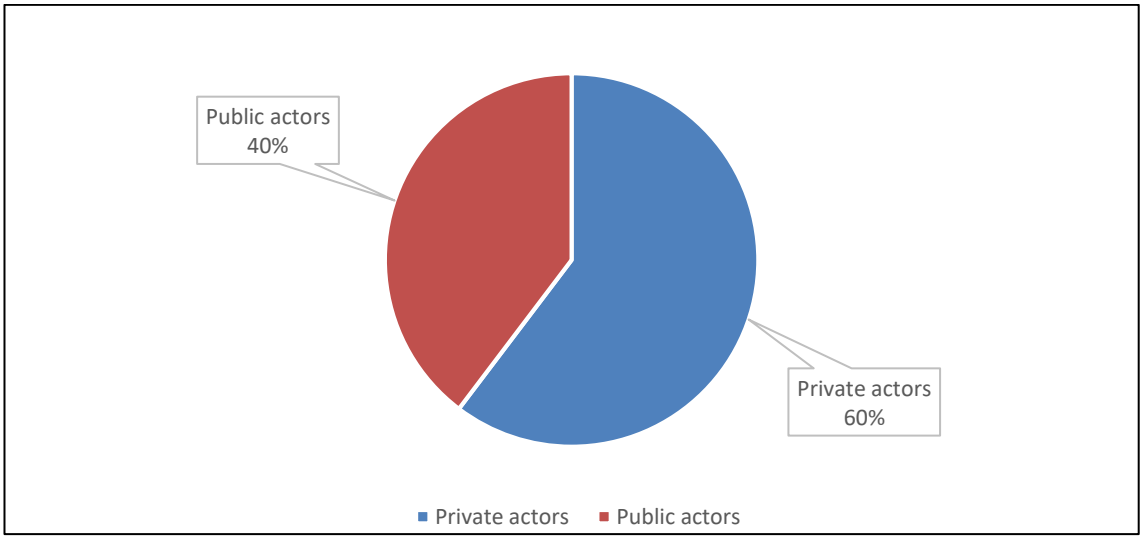

Figure 6-4 Classification of the identified external stakeholder groups in Crossrail project

The public actors who had an interest in the Fifteen Billion Pound project and identified by the present study include the UK national government, 42 local authorities and 8 regulatory agencies, **Figure 6-5**.

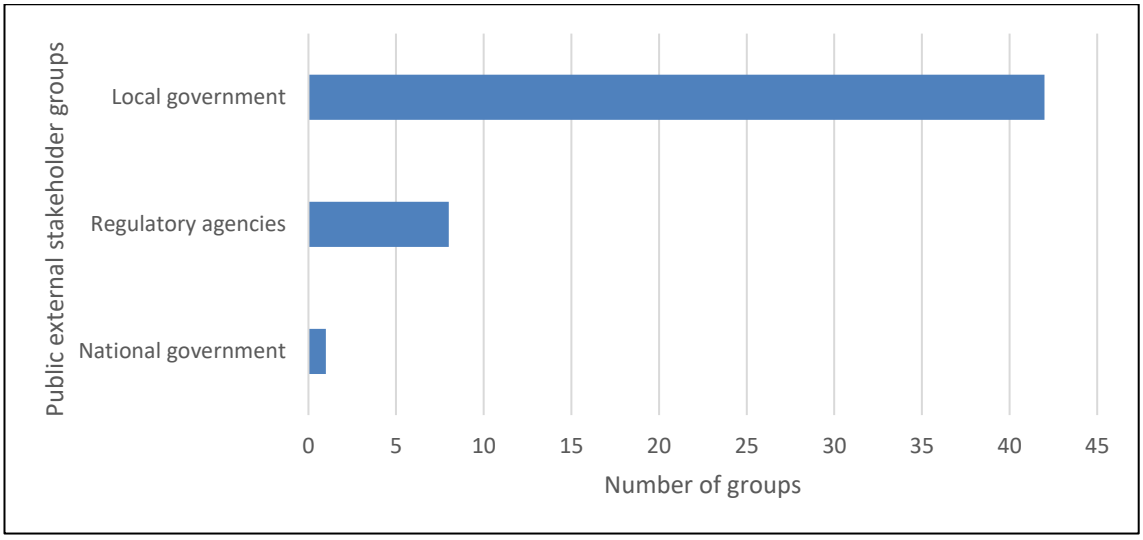

Figure 6-5 Public external stakeholder groups involved in Crossrail project

The private external stakeholder groups, on the other hand, comprise 60 per cent of the total number of the identified external stakeholder groups. They include environmentalists, conservationists, businesses, politicians, interest groups and non-statutory groups, **Figure 6-6**. The figure shows that business actors comprise 38 groups followed by interest groups and environmentalists whose comprise 10 and 9 groups respectively. This indicates the businesses in London had a huge interest in the project.

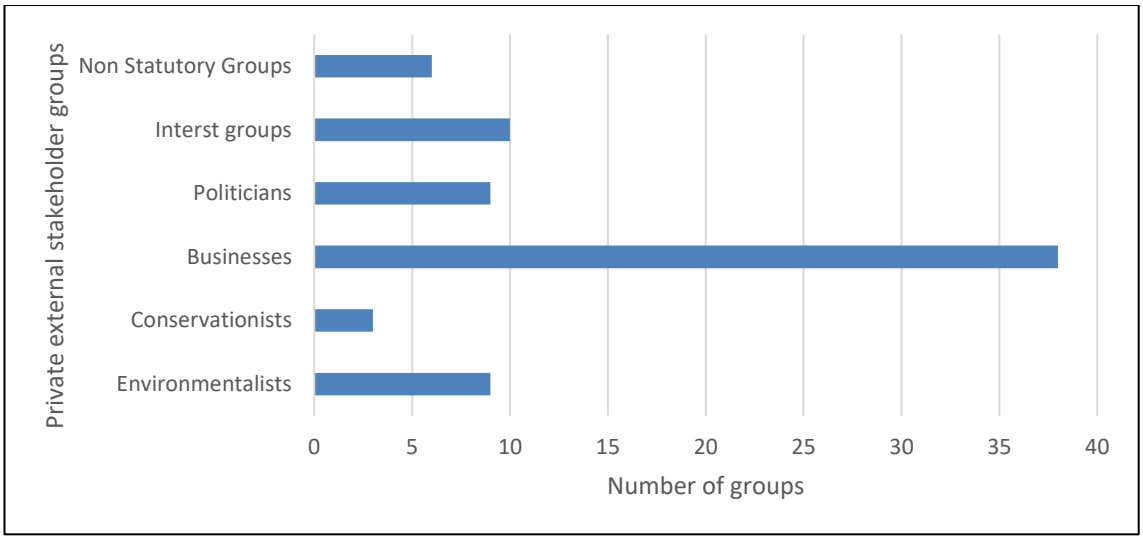

Figure 6-6 Private external stakeholder groups involved in Crossrail project

Identifying and classifying the stakeholder groups who either were involved or expressed interest in Crossrail project reveals that the project had a huge effect on a wide range of stakeholders. The classification of these stakeholders shows the diversity of external stakeholder groups that the project management team had to deal with. It also facilitates the exploration of the involvement of these groups in the pre-design phase of Europe's

largest underground civil engineering infrastructure project, which is discussed in the following section.

6.3.2 The extent of external stakeholder involvement in the pre-design phase

This section explores external stakeholder involvement in the pre-design phase of Crossrail project. It examines to what extent the external stakeholder groups identified in **section 6.3.1** were involved in the pre-design phase of the Fifteen Billion Pound project demonstrated in **section 6.2.** In order to do so, the author identified a theme of events called ‘events relating to external stakeholders’. The theme identifies key events that are related to external stakeholder groups and their management during the development of the project. This includes, but is not limited to, stakeholder consultation, public consultation, stakeholder communication, discussions, disputes and conflicts between the project management teams and the projects external stakeholder groups. The ‘events relating to external stakeholders’ theme was derived from data from **Appendix N** (on events relating to external stakeholders in Crossrail project).

The ‘events relating to external stakeholders’ theme was then mapped onto the ‘key events and milestones in the project’ theme discussed in **section 6.2**. The purpose of this mapping was to produce a project time line in order to visualise external stakeholder involvement in the development of Crossrail project. This reveals when external stakeholder groups had the chance to get involve in the pre-design phase of the Fifteen Billion Pound railway project. The extent of external stakeholder involvement in the pre-design phase of the project is illustrated in **Figure 6-7** and detailed in the text that follows.

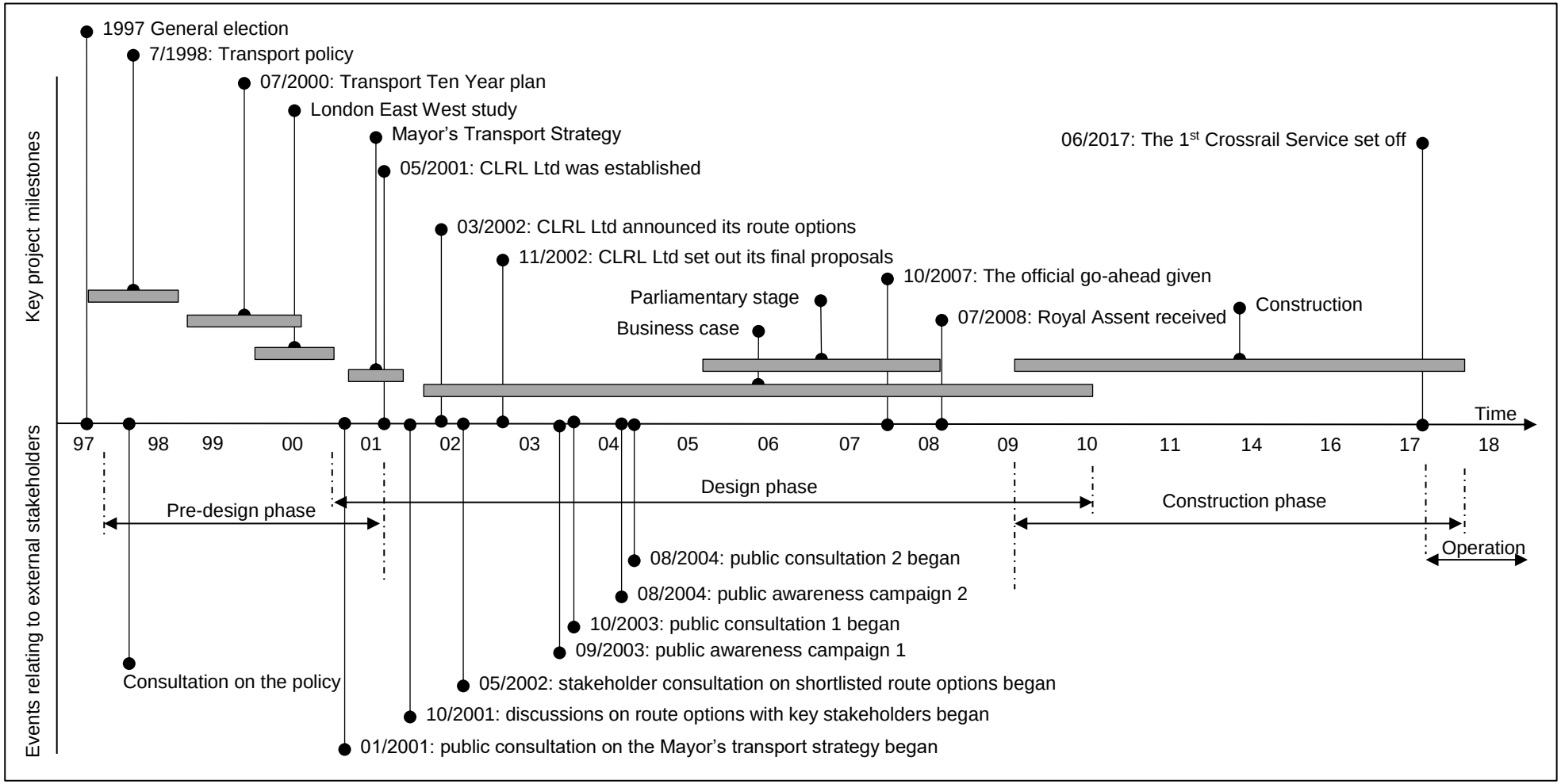

Figure 6-7 Crossrail project time line

As demonstrated in **section 6.2**, Crossrail project is not a new idea. The scheme was given the green light by the UK government in 1990, but suffered a major setback in 1994 when a parliamentary Select committee rejected a Private Bill seeking powers to construct the project. Although the Bill was rejected, the idea of Crossrail was not forgotten.

The Labour's 1997 election manifesto (Labour Party, 1997) stated its intention to develop an integrated transport policy to tackle the problems of congestion and pollution at national, regional and local level. This suggests that the need for a new transport policy was identified by the Labour party in their 1997 manifesto. The 1998 Transport White Paper (Department of the Environment; Transport and the Regions, 1998) (policy), in which the need for an integrated transport system was articulated, emerged from the labour's 1997 manifesto. However, discussions in Chapter 3 **section 3.6.2** suggest that drafting a manifesto is a purely party political matter and external stakeholders have no role in the process. The main sources of the specific proposals presented in the manifesto are from the politicians themselves, their political advisers and party employees (Waller et al., 2008). Therefore, it can be argued that the need for a new transport policy was identified by the labour party outside government departments involving the party's politicians, employees or political advisors.

Once they took office in May 1997, the Government began a review of rail regulation (Butcher, 2010). In July 1998 the then Deputy Prime Minister, John Prescott, published a transport White Paper (Department of the Environment; Transport and the Regions, 1998) fulfilling the government's manifesto commitment to create a better, more integrated transport system to tackle the problems of congestion and pollution. The need for a new integrated transport system (nature of a solution) was identified in this government policy. This is in line with discussions in Chapter 2 **section 2.5** which suggest that infrastructure needs are often identified in public policies.

As a manifesto-driven policy, the 1998 White Paper (Department of the Environment; Transport and the Regions, 1998) was produced within the core executive. The stakeholders involved in drafting this policy were those who could exercise choice. These were The Prime Minster, senior ministers (secretaries of state), junior Minsters, senior civil servants and special advisors. These stakeholders are part of a network of key institutions which also constitute the core executive. These key institutions are The Prime Minister's Office, The Cabinet Office, government departments, The Cabinet and The Parliament. The policy was then subject to consultation with external stakeholders from 21 August to 14 November 1997. This consultation took place after the policy had already be drafted. This is in line with discussions in Chapter 3 **section 3.6.2** which suggest that

although public policies undergo public consultation and parliamentary scrutiny, the detailed formulation of a policy occurred inside the government departments. The purpose of the consultation is often to seek views on the need for development of infrastructure projects and the government's proposed policy to address that needs.

The *new deal for transport* policy (Department of the Environment; Transport and the Regions, 1998) triggered the government's Transport Ten Year Plan 2000 (Department for Transport, 2000). The Transport Ten Year Plan is a ten-year route map towards the goals the Labour government set in its election manifesto (Labour Party, 1997) and the Integrated Transport White Paper (Department of the Environment; Transport and the Regions, 1998). It presents an ambitious vision of what they wanted to achieve by 2010. The Ten Year Plan was designed to deliver the Government's priorities at the time: reduced congestion, better integration, and a wider choice of quicker, safer, more reliable travel on road, rail and other public transport. The Plan proposed Crossrail to deliver a 15% increase in total national rail and Underground seats into central London. The Plan was published in July 2000, and was carried out by a Task Force led by the then Minster for Transport Gus Macdonald (Department for Transport, 2000).

When the Transport Ten Year Plan was published, the shadow Strategic Rail Authority (sSRA) was carrying out a review of the issues relating to rail travel on an East West axis across London. The sSRA was commissioned by the then Deputy Prime Minister in December 1999, and published its report London East West study (Strategic Rail Authority, 2000) in November 2000. The study was carried out by the sSRA, Transport for London (TfL), Railtrack and London Underground (LU). It should be noted that the study was carried out solely within the four railway organisations directly responsible for the railway network in London and the Department for Transport (DfT) as confirmed in an interview with a project management team member from within CLRL Ltd (Int-CLRL-121214-FW1). London East West study strongly recommended taking Crossrail project into the definition stage.

Following the publication of London East West study and the government's Transport Ten Year Plan 2000, the Mayor of London published his draft transport strategy entitled "*The Mayor's Transport Strategy: Draft for public consultation"* on 11 January 2001. The Mayor's strategy had Crossrail in it. The draft strategy was subject to extensive public consultation from January to March 2001. Consultation closed on 30 March 2001 (MORI and Greater London Authority, 2001). The consultation process included: circulating a publicity leaflet to London's households, widely distributing a consultation document and questionnaire, and organising and facilitating a series of consultation meetings with a range of stakeholder groups across London (Greater London Authority, 2001).

External stakeholder groups were asked to rate the importance ten transport priorities and eleven approaches to making improvements in different areas of transport in London given in the draft Transport Strategy. One of these approaches was “construct new rail lines, new Thames crossings in east London, and new high quality tram or guided bus schemes”. Crossrail was presented as one of the major proposal to increase rail capacity in central London. In this public consultation, external stakeholder groups were asked to rate their level of agreement with the mayor’s approaches for improvements. This suggests that external stakeholders were asked to endorse the Mayor’s proposals for transport improvements in London rather than to contribute to the development of those proposals. External stakeholder groups were only able to comment or express views on what was meant to solve their transport problems.

A month after the public consultation on the Mayor’s draft Transport Strategy and even before the final strategy was published, the Government announced that work would commence immediately on project definition and design development of the tunnel section of Crossrail. Essentially, this was confirmed in a written answer (HC Deb, 03 May 2001) by the then Secretary of State for the Environment, Transport and the Regions to the House of Commons at the time stating that:

> *Work will start immediately on project definition and design development of a central, cross-London rail link, the tunnel section of which could follow the alignment of the CrossRail scheme. The work will look at alternative service patterns and access to Heathrow. This will lead to a recommendation on the option to be taken forward … This work will be taken forward jointly by the Strategic Rail Authority and Transport for London.*

Therefore, in the context of the present research the establishment of CLRL Ltd makes the end of the pre-design phase of Crossrail project. The project, at least as we know it today, had its root in a government policy - A *new deal for transport: better for everyone* (Department of the Environment; Transport and the Regions, 1998). This is because this policy identified the need for the project which the author considers to be the beginning of the pre-design phase. The need for Crossrail was then articulated in the government’s Transport Ten Year Plan (Department for Transport, 2000), confirmed by the London East West study (Strategic Rail Authority, 2000) and boosted by the Mayor’s transport strategy (Greater London Authority, 2001), **Figure 6-8**.

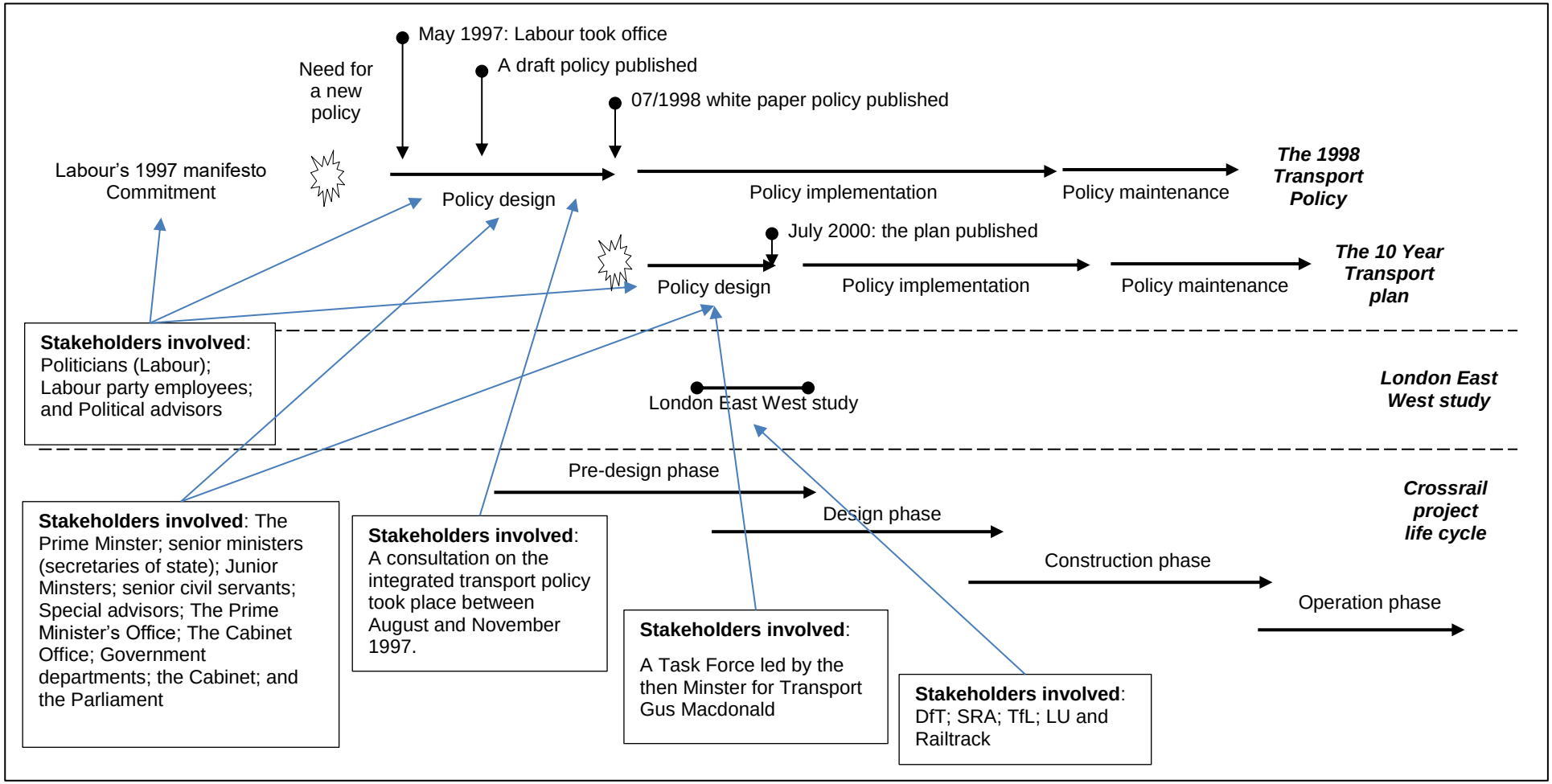

Figure 6-8 External stakeholder involvement in the identification process of Crossrail project

Because the 1998 White paper (Department of the Environment; Transport and the Regions, 1998) and the 10 Year Transport Plan (Department for Transport, 2000) were both manifesto-driven-policies, drafting them was a purely party political matter and external stakeholders had limited role in the process. Although the design stage of the policies involved civil servants and the UK parliament, the main sources of the specific ideas presented in the policy are from the Labour politicians themselves, their political advisers and party employees. This suggests that the identification of the need for a solution and identification of the nature of the solution were purely party political matters carried out by the Labour party's politicians, their political advisers and party employees.

The pre-design phase of Crossrail project (solution) was also embedded in the London East West study (Strategic Rail Authority, 2000). The study identified the need for Crossrail to provide significant additional passenger capacity across Central London. However, the study was carried out with limited external stakeholder involvement. It was carried out solely within the four railway organisations directly responsible for the railway network in London and the Department for Transport (DfT) as confirmed in an interview with a project management team member from within CLRL Ltd (Int-CLRL-121214-FW1).

Attention to external stakeholder groups was given after the establishment of CLRL Ltd (the end of the pre-design phase of Crossrail). CLRL Ltd developed a number of route options (corridors) based on the original Crossrail plan in the London East West Study. In autumn 2001, Crossrail Board agreed on the broad corridors in east and west London as a starting point for route selection. The company then derived a total of 19 service options for these corridors in order to assess their feasibility and impact (Crossrail, 2002).

The 19 option corridors were then subject to discussion with a wide range of key stakeholders and to a comprehensive assessment and sifting process over the period between October 2001 and February 2002. According to Crossrail (2007), these preliminary discussions introduced the local authorities and other key stakeholders to the project and the plans for consultation. It did not seek formal comment. Following this process, Crossrail Board concluded six corridors (the short list) should be taken to the next stage – appraisal (Crossrail, 2002).

The shortlisted options were then sent to stakeholders for consultation, but not to the wider public at this stage. Stakeholder consultation about the shortlisted options run from May to July 2002. CLRL Ltd issued a consultation document entitled *'Crossrail line 1: Stakeholder Consultation'* identifying the project's economic and planning objectives, short-listed options, the process and timescales for decisions and the sifting and

appraisal criteria to be used to select the preferred scheme. CLRL Ltd formally requested stakeholder views and comments. The consultation document (Crossrail, 2002, p.24) contains the following:

> *There are choices to be made on the routes for the Crossrail Line 1 project, and on issues such as the extent of services and the key interchanges. We would like your views on the options presented in this document.*
>
> *…Our aim is to provide the Crossrail line 1 scheme which represents best value for money, is feasible in both engineering and operational terms, and for which funding is possible. To achieve this we will need to justify why the project is necessary and to demonstrate its impact over a wide range of issues and areas.*
>
> *We would therefore welcome your views on the Crossrail Line 1 project as a whole, how important you think it is for London and the South East and what impact you think it will have on your particular area of interest. You may also wish to comment on our proposed appraisal framework.*
>
> *We will use your responses in the selection process to help determine the preferred route, and support the general case for the project.*

In an interview with a Crossrail project management team member, it was stated that the stakeholder consultation document was sent to the local authorities, representative organisations, such as English Heritage and English Nature, but not to the general public (Int-CLRL-121214-FW1). The purpose of this stakeholder consultation was to seek comments on the shortlisted options for the routes from stakeholders to help determine the preferred route for Crossrail, 151 responses were received (Crossrail, 2007).

Following the stakeholder consultation on a short-list of options, the Crossrail Environmental Scoping Report defining the proposed scope of the environmental impact assessment and setting out the general assessment methodology was sent to 95 consultees in September 2002. Comments relating to the proposed scope led to changes being made. The scope of the Environmental Impact Assessment was updated in March 2003 and detailed assessment methodologies were provided. 118 consultees were sent the report. Further comment was made about the scope and approach leading to further change (Crossrail, 2005).

Next, a Public Awareness Campaign took place between 8 – 29 September 2003 in which widespread advertising and leaflet distribution along the route introduced and broadly explained the proposals, asked for comment and announced the forthcoming Public Information Centres. This was followed by Public Consultation Round 1 from 27 October 2003 to 3 December 2003 which aimed at introducing the proposed route and destinations (ibid). Round 1 sought comments on the preferred route, destinations and stations. More than 7,200 individuals visited Crossrail information centres and over 2,800 responses were received (Crossrail, 2007) indicating a huge public interest in the project.

After the Public Consultation Round 1, a supplementary Public Awareness was held from 2 August to 24 August 2004. This was followed by a second round of public consultation which run from 25 August to 27 October 2004. The purpose of the Public Consultation Round 2 was to provide more detail about the proposals, present the results of Consultation Round 1 and the project's response to comment received (Crossrail, 2005).

Following the analysis of responses from the consultations , a Hybrid Bill (*Crossrail Bill*, 2005) was presented to Parliament in February 2005 to secure powers necessary to build Crossrail. The Bill was then scrutinised by committees in both Houses of Parliament and eventually received Royal Assent in July 2008. Nearly 13 decades (1880-2009) after the idea of a new rail link across London was first mooted, Crossrail finally broke ground on 15 May 2009 at the site of a new Canary Wharf station (Crossrail, 2017). The first new state-of-the-art Elizabeth line train entered passenger service between Liverpool Street Main Line and Shenfield on the TfL Rail route on 22 June 2017, whereas the Elizabeth line will fully open in December 2019 (Transport for London, 2017).

Taking into consideration the present research's definition of the pre-design phase which states that the pre-design phase is the first phase of a civil engineering infrastructure project life cycle which commences when the initial idea is conceived and proceeds to generate information, consolidate stakeholders' views and positions, and arrive at the final decision as to whether or not to finance the project (Williams and Samset, 2010; Samset, 2009). Thus, the pre-design phase of Crossrail project ended when CLRL Ltd was established in 2001.

Although CLRL Ltd carried out extensive stakeholder consultations about the project, all CLRL Ltd's consultations took place at a stage where external stakeholders could merely comment/express views on the project. External stakeholders were consulted after the project had already been identified. When external stakeholder groups were consulted, the government had already given the project the go ahead.

The foregoing paragraphs suggest that external stakeholder groups were merely informed about the project proposal during the pre-design phase of Crossrail project – the phase before the establishment of CLRL Ltd. The pre-design phase of Crossrail project was embedded in government transport polices, studies and strategies. This meant that this process was carried out within the core executive with limited input form external stakeholders. It also means that there is a lack of an overarching approach for the pre-design phase that enables effective external stakeholder involvement.

The analysis of the data from **Appendices K** and **N** (which involved mapping the two themes of events onto a time line) clearly shows a time lag between the start of the pre-

design phase and the beginning of external stakeholder involvement in the project. Plotting the two themes of events on the same time line reveals that external stakeholder groups had limited inputs into key aspects of Crossrail project defined during the pre-design phase – the phase prior the establishment of CLRL Ltd.

Taking into consideration the present research's definition of the pre-design phase, only one public consultation took place during this phase. It was the public consultation about the Mayor's transport strategy ran from January to March 2001. This consultation sought stakeholder views on the mayor's proposals for improving transport network in London. Crossrail was one of the proposal presented in the strategy.

Stakeholder consultations about Crossrail project were actually carried out by CLRL Ltd, and took place during the design phase of the project after CLRL Ltd had already identified its preferred route options. The purpose of the consultations carried out by CLRL Ltd about the project was to seek views and comments on the project proposal to contribute to the final route designs. This suggests that external stakeholder groups had limited input into the pre-design phase of Crossrail project when they had the chance to do so. The implication of this is that positive external stakeholder inputs into key aspects of the project defined before the establishment of CLRL Ltd (during pre-design phase) may have been overlooked, thereby compromising the effectiveness of external stakeholder involvement in the pre-design phase. This underpins the need for an overarching approach that enables effectiveness of external stakeholder involvement in the project identification process of civil engineering infrastructure projects.

This section examined the extent of external stakeholder involvement in the identification process of Crossrail project. This was done based on empirical data obtained from project management team members from within the project and from other documentary sources. The following section, by contrast, examines the external stakeholder involvement in problem identification during the identification phase of Crossrail.

6.4 Case study practice of problem identification

This section examines the extent of external stakeholder involvement in the identification process of problems to be addressed by Crossrail project. The section identifies the problems that are meant to be addressed by Crossrail project, and then identifies those who were involved in the identification of those problems. In identifying the problems, the author searched for evidence and coded where it is stated/perceived/understood that a specific problem is meant to be addressed by the project, **Figure 6-9**.

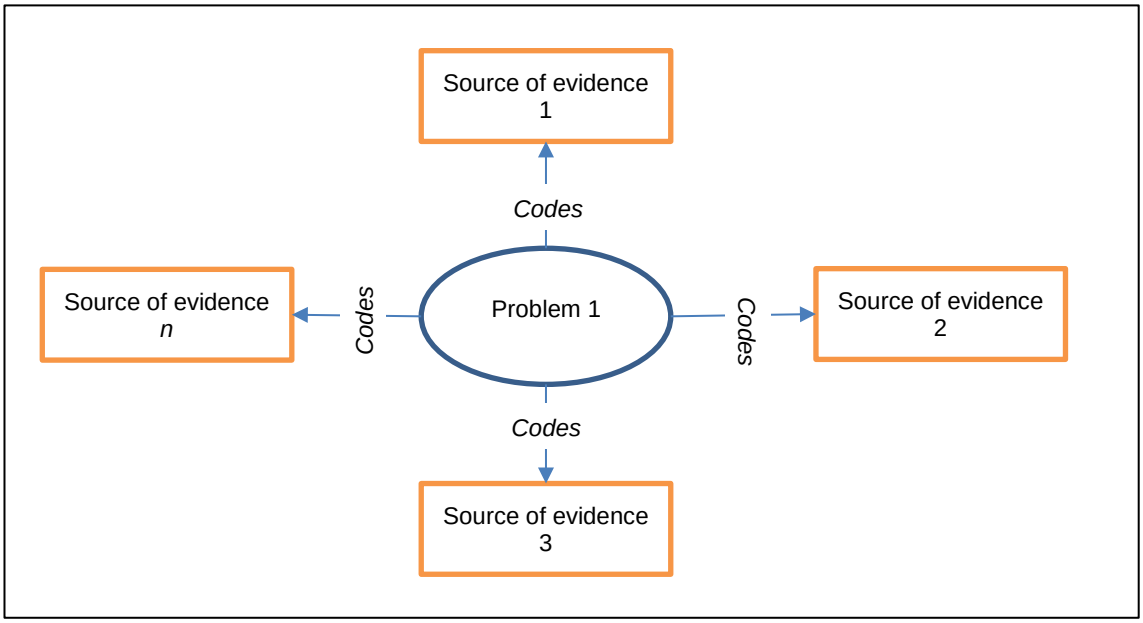

Figure 6-9 Problems coding procedure

The identified problems are then analysed in order to find out how they related to each other, and to identify if they pertain to an overarching problem. The section then explores the extent of external stakeholder involvement in defining those problems.

6.4.1 Problems to be addressed by the project

Data obtained from a comprehensive review of publicly available documents and an interview with two project management team members from within Crossrail project shows that the problem Crossrail project is meant to address comprises different elements, as illustrated in **Table 6-2**.

Table 6-2 Overarching problem to be addressed by Crossrail project

Overarching problem	***Main elements***	***Basic elements***
Discomfort and inconvenience of rail travel to, from and across central London	Journey times	Accessibility Connectivity
	Overcrowding	Overcrowded trains Overcrowded stations Overcrowded termini
	Congestion	Road traffic congestion
	Capacity	Future demand Government policy

The author found that the overarching problem Crossrail project is built to deal with is the discomfort and inconvenience of rail travel to, from and across central London. It was also found that the overarching problem pertains to four problems. These four problems are referred to in the present research by the main elements of the overarching problem. These are

- journey times,
- overcrowding,
- congestion, and
- capacity.

Each of the four problems are discussed in more details below.

6.4.1.1 Journey times

Case study evidence from **Appendix O.1** shows that Crossrail is meant to reduce journey times through improving accessibility and connectivity by reducing the need for interchange for British Rail (BR) passengers coming to/crossing central London. Improving accessibility and connectivity for British Rail passengers travelling to, from and across central London are the means through which Crossrail project would bring about journey time improvements.

The accessibility problem is twofold: reaching central London without transferring to another type of transport and improving access to Heathrow Airport. The intention of improving accessibility for BR passengers is to improve the comfort and convenience of rail travel to, from and across central London. In contract, improving access to Heathrow aims to provide additional link between the City and Heathrow Airport in order to reduce the traffic in the area of Heathrow. This would also contribute to the comfort and convenience of rail travel to, from and across central London.

Connecting railway services on either side of central London is perceived as an issue deteriorating the convenience of rail travel to/across London. Connecting central London termini and British Rail Systems East and West London was identified as means through which journey times for BR passengers can be improved. Improving connectivity by providing direct links across the central area suggests that the intention is to improve the comfort and convenience of rail travel to, from and across central London.

6.4.1.2 Overcrowding

Case study evidence presented in **Appendix O.2** reveals that overcrowding is another problem that Crossrail project is meant to address. This includes overcrowded trains, stations, platforms, termini and the underground network during peak times. Overcrowded trains, platforms and termini in central London were identified in the London East West Study (Strategic Rail Authority, 2000). The study links overcrowding with passenger discomfort, and links this discomfort with the economic growth of London. It suggests that overcrowding limits the number of journeys made by rail, and leads to suppression of demand. It also considers overcrowding as a cause of discomfort and inconvenience of rail travel, which undermines London's growing economy.

6.4.1.3 Traffic congestion

Evidence presented in **Appendix O.3** illustrates that Crossrail project is also meant to deal with traffic congestion problems. Road traffic congestion is identified in London East West Study (Strategic Rail Authority, 2000), and was linked to the passenger discomfort caused by overcrowding. Congestion problems in this section refer to traffic congestion, congestion on transport network, on national rail and on tube networks in London. In 2000, some parts of the road system in London were more congested than the railways according to the London East West Study. The study identifies congestion problems during peak times on the rail network and on the roads to Heathrow Airport. In investigating the root causes of this problem, the study refers to the continued economic growth of London, but not to car ownership increase, for example. Car ownership increase, resulting from the availability of leisure money brought about by the economic growth of the city, probably contributed to traffic congestion.

6.4.1.4 Capacity problems

Case study evidence presented in **Appendix O.4** shows that Crossrail project is meant to provide additional capacity to cater for forecast increase in demand, and to meet government transport plan targets. Capacity of a rail route is governed by the number and capacity of trains which can pass along the route in a given time (Greater London

Council and Department of the Environment, 1974). Capacity in terms of train movements and passenger flow is one of the problems that is meant to be addressed by Crossrail, and have been identified in London East West Study (Strategic Rail Authority, 2000).

London East West Study predicted that growth in peak period between 2000 and 2020 for National Rail Network travel in the South East would increase by 15%. Furthermore, there was the Government's 10 Year Transport Plan (Department for Transport, 2000) target to increase the national rail travel by 50% by 2010 (Strategic Rail Authority, 2000). This led to the need for addition capacity to provide acceptable standards of quality for London's rail passengers, and support the forecast growth in rail travel. Crossrail project was meant to provide for this needed capacity, and thus improve the comfort and convenience of rail travel to, form and across central London.

6.4.1.5 Comments about the problems

The identification of the problems that are meant to be addressed by Crossrail project demonstrates that different stakeholder groups perceived Crossrail project as a solution to problems. This is in line with the discussions and the author's argument made in Chapter 2 **section 2.2** that civil engineering infrastructure projects are, at best, solutions to problems, and identifying what problems exist within a community would help identify the right civil engineering infrastructure project(s) to tackle those problems.

The analysis of data from **Appendices O.1**, **O.2** and **O.3** reveals that the identified problems are related to each other and pertain to the same overarching problem (the discomfort and inconvenience of rail travel to, from and across central London). This suggests that if civil engineering infrastructure projects are accepted to be solutions to problems, they can be identified through a problem solving process.

This section demonstrated that Crossrail project was perceived a solution to problems. The next section, on the other hand, explores the extent of external stakeholder involvement in problem identification during the identification phase of the project.

6.4.2 The extent of external stakeholder involvement in problem identification

This section identifies who was involved in the identification of the problems to be addressed by Crossrail project. The limited external stakeholder involvement in project identification demonstrated earlier in **section 6.3.2** meant that external stakeholder groups had limited (if any) input into activities that led to the identification of the need for Crossrail project. This would include problem identification, if any problem analysis was

ever done. In seeking to identify who was involved in identifying the problems to be addressed by the Fifteen Billion Pound project, the author looked at the project identification process of Crossrail project (demonstrated in **section 6.2**) in order to find out whether problem analysis was carried out during the identification phase of the project.

The author found that the Labour's 1997 election manifesto identified infrastructure problems at a national level. The manifesto contains that Britain's infrastructure is dangerously run down: parts of our road and rail network are seriously neglected, and all too often our urban environment has been allowed to deteriorate (Labour Party, 1997). However, the identification of these issues was a purely party political matter and external stakeholders have no role in the process. The 1998 White paper, a *new deal for transport*, (Department of the Environment; Transport and the Regions, 1998) also identified infrastructure challenges at a strategic level, however this was also a purely party political matter and external stakeholders have limited role in the process. The policy was drafted within the core executive, and then was subjected to stakeholder consultation between 21 August and 14 November 1997 (ibid). The consultation was about the government's policy to address the problems identified by the government. This is in line with discussions in Chapter 3 **section 3.6.2** which suggest that there is a limited external stakeholder involvement in the development of the public policy (external stakeholders are involved after the policy has already been drafted), therefore limited external stakeholder involvement in the identification of infrastructure needs/projects often articulated in those polices.

The author also found that transport problems in the UK's capital city were identified in the London East West study (Strategic Rail Authority, 2000) in which the need for Crossrail in London was revived. London East West study sets out the issues such as network capacity, congestion and growth. The identification of these problems was carried out by the organisations involved in the production of London East West study. These are the sSRA, TfL, Railtrack, LU and DfT. It should be noted the identification of the issues was based on information and data held by these organisations. In an interview with a project management team member from within CLRL Ltd (Int-CLRL-121214-FW1) it was confirmed that the study was carried out solely within the four railway organisations. This suggests that there was limited (if any) external stakeholder involvement in the identification of the problems Crossrail project is meant to address.

The author acknowledges that the Mayor's transport strategy identifies transport problems to be addressed by Crossrail project and other major projects proposed by the Mayor at the time. However, it should be noted that external stakeholder groups were

consulted about the Mayor's top priorities and approaches to meet those priorities, but not about the problems identified in his transport strategy. This suggests that those problems were actually identified and defined solely from the Mayor's perspective (obviously presented by TfL). External stakeholder groups were asked to endorse proposal to address those problems, with limited contributions to the identification of the problems. This informs the need to redesign the project identification process in order to enable infrastructure developers and affected stakeholders to get involved in problem solving process as a means for identifying, developing and delivering civil engineering infrastructure projects. This would be in line with discussions in Chapter 3 **section 3.3** (on why external stakeholders matter).

6.5 Summary of practice

The examination of the extent of external stakeholder involvement in the pre-design phase of Crossrail project reveal that:

- The pre-design phase of Crossrail project had several false starts.
- The pre-design phase of Crossrail project, at least as we know it today, began during the design stage of a public policy (Department of the Environment; Transport and the Regions, 1998), and was embedded in the development of a local transport study (Strategic Rail Authority, 2000) and a mayoral transport strategy (Greater London Authority, 2001).
- The identification process of Crossrail project was to some extent a political matter, as the project was a government means to deliver a government policy.
- There was limited external stakeholder involvement in the pre-design phase of Crossrail project – before the establishment of CLRL Ltd.
- There was a time lag (delay) between the start of the pre-design phase (during the design stage of the 1998 Transport policy) and beginning of external stakeholder involvement (after CLRL Ltd was established).
- The time lag prevented external stakeholder groups from having input (if any) into key aspects of the project defined before the establishment of CLRL Ltd.
- Attention was given to external stakeholders after the need for the project is identified and preferred options had already been specified.
- Consultations with external stakeholders on Crossrail project started after CLRL Ltd had already identified its preferred route options.
- The purpose of consultations was to raise awareness of the project proposals, and seek stakeholder comments about the route options.

- Although Crossrail project was perceived as a solution to transport problems in Edinburgh, there was a lack of external stakeholder involvement in a problem solving process during the project identification phase.

As a consequence, it can be argued that the pre-design phase of Crossrail project (the project phase prior to the establishment of CLRL Ltd) was carried out with limited external stakeholder involvement. External stakeholder groups were merely asked to support a proposal that suited the project promoter/developer rather than engaging in the project identification process of the project. The implications of this insufficient project external stakeholder involvement could have been a misalignment of project purpose with external stakeholder expectations which, in turn, could have limited the project success. The implications could have been similar to the examples provided in Chapter 3 **section 3.3** on the negative impact external stakeholders could have upon a project. As a consequence, any improvement sought needs to consider recommendations for improvement of the effectiveness of the pre-design phase through the means of effective external stakeholder involvement in project identification. This suggests that an overarching, systematic approach for project identification is desirable.

6.6 Chapter summary

This chapter has examined the extent of external stakeholder involvement in pre-design phase of Crossrail project. The findings from the empirical study of Crossrail project illustrated weaknesses in the pre-design phase of Crossrail project resulted from insufficient external stakeholder involvement in project identification. The chapter showed that external stakeholder groups had limited (if any) input into key aspects of Crossrail project defined during the pre-design phase (before the establishment of CLRL Ltd). This informs the need for improving the effectiveness of the pre-design phase through the means of effective external stakeholder involvement in project identification.

Chapter 7 A Proposed Project Identification Process for Civil Engineering Infrastructure Projects

Critical discussion of the empirical evidence presented in chapters 5 and 6 showed that there is a need to improve the effectiveness of the pre-design phase of civil engineering infrastructure projects in order to facilitate the alignment of project purpose with external stakeholder expectations. In this chapter, therefore, the author presents a new proposal for improvement. The proposal takes into consideration recommendations made in the previous chapters on the importance of external stakeholder involvement in the project identification process of civil engineering infrastructure projects, and on the need for infrastructure developers and external stakeholders to get involved in a problem solving process as a means to identifying infrastructure needs. This chapter is detailed as follows:

- Section 7.1, ‘Development of a new approach for project identification’, presents the rationale for the new project identification approach, and describes the development of the new proposal for project identification;
- Section 7.2, ‘Elements of the proposed two-stage process’, describes the steps in the proposed process;
- Section 7.3, ‘The two-stage process and existing project management frameworks’, provides arguments for the two-stage process in the context of existing project management frameworks; and
- Section 7.4, ‘Chapter summary’, provides a conclusion to this chapter.

7.1 Development of a new approach for project identification

This section demonstrates the development of a new approach for project identification. The section presents the rationale for a new project identification approach for improving the effectiveness of the pre-design phase of civil engineering infrastructure projects, and describes the method used to bring about the required improvement.

7.1.1 The need for improvement

The findings from the two cases showed that the pre-design phase in the two projects began during the design stage of a public policy and continued through the subsequent stage of policy implementation at which it finished. Across case analysis revealed that the seeds of ETN and Crossrail projects were planted in government policies. The government policies, in turn, had their roots in the 1997 Labour election manifesto (Labour Party, 1997).

The analysis of the implementation of the pre-design phase of ETN project (Chapter 5 **section 5.2**) and Crossrail project (Chapter 6 **section 6.2**) showed that the project identification process of the two projects was to some extent a party political matter, as the projects are a government means to deliver a government policy. The project identification process of the two projects was embedded in government transport polices, studies and strategies. This meant that this process was carried out within the core executive with limited input from external stakeholders, **Figure 7-1**.

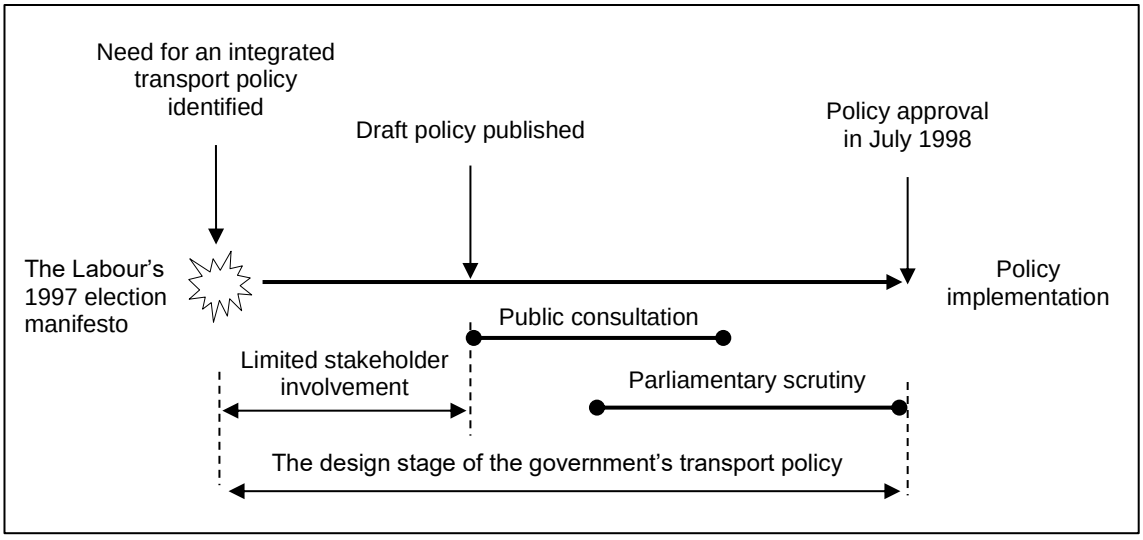

Figure 7-1 External stakeholder involvement in the development of the government's 1997 integrated transport policy

The examination of the extent of external stakeholder involvement in the pre-design phase of the two projects (discussed in Chapter 5 **section 5.3** and Chapter 6 **section**

6.3) revealed limited external stakeholder involvement in the project identification process. This suggested the need for improving the effectiveness of the pre-design phase through the means of effective external stakeholder involvement in the project identification process.

The cross case analysis showed that in the two cases during the pre-design phase external stakeholder groups were merely informed about the project proposals. It showed that attention was given to external stakeholder groups after the project promoters have developed their proposals. This resulted from performing the project identification and external stakeholder involvement processes separately. This independency led to a time lag between the start of project identification and beginning of external stakeholder involvement in the two projects, **Figure 7-2**.

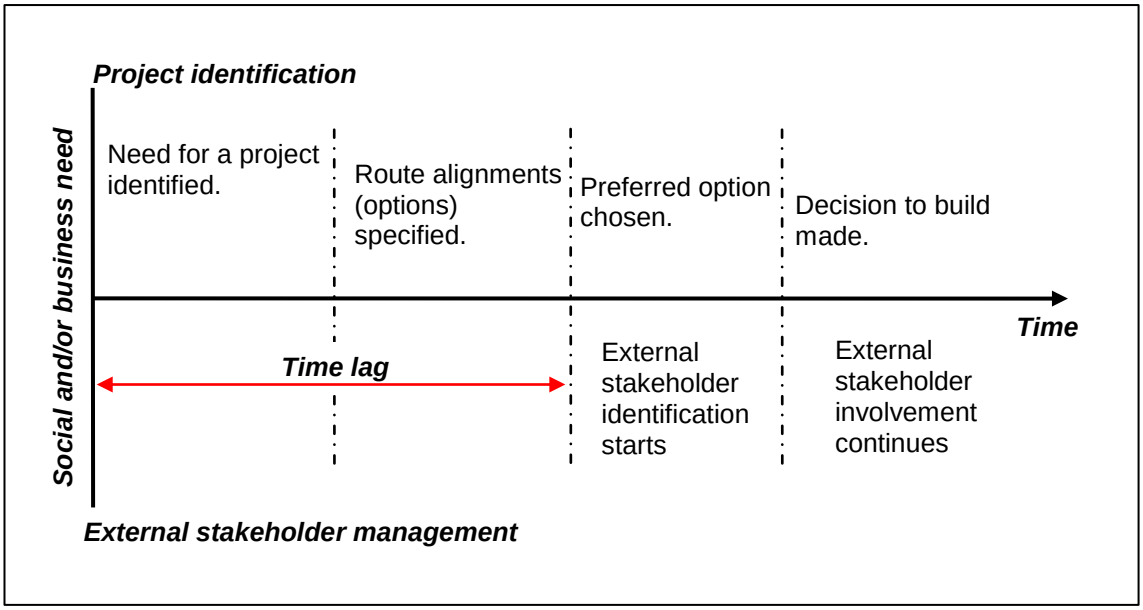

Figure 7-2 The time lag between project identification and external stakeholder identification processes

The time lag prevented external stakeholder groups from have input into key aspects of the projects defined during the project identification processes. The implication of this is that positive external stakeholder inputs into key aspects of the projects defined during the project identification process may have been overlooked, thereby compromising the effectiveness of external stakeholder involvement in the projects. This underpins the need for an overarching approach that enables effective external stakeholder involvement in the identification process of civil engineering infrastructure projects.

Furthermore, discussions in Chapter 2 **section 2.2** demonstrated that civil engineering infrastructure projects are at best solutions to problems, and suggested that if these projects are accepted to be solutions to problems, they can be identified, developed and

delivered through a problem solving process. This is supported by findings from the two cases which showed that both projects were perceived by different stakeholder groups as a solution to problems. However, the findings from the empirical evidence (discussed in Chapter 5 **section 5.4** and Chapter 6 **section 6.4**) indicated a lack of proper problem analysis during the pre-design phase of the two cases, although discussions in Chapter 2 **section 2.2** clearly demonstrated that identifying what problems to address would help ensure the identification of the right civil engineering infrastructure project to address those problems.

As a consequence, any improvement sought needs to consider recommendations for effective external stakeholder involvement in problem solving process during the pre-design phase of civil engineering infrastructure projects. The next section, by contrast, describes the method used to bring about the required improvement.

7.1.2 Method

This section presents the development of the author's proposal for improvement based on the method described in Chapter 4 **section 4.4** - a desk study. The empirical evidence presented in **Chapters 5** and **6** showed that there is a need to improve the effectiveness of the pre-design phase of civil engineering infrastructure projects in order to facilitate the alignment of project purpose with external stakeholder expectations.

The findings from the two empirical studies showed any improvement sought needs to consider recommendations for effective external stakeholder involvement in problem solving process during the pre-design phase of civil engineering infrastructure projects. Therefore, a desk study involving a review of two problem solving process models (Proctor, 2010; Bransford and Stein, 1993), and a comparison of the steps in these models with the project phases in the generic civil engineering infrastructure project life cycle (Chapter 2 **section 2.4**) was conducted. The purpose was to show that if civil engineering infrastructure projects are viewed as solutions to problems, the project life cycle can be mapped onto a problem solving process. Ideas in these models were then adapted and incorporated into the project identification process. This is supported by discussions in Chapter 2 **section 2.2** which suggested that identifying what social/economic problems exist within a community would help identify the right civil engineering infrastructure project to tackle these problems.

As demonstrated earlier in Chapter 2 **section 2.4**, the generic civil engineering infrastructure project life cycle comprises five generic phases:

1. Pre-design phase: the earliest phase in the project life cycle during which the need, opportunity or problem to be addressed is identified, the overall feasibility of the project is considered and a preferred solution identified (Association for Project Management, 2006);
2. Design phase: evaluates the preferred solution and options to meet that solution, and prepares implementation plans for the project (Association for Project Management, 2006);
3. Construction phase: the actual work of the project is performed. Materials and resources are procured and transformed into the intended project result (Chapman and Ward, 2003);
4. Operation phase: period when the completed deliverable is used and maintained in service for its intended purpose (British Standards Institution, 2000b); and
5. Disposal phase: the disposal of such deliverables at the end of their life (ibid).

The two problem solving models considered in the present research are best discussed in Proctor (2010) and Bransford and Stein (1993), though the following paragraphs outline the steps followed in each model and explain them briefly.

Bransford and Stein (1993) proposed a model for problem solving in which components are represented by the acronym IDEAL, where:

I = **Identify** problems and treat them as opportunities to do something creative;

D = **Define** goals in the problem situation;

E = **Explore** possible options/strategies to solving the problem;

A = **Anticipate** possible outcomes and then Act on that strategy; and

L = **Look** at the actual effects of your strategy/option and Learn from the experience.

According to Bransford and Stein (1993), problem identification is one of the most important steps in the problem solving process. Bransford and Stein argue that it is just as important to actively look for potential problems as simply to respond to them when they become critical or noticed (ibid). Defining goals often reflects how different people perceive the same problem. Therefore, defining the goals is a crucial step in moving towards a solution. Moving straight to the exploration of possible options without considering alternative goals often leads to difficulties in deciding which option to choose. Moreover, if goals have not been specified, generated options may not provide acceptable answers to a given problem.

Exploring possible options involves reanalysing goals and considering alternatives that might be implemented to achieve those goals. Following the selection of an option,

contingency plans should be made and the chosen option implemented. The last component of the IDEAL model is to look back at the effects of the implemented option and learn from the experience.

Proctor (2010), by contrast, proposed a creative problem solving process based on the IDEAL model consisting of six stages as follows:

1. define the problem area,
2. gather information,
3. define the problem correctly,
4. generate solutions to the problem,
5. evaluate and choose between possible solutions, and
6. implement chosen idea correctly.

According to Proctor, each stage involves activities that require first divergent thinking and then convergent thinking (ibid). In divergent thinking the task is to generate as many ideas and solutions as possible. Once an exhaustive number of ideas have been reached, convergent thinking takes place. The aim of this thinking is to focus on obtaining solutions to the problem based on the ideas from the divergent thinking.

The author argues that if civil engineering infrastructure projects are accepted to be solutions to problems, ideas of a problem solving process can be adapted and incorporated into the project identification process. In support of this argument, the author plotted the generic project life cycle to the two problem solving models, as illustrated in **Figure 7-3**.

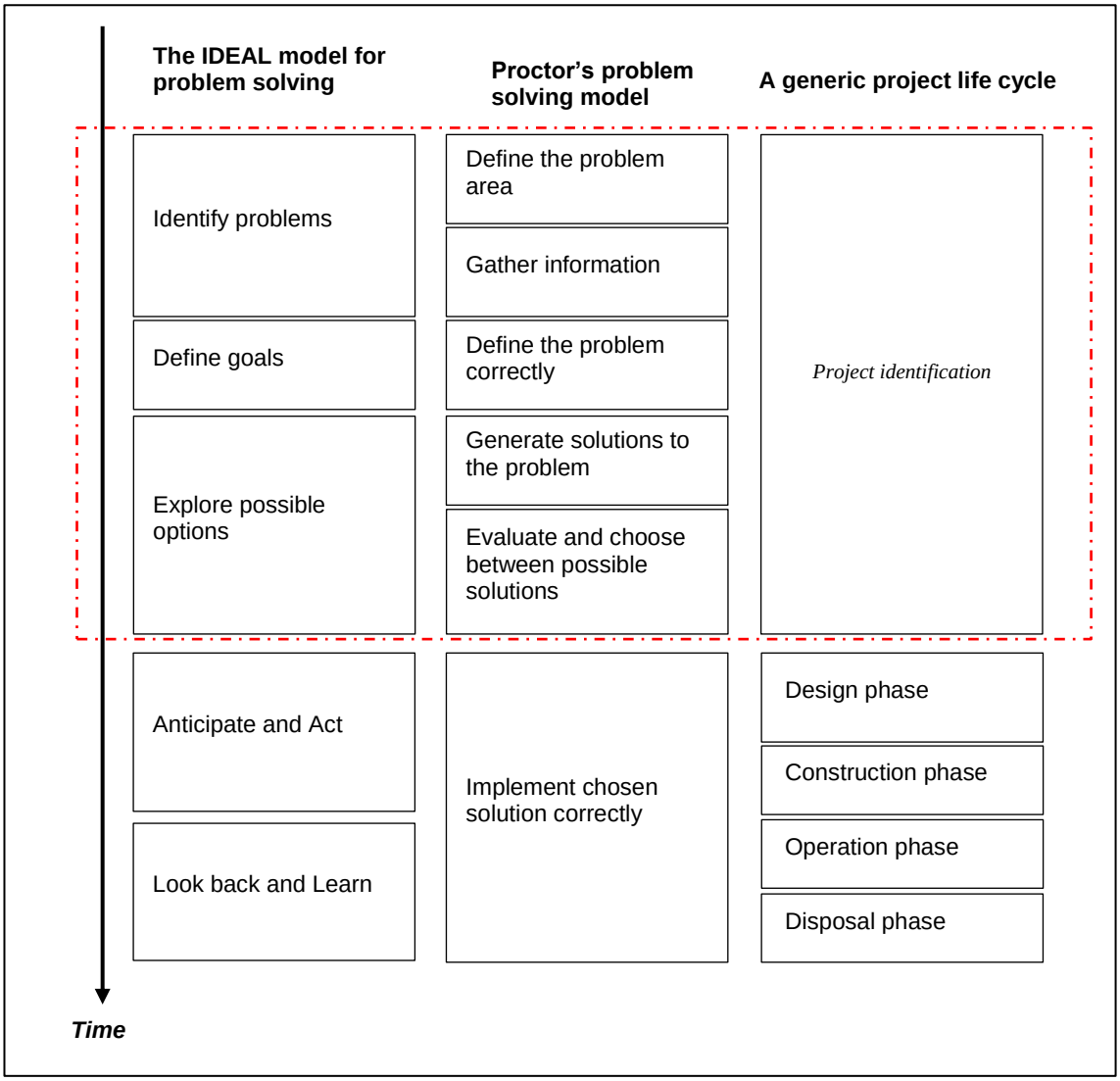

Figure 7-3 Civil engineering infrastructure project life cycle vs. problem solving process

In the context of the present research, the pre-design phase is defined as the earliest phase in the project life cycle during which the need, opportunity or problem to be addressed is identified, the overall feasibility of the project is considered and a preferred solution identified (Association for Project Management, 2006). It includes all activities from the time the need is identified, until the final decision to finance the project is made. This suggests that the pre-design phase comprises two stages: project identification and feasibility, but not detailed design stages (Williams and Samset, 2010), and covers all informal and formal actions which led to the project design (Matinheikki et al., 2016).

Taking into account the definition above, the first three steps of the IDEAL model (Bransford and Stein, 1993) and the first five steps of Proctor's model (Proctor, 2010) map on the project identification process. These steps cover the identification of a need for intervention (problem), and an initial appraisal of potential solutions. Therefore, ideas in these steps were adapted and then incorporated into the project identification process

of civil engineering infrastructure projects. This resulted in a new problem solving process to identifying civil engineering infrastructure projects, as shown in **Figure 7-4**.

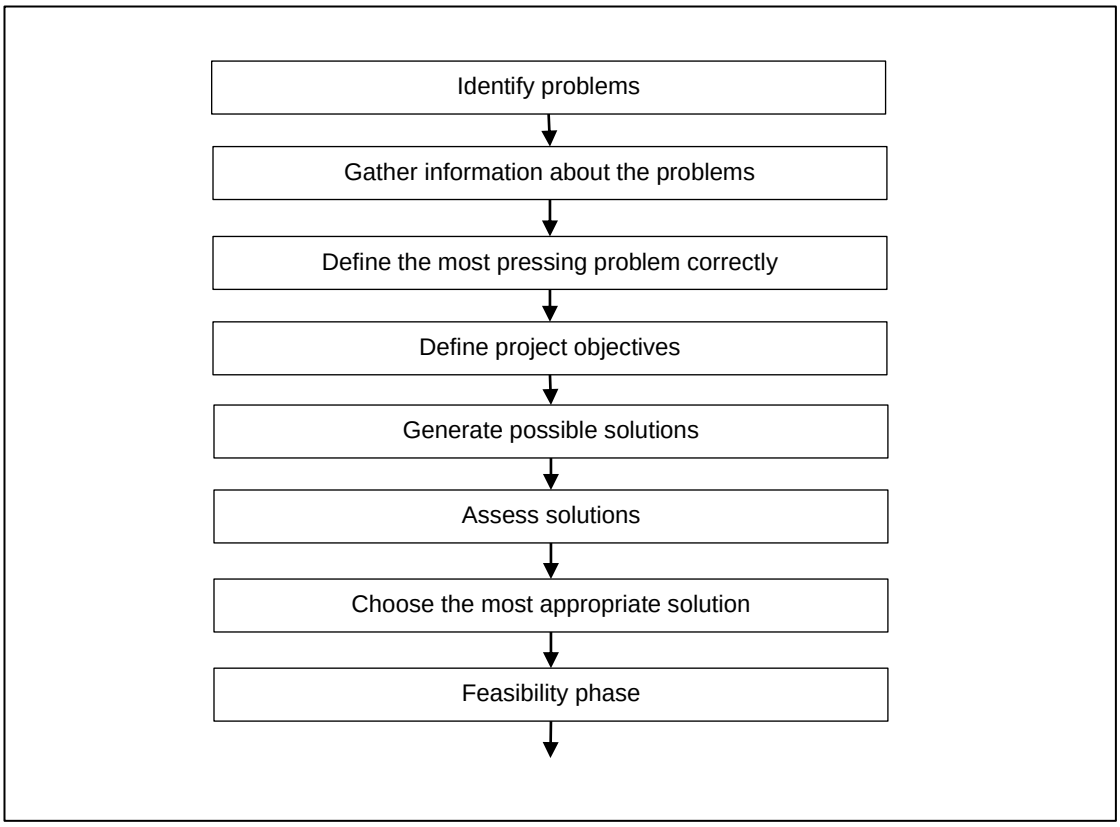

Figure 7-4 A proposed project identification process

In order to enable effective external stakeholder involvement in the new process, the author integrated the new process with the generic external stakeholder management process derived in Chapter 3 **section 3.5.2**. The integration of external stakeholder identification process with the new project identification process results in an integrated process for project identification, **Figure 7-5**. The integrated process brings together infrastructure developers and external stakeholders at a sufficiently early stage to first identify problems, and second to generate solutions assess them and then decide on appropriate solution to be taken to the feasibility stage.

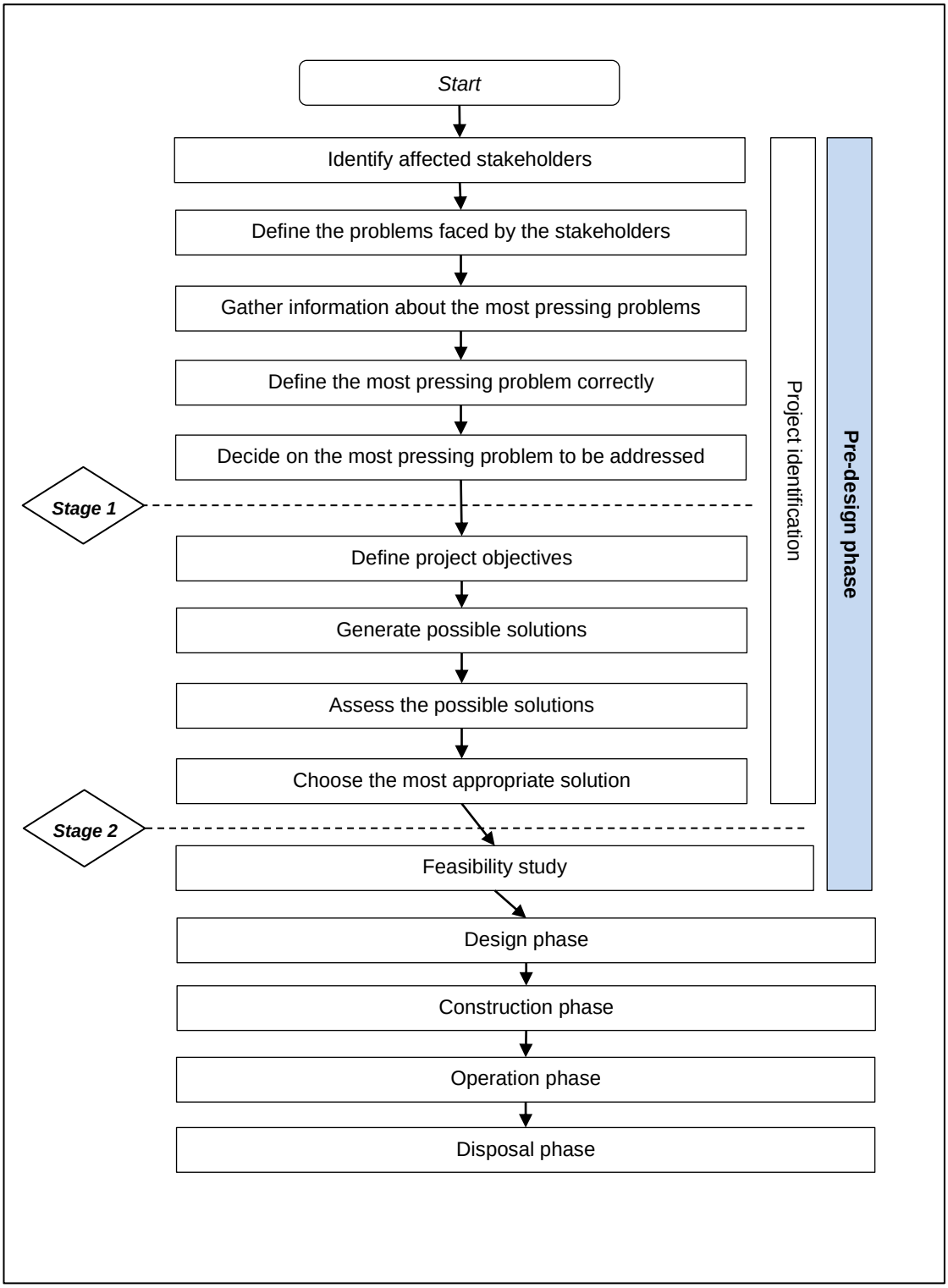

Figure 7-5 Proposed two-stage identification process for civil engineering infrastructure projects

The integrated process involves nine steps. These steps are grouped into two broad stages, namely problem definition and choice of a solution. The first stage seeks to identify problems, and the second stage aims at finding solutions to the problems. Because the second stage cannot commence until the first stage has completed, and because the overall success of the integrated process depends upon the success of the two stages, the integrated process is named a two-stage project identification process. The output of Stage 1 is a well-defined problem, while the output of Stage 2 is an appropriate solution(s) to be taken to the feasibility stage.

The two-stage identification process involves activities that require first divergent thinking and then convergent thinking. Divergent thinking is the thinking that moves away in diverging directions so as to involve a variety of aspects and which sometimes lead to novel ideas and solutions. The divergent thinking moves in different directions, sometimes searching, sometimes seeking variety (Guilford, 1959). It involves producing multiple or alternative solutions from available information (Cropley, 2006). Convergent thinking, by contrast, brings together information focussed on solving a problem. In convergent thinking the information leads to one right solution or to a recognised best or conventional solution (Guilford, 1959). This type of thinking (convergent thinking) is oriented towards deriving the single most appropriate solution to a clearly defined problem and, thus leaves no room for ambiguity (Cropley, 2006).

In the proposed two-stage project identification process, the divergent thinking should seek to generate as many ideas as possible. There should be no limits to the ideas formed during this thinking. Once a satisfactory level of ideas has been reached, convergent thinking must be used. The purpose of the convergent thinking is to focus on obtaining solutions to the problem based on the ideas from the divergent thinking. This is explained in the following section which discusses the elements of the proposed two-stage project identification process in detail.

7.2 Elements of the proposed two-stage process

Essentially, the proposed two-stage process divides the project identification process into nine distinct steps. These are grouped into two broad stages, namely problem definition and choice of a solution to be taken to the feasibility stage.

7.2.1 Stage 1: problem definition

In Stage 1, infrastructure developers (often governments/public sector organisations) would work closely and collaboratively in a spirit of openness and transparency with

external stakeholders/stakeholder groups who have relevant knowledge and interest in the infrastructure need/issue that is being considered. This collaboration, openness and transparency would enhance the developer's understanding of the infrastructure needs/problems where various stakeholders with different knowledge, stakes and values are involved (Head and Alford, 2015). Participating in this stage of the two-stage process should be voluntary. It is recommended that throughout the process infrastructure developers should consider the full range of people, businesses and stakeholders affected (Project Management Institute, 2017; British Standards Institution, 2010; Moodley et al., 2008; Association for Project Management, 2006; Young, 2006; Olander and Landin, 2005). The output of Stage 1 is a well-defined problem. This stage involves five steps as follows:

1. Identify affected stakeholders,
2. Define the problems faced by the stakeholders,
3. Gather information about the most pressing problems,
4. Define the most pressing problems correctly,
5. Decide on the most pressing problem to be addressed.

Each of these five steps is discussed in great detail in the following subsections.

7.2.1.1 Identify affected stakeholders

During this step infrastructure developers identify affected stakeholders using a variety of stakeholder identification techniques. Stakeholder identification should be carried out constantly throughout the process, and should identify those individuals and organisations who might have an interest in the infrastructure matter being considered, and gather as well as document relevant information about them (Project Management Institute, 2017; 2013). When identifying stakeholders, a greater understanding of each stakeholder/stakeholder group should be gained, and the importance of all of them to implementing the two-stage process determined (British Standards Institution, 2010). This is important because according to Warner (1984), problems and their corresponding solutions can be defined only within the context of the communities in which they exist.

Therefore, it is crucial to first identify the communities and the people who live in them before any attempts at generating solutions are made. This is supported by the consensus amongst project management scholars (Moodley et al., 2008; Young, 2006; Olander and Landin, 2005) and professional organisations (Project Management Institute, 2013; British Standards Institution, 2010; Association for Project Management, 2006) on the importance of the early identification of affected stakeholders.

In order to ensure comprehensive identification of as many affected stakeholders/stakeholder groups as possible, the author recommends the use of a combination of stakeholder identification techniques as suggested by Luyet et al. (2012). Previous studies have presented various stakeholder identification techniques. Mitchell et al. (1997), for instance, proposed a technique for stakeholder identification by taking into consideration the stakeholder's legitimacy, urgency and proximity. King et al. (1998) recommends the use of a specific identification technique, the snowball technique, in which a list of stakeholders is produced and is then submitted to one of the already identified stakeholders to add further stakeholders. Project Management Institute (2013) advocates the use of expert judgment in which judgment and expertise are sought from groups or individuals with specialised training or knowledge on the subject area.

Infrastructure developers need then to engage with the identified stakeholders upon their identification in order to build up relationships (Jing et al., 2011; British Standards Institution, 2010; Association for Project Management, 2006). The early identification of affected stakeholders enables infrastructure developers to gain greater understanding of the stakeholders' interests, demands and expectations (Project Management Institute, 2017; British Standards Institution, 2010; Association for Project Management, 2006). This is because developers will obtain information/knowledge on affected stakeholders from the stakeholders themselves, thereby basing their stakeholder engagement strategies on facts instead of assumptions. In this manner, decisions made by infrastructure developers in relation to managing affected stakeholders will be informed decisions. This shall also enhance the effectiveness of the subsequent steps in the two-stage process.

The main purpose of this first step is to produce a comprehensive list of affected stakeholders - a stakeholder register. The stakeholder register should contain all details related to the identified stakeholders including but not limited to: name, designation, organisation name and contact details (Project Management Institute, 2017). The stakeholder register should be used to trigger the next step of the process, and should also be updated constantly throughout the process.

7.2.1.2 Define the problems faced by stakeholders

Defining the problem to be addressed is probably the most important step in Stage 1 of the two-stage process, for unless the problem is already correctly defined it is unlikely that an effective solution can be found. Infrastructure developers need to engage with affected stakeholders upon their identification in order to identify the infrastructure problems faced by stakeholders. It is important to define the problems faced by the

stakeholders because what we often see according to Priemus (2010) is that lobby groups mobilising support for a project (solution) that may constitute opportunities to the developers, but neither solve the stakeholders' problems nor meet their expectations.

Engaging with as many affected stakeholders as possible at this stage in order to identify the infrastructure problems faced by the stakeholders is supported by the consensus amongst project management scholars (Li et al., 2012; Jing et al., 2011; Atkin and Skitmore, 2008; Bourne and Walker, 2006; El-Gohary et al., 2006) and professional organisations (Project Management Institute, 2013; British Standards Institution, 2010; Association for Project Management, 2006) on the importance of the early involvement of external stakeholders.

Identifying and defining the infrastructure problems faced by the stakeholders would enhance the analysis of stakeholders and problems in the next step (Proctor, 2010; Bransford and Stein, 1993). Therefore, the process of identifying problems needs to be clear, concise and focused. Affected stakeholders must be asked to identify the most pressing infrastructure problems which should be addressed.

The process of identifying the problems faced by stakeholders should allow sufficient time. Consulting for too long will unnecessarily delay the process (UK Cabinet Office, 2016). Consulting too quickly will not give enough time for consideration and will reduce the quality of defining the problems faced by stakeholders. During this step there is a need to collect information/data from the stakeholders in a format that will enable the identification of the most pressing problems. As a result, the author recommends infrastructure developers to draw up this exercises in line with the best practice guidelines for consultation (ibid). The developers should use the most appropriate approach to consult with affected stakeholders (Association for Project Management, 2012a; British Standards Institution, 2010). Examples of possible stakeholder engagement approaches including their strengths and weaknesses are presented in **Appendix P**.

The identified problems are then assessed to a level that they can be prioritised. Thus, ownership, priority and urgency of the problems should also be identified at this stage (Proctor, 2010; Bransford and Stein, 1993). The assessment of the problems should take into consideration the scale of the problem, how many stakeholders are affected by it, the impact of the problem on individuals and society as a whole. This enables the most pressing problems faced by the stakeholders to be identified, and paves the way for the next step of the two-stage process to commence.

7.2.1.3 Gather Information about the most pressing problem(s)

This step involves collecting information in order to enable proper stakeholder and problem analysis to be undertaken (Proctor, 2010; Bransford and Stein, 1993). Once the most pressing problem(s) have been identified, more information about them should be sought from the stakeholders. In this step, infrastructure developers seek views on the most pressing problem(s). This can be considered as a fact-finding mission in which infrastructure developers engage with affected stakeholders to collect relevant information about the most pressing problem(s). The purpose of this data collection is to increase the overall comprehension of the most pressing problem(s). For affected stakeholders, this early engagement means a chance to understand what issue/problem is being considered, to help define problems and to have their say in the process. For developers, engaging with affected stakeholders can provide vital local knowledge about the infrastructure issue/problem being considered. This is in line with the Royal Town Planning Institute's guidelines on effective community involvement and consultation (The Royal Town Planning Institute, 2012; 2007), which suggests that good stakeholder engagement is an essential part of a good development process, especially when undertaken early on in the process when changes can more easily be made.

Here, it should be indicated that since different stakeholders/stakeholder groups may have different perspectives of the most pressing problem (Li et al., 2012; Randeree and Faramawy, 2011; Aaltonen and Kujala, 2010), and hence different views to its precise nature (Head and Alford, 2015), there is a need to engage with as many affected stakeholders as possible before the most pressing problem is finally fully specified (Young, 2006). At this stage, it is important to consult widely (HM Treasury, 2011), as this is often the best way to gain greater understanding of the most pressing problems based on information/knowledge obtained directly from the affected stakeholders themselves rather than on assumptions. Bringing together infrastructure developers and affected stakeholders to work cooperatively would also increase the likelihood that the nature of the problem can be better understood (Head and Alford, 2015).

Recommended stakeholder engagement approaches that can support the implementation of the two-stage process are provided in **Appendix P**. When gathering more information, attention should be given to the ownership, priority and urgency of the problems (Proctor, 2010; Bransford and Stein, 1993). The aim should be to collect sufficient information and data from the stakeholders about the most pressing problems in order to enable the problems to be correctly defined. This will result in new ideas being

generated and the previously identified problem(s) may now be seen from a new perspective, and pave the way for the next step of the process to begin.

7.2.1.4 Define the most pressing problem(s) correctly

This step considers a variety of problem perspectives. At this stage, infrastructure developers examine the information/data obtained about the most pressing problem(s) faced by the stakeholders in order to generate possible problem redefinitions. The objective of this step is a precise definition of the most pressing problem(s) (Proctor, 2010; Bransford and Stein, 1993) based on the information obtained from affected stakeholders.

The author acknowledges that some problems may not be definitively described. These problems have been called “wicked problems” – those that are complex, unpredictable, ill-formulated or intractable, and any proposed solution to address them often turns out to be worse than the symptoms (Rittel and Webber, 1973; Churchman, 1967). However, the proposed two-stage process facilitates a more understanding of the seriousness of these problems and puts forward possible responses to them through collaborative working, divergent and convergent thinking, openness and transparency. These strategies for dealing with wicked problems have been proposed and recommended by Head and Alford (2015).

The analysis of the information/data collected during the previous step should enable the most pressing problems to be defined correctly. This step identifies a clear infrastructure need which it is in the wider community’s interest to address. It provides a clear rationale for intervention which is in line with the UK’s guide for appraisal and evaluation in central government (HM Treasury, 2018; 2011), as it ensures that there is clearly defined problem to be addressed, and that any proposed intervention to address it is worthwhile. Once the most pressing problem(s) have been correctly defined, it should be put into context and the next step starts in order to decide on the problems to be addressed.

7.2.1.5 Decide on the most pressing problem to be addressed

Once the most pressing problem(s) have been correctly defined, they should be communicated back to affected stakeholders. It is likely that more than one pressing problem occur at the same time. Infrastructure developers and affected stakeholders might have to simultaneously deal with more than one problem. However, in order to enable solutions to be generated, the developers and affected stakeholders will need to decide on what problem(s) to be addressed (Proctor, 2010; Bransford and Stein, 1993).

The purpose of this step is to put the most pressing problem into a context and paves the way for a solution to be identified. It requires the correctly defined most pressing problem to be communicated back to affected stakeholders. Infrastructure developers should draw up a consultation exercise in line with the best practice guidelines (UK Cabinet Office, 2016) to inform the affected stakeholders about the most pressing problem to be addressed. In addition, information about Stage 2 of the two-stage process should also be provided to the stakeholders during this step. Affected stakeholders should be briefed about Stage 2 of the process before Stage 2 actually commences.

Here, it is vital to evaluate and review the process of engaging with stakeholders (Olander and Atkin, 2010; McElroy and Mills, 2007; Olander and Landin, 2005). Monitoring and reviewing the engagement process should be carried out at regular intervals (McElroy and Mills, 2007). The output of Stage 1 is a well-defined problem to be addressed immediately by infrastructure developers. This requires the move to Stage 2 of the two-stage project identification process.

7.2.2 Stage 2: choice of a solution

In Stage 2, infrastructure developers would work closely and collaboratively in a spirit of openness and transparency with affected stakeholders/stakeholder groups who are affected by the most pressing infrastructure problem defined during Stage 1. This collaboration, openness and transparency increase the likelihood that effective solutions to the problem can be found, because greater cooperation improves the prospect that diverse stakeholders may reach an understanding about what actions to take to address the problem (Head and Alford, 2015). Once again, participating in this stage of the two-stage process should be voluntary. It is recommended that infrastructure developers should consider the full range of people, business and stakeholders affected (Project Management Institute, 2017; British Standards Institution, 2010; Moodley et al., 2008; Association for Project Management, 2006; Young, 2006; Olander and Landin, 2005). The output of Stage 2 is a workable solution to be taken to the feasibility phase. This stage involves four steps as follows:

1. Define project objectives,
2. Generate possible solutions,
3. Assess the possible solutions,
4. Choose the most appropriate solution.

Each step is discussed in more detail in the following subsections.

7.2.2.1 Define project objectives

Once the most pressing problem has been decided upon, objectives are carefully defined. Defining objectives in the problem situation is a crucial step in moving towards a solution to a problem. Because if objectives have not been specified, solutions generated may not provide acceptable answers to the problem (Proctor, 2010; Bransford and Stein, 1993). Setting objectives allows the identification of the full range of alternative options which may be adopted to address the problem. This is in line with the UK's guide for appraisal and evaluation in central government – the Green Book (HM Treasury, 2018; 2011), which suggests that a lack of clear objectives limits effective appraisal, planning, monitoring and evaluation.

Objectives should be stated so that it is clear what proposed solutions are intended to achieve (Corrie, 1991). At this stage, in order to ensure the full range of options to meet the objectives are considered, objectives may be expressed in general terms. Moreover, the author recommends that alternative objectives should also be considered before moving to the exploration of possible solutions. Because solutions may well be generated which solve a given problem, but deciding which solution to choose then becomes a difficult problem (Proctor, 2010).

Consequently, the project objectives should be written down concisely. There may be principal objectives and a number of subsidiary goals. The objectives do not necessarily have to remain fixed, but rather can be adjusted in the light of subsequent development and information (Corrie, 1991). Once the desired outcomes and objectives of an intervention have been defined, the full range of options/solutions that may be available to achieve them can be identified and the next step begins.

7.2.2.2 Generate possible solutions

Generating possible options (in outline) involves ideas finding to help structure the search for potential solutions. This step uses mainly divergent activity to generate many ideas using a variety of idea-generation aids. The divergent thinking involved in the process when generating ideas/solutions allows greater room to discover alternative options of solving problems (Head and Alford, 2015). The aim of this step is to explore alternative approaches to solving the problem which may involve reanalysing the objectives (defined during the previous step) and considering options that might be employed to address the problem. This involves preparing a list of the range of options which could possibly achieve the defined objectives (HM Treasury, 2018).

This step devises various options (in outline), each meeting the objectives specified in the previous step, and then compares them (Corrie, 1991). An option is a written statement defining an intervention to address the problem. Developing options and comparing them is important at this stage because it ensures that no attractive scheme goes unrecognised, and also reveals the relative strengths, weaknesses and potential challenges of various solutions. During this step, each option should be identified by a description. The description is simply a method of clarifying what each option comprises, so that it can be appraised as precisely as possible (ibid).

The range of options to be defined depends on the nature of the problem to be addressed and objectives to be achieved (HM Treasury, 2018). The author therefore recommends that a wide range of possible options/solutions should be considered. This requires infrastructure developers to consult widely with affected stakeholders/stakeholder groups in order to create a list of the full range of project options which can possibility be implemented to achieve the desired objectives (ibid). This is vital for affected stakeholders, because this engagement means a chance to understand what is proposed, to explore how a development can bring value to an area, to identify which options would work best within a local context and to help shape solutions (Head and Alford, 2015). It is also crucial for developers, as it can provide vital local knowledge (Reed, 2008), reduce the risk of challenges and delays (Atkin and Skitmore, 2008), identify how a scheme can bring value to a local area and enhance the reputations of all involved (International Finance Corporation, 2007).

The requirement to consult with stakeholders at this step is in line with the Royal Town Planning Institute's guidelines on effective stakeholder involvement (The Royal Town Planning Institute, 2012), and the UK's guide for appraisal and evaluation in central government (HM Treasury, 2018; 2011). Once a list of the full range of possible options has been identified, infrastructure developers and affected stakeholders are ready to move to the next step.

7.2.2.3 Assess the possible solutions

This step involves a preliminary appraisal of the project options generated in the previous step. The purpose of this appraisal is to review the characteristics of the options and the extent to which each option can meet the objectives set (Corrie, 1991). The options should be assessed in terms of how well the meet the defined project objectives (HM Treasury, 2018). This should form the basis for deciding which option should be further examined in the feasibility stage.

The proposed two-stage process does not require specific assessment criteria to be implemented when assessing options. However, it requires that all options to be subjected to the same specific assessment criteria. The author suggests that the preliminary appraisal of the options should cover technical, financial, economic, environmental and social assessments of the options as recommended by Corrie (1991).

The author recommends that each option should be examined to determine whether or not it will work technically. Each option should be considered in terms of whether or not it is an effective technical solution worthy of inclusion in the feasibility phase. Moreover, outline costs for each option should always be produced. These costs could be produced based on historical data, and should be used for calculating preliminary costs.

In this step, the worth of each option to the community at large should also be assessed. The preliminary assessment of the economic benefits and associated costs should be estimated to determine whether or not an option is worth inclusion in the feasibility phase. In addition, the preliminary appraisal of the options should define the likely effects of each option on the environment. Furthermore, the implications of each option for the stakeholders affected directly and indirectly should be explored. The preliminary appraisal should also consider the social advantages and disadvantages of each option (HM Treasury, 2018).

In this step, the extent to which each option can meet the objectives is set in order to determine whether or not an option is effective solution worthy of inclusion in the feasibility phase. Once this has been done, the next step commences in order to decide which option should be taken to the feasibility stage.

7.2.2.4 Choose the most appropriate solution

The purpose of this step is to decide which option should be taken to the feasibility stage. When exercising choice it is usual to have a set of alternatives and a set of assessment criteria. Appraising a list of alternatives involves measuring, trading off or scoring them in terms of the specified criteria and determining the relative importance of the criteria (Proctor, 2010). Following the technical, financial, economic, environmental and social analysis of the options from the previous step, it is a fairly simple task to assess all the factors and decide which option should be taken to the feasibility stage.

It should be noted that the preliminary appraisal of the options from the previous step may result in new information which in turn could place the original project objectives in a new light (Proctor, 2010; Bransford and Stein, 1993). Therefore, the original objectives should be revisited before choosing which option to be included in the feasibility study.

At this stage, if the results of the preliminary appraisal show that the options do not fulfil the original objectives, either the objectives or the options have to be reconsidered. However, if more than one options are shown to meet the objectives, the comparative merits of each option are listed and a tentative ranking order should be established (Corrie, 1991). The most appropriate option should be taken forward into the feasibility stage.

Engaging with stakeholders at this stage is important as it informs affected stakeholders about the chosen option to be assessed in terms of their feasibility (HM Treasury, 2018). It also reduces the risk of challenges and delays, identifies how a scheme can bring value to a local area and enhances the reputations of all involved (The Royal Town Planning Institute, 2012).

Here, it should be indicated that at this step stakeholder engagement should be carried out in line with the best practice guidelines for consultation set by the government (UK Cabinet Office, 2016). The consultation document should be clear, concise and focused. It must be written in non-technical language enabling stakeholders from understanding how the option had been assessed and chosen to be taken to the feasibility stage. The outcome of this Stage 2 is a workable solution/option to be taken to the feasibility stage.

The choice of the most appropriate solution to be taken to the feasibility stage marks the end of the two-stage project identification process, and triggers the feasibility stage. The feasibility stage takes as its starting point the output of the two-stage process – the choice of the most appropriate solution. It starts before the project design phase starts. The feasibility study will be required to determine options for the way ahead (Office of Government Commerce, 2009). It can be short or lengthy, simple or complex, depending on circumstances. It is one of the principal stages in the pre-design phase, and should be design to give an early assessment of the viability of the project (Corrie, 1991). The outcome of the feasibility stage should be the selection of a defined project which meets the stated project objectives – a project brief/mandate.

This section described the elements of the two-stage project identification process proposed by the author for improving the effectiveness of the pre-design phase of civil engineering infrastructure projects. The following section, on the other hand, provides arguments for the new proposal in the context of existing project management frameworks.

7.3 The two-stage process and existing project management frameworks

This section provides arguments for the new two-stage project identification process in the context of two project management frameworks, namely PRINCE2 and BSI 6079.

7.3.1 PRINCE2

PRINCE2 is one of the most used project management methodologies in the UK. It is a process-based approach that provides the set of activities required to direct, manage and deliver a project (Office of Government Commerce, 2009). PRINCE2 was originally designed in the late 1980s by the Central Computer and Telecommunication Agency (a former UK Government agency), and was based on IT projects at the time. However, it was introduced in 1996 as a standard for project management for public and private sector projects in the UK and other countries. The copyright to PRINCE2 method is held by the Office of Government Commerce (OGC) (Hedeman et al., 2006). In PRINCE2, there are seven processes as follows:

1. Starting up a Project,
2. Directing a Project,
3. Initiating a Project,
4. Controlling a Stage,
5. Managing Product Delivery,
6. Manage a Stage Boundary, and
7. Closing a Project.

PRINCE2 assumes a project mandate exists to trigger its first process (Starting up a Project) and therefore start the project. PRINCES2 calls the trigger for the project a project mandate – an external product generated by the commissioning organisation (Office of Government Commerce, 2009). Although the project mandate is a “product”, PRINCES2 gives little information on the process through which this product is produced. However, it should be indicated that in PRINCES2 terminology the term “project mandate” applies to whatever information used to trigger the project. This suggests that the project trigger can be almost anything.

According to PRINCE2, the mandate could be an invitation to tender, the output of a feasibility study or a project brief from a programme (Office of Government Commerce., 2007). Therefore, the two-stage process can trigger PRINCE2 Starting up a Project process, because the two-stage process can be consider as a means through which a project mandate can be produced, Figure **7-6**.

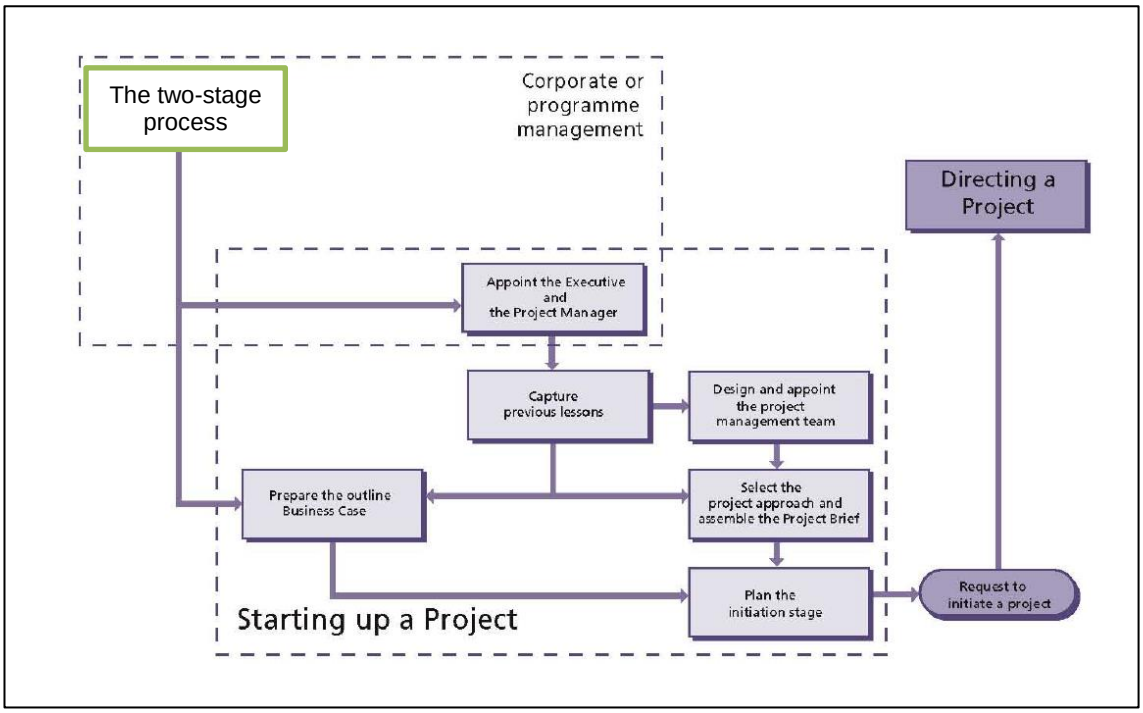

Figure 7-6 Overview of the link between the two-stage process and PRINCE2 Starting up a Project

The purpose of PRINCE2 Starting up a Project process is to prevent poorly conceived projects from ever being initiated as it is about approving the initiation of viable projects. The two-stage process can support PRINCE2 in achieving this because the two-stage process helps ensure that the most appropriate solution(s) is chosen and moved to the feasibility stage. In this manner, implementing the two-stage process can prevent inviable projects from ever being initiated.

In addition, the project mandate which triggers PRINCE2 Starting up a Project process should provide sufficient information to help make a decision to initiate the project, to prepare the outline business case and assemble the project brief (Office of Government Commerce, 2009). The two-stage process provides such information. The problem and solution analysis during stage 1 and 2 of the two-stage process provide sufficient information about the most appropriate solution (the project) that can be implemented. This analysis helps provide sufficient information required by PRINCE2 to define and confirm the scope of the project. Therefore, implementing the two-stage process can help make a decision to initiate the project, to prepare the outline business case and assemble the project brief.

This section demonstrated the link between the two-stage project identification process and PRINCE2 project management methodology. The section showed that implementing the two-stage process can trigger PRINCE2 Starting up a Project process

and support PRINCE2 process in preventing inviable projects from ever being initiated. The next section, by contrast, considers the two-stage process in the context of BSI 6079.

7.3.2 BSI 6079

BSI 6079–1: 2010 Project Management: Principles and Guidelines for the Management of Projects provides principles and guidance on: sponsorship, management, planning and delivery of a project. This standard incorporates current technology, techniques and developments in the field of project management, and focuses on the importance of projects being driven by the organisational needs, drawing on cross-functional teams of specialists in pursuit the stated organisational objectives (British Standards Institution, 2010). The BSI 6079 project activities comprise:

1. Preparing for a project;
2. Approving a project or a phase within a project;
3. Initiating a project;
4. Directing a project;
5. Managing a project;
6. Managing delivery;
7. Closing a project; and
8. Reviewing project outcome.

BSI 6079 assumes that preparatory work to prepare a project brief is carried out before the formal start of the project to trigger the project. According to British Standards Institution (2000b), the project brief triggers the conception phase which captures new ideas or opportunities and identifies potential candidates for further development in the feasibility study. However, BSI does not offer much advice about the process which leads to a project brief being produced – project identification. The only advice BSI 6079 offers about this preparatory work is that such work may take a number of forms. For internal projects, it is part of ongoing corporate management as part of project portfolio management. For programmes, the projects are identified as part of project portfolio management. For contracting organisations, the project would start with the invitation to bid or tender (British Standards Institution, 2010).

The two-stage process provides an overarching, systematic approach through which a project brief can be produced successfully. So, the two-stage process becomes the means through which preparatory work to prepare a project brief is carried out, Figure **7-7.** In this manner, it can be argued that the two-stage process complements the BSI's project life cycle model.

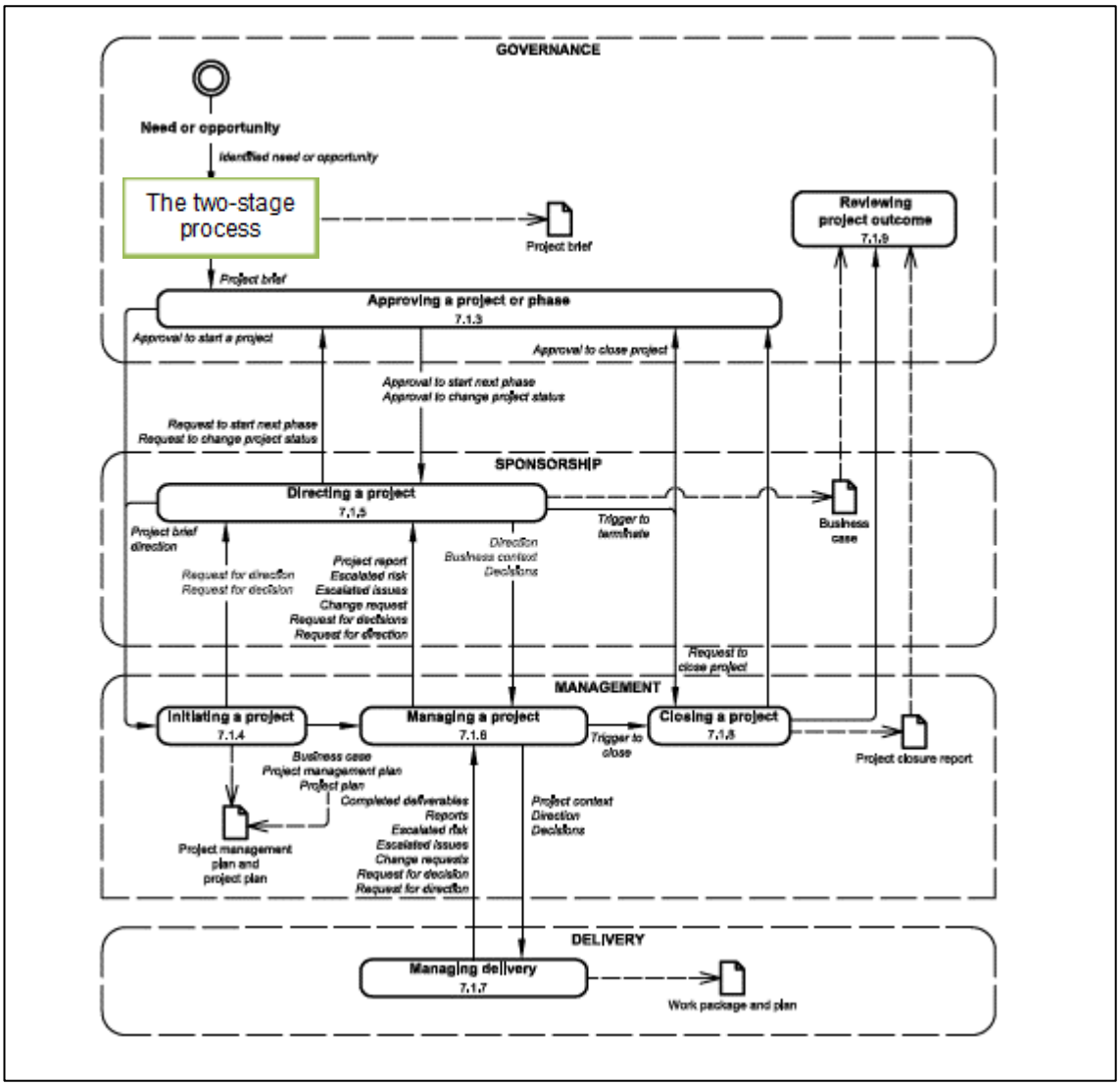

Figure 7-7 Overview of the link between the two-stage process and the BSI project integration activities (British Standards Institution, 2010, p.28)

BSI 6079 assumes a project brief is produced before the formal start of the project to trigger the project. The two-stage process is a means through which a project brief can be produced. The implementation of the two-stage process should lead to a project brief being developed. The analysis of the problems and assessment of the solutions in stages 1 and 2 of the two-stage process enables the most appropriate solution to be taken to the feasibility study. Thus, ensuring the most viable solution (project) being mandated. Consequently, the two-stage process can help define and confirm the scope of the project. In this manner, implementing the two-stage process in the context of BSI 6079 can help make a decision to initiate the project, to prepare the outline business case and assemble the project brief.

This section provided arguments for the new two-stage project identification process in the context of existing project management frameworks. The section demonstrated that

the new process complements existing frameworks. It showed that implementing the two-stage project identification process can support existing project management frameworks in preventing inviable projects from ever being initiated. The next chapter, on the other hand, describes the evaluation of the new process.

7.4 Chapter summary

The chapter presented the proposed two-stage project identification for improving the effectiveness of the pre-design phase of civil engineering infrastructure projects in order to facilitate the alignment of project purpose with external stakeholder expectations. The proposed process resulted from adapting ideas of a problem solving process and incorporating those ideas into the pre-design phase. It integrates the external stakeholder identification and involvement processes with project identification processes, hence paves the way for effective external stakeholder involvement in the pre-design phase.

Chapter 8 Evaluation of the Proposed Project Identification Process

In this chapter the evaluation (verification and validation) of the proposed two-stage project identification process is described. It is worth restating that the proposed two-stage project identification process has been developed in response to issues identified from the literature (Chapter 2 and 3) and from the critical discussions of the empirical evidence presented in Chapters 5 and 6. The purpose of the proposal is to improve the identification process of civil engineering infrastructure projects through the means of effective external stakeholder involvement in order to facilitate the alignment of project purpose with external stakeholder expectations – the aim of the present research. Therefore, it was vital to ensure that the proposed process can be beneficial to the construction industry and practitioners who are seeking to improve the identification, development and delivery of civil engineering infrastructure projects through effective external stakeholder involvement.

In order to provide a conclusive evidence that the proposed two-stage project identification process can work in reality, it was validated. The present chapter presents the outcome of the validation of the proposal, and is organised as follows:

- Section 8.1, 'Verification of the proposed two-stage process', presents the verification of the proposed two-stage project identification process;
- Section 8.2, 'Validation of the proposed two-stage process', provides an overview of the research interviewees who took part in the validation of the proposal, and presents the outcome of implementing the research method described in Chapter 4 **section 4.5.2**, interview survey;
- Section 8.3, 'The impact of the validation exercise of the original proposal', provides reflections on how the validation exercise might impact the original two-stage process;
- Section 8.4, 'Critical appraisal of the modified two-stage process', presents practical and theoretical discussions and places the new proposal in a context; and
- Section 8.5, 'Chapter summary', provides a conclusion to this chapter.

8.1 Verification of the proposed two-stage process

The purpose of verification is to ensure that the proposed two-stage project identification process had been developed correctly by assessing its consistency and completeness. A process is complete to the extent that all of its elements are present, while a process

is consistent to the extent that its provisions do not conflict with each other or with governing specifications (Boehm, 1984).

The completeness of the proposed two-stage process is verified by assessing that all elements of the proposed process are present. The proposed two-stage process divides the project identification process into nine distinct steps. These are grouped into two broad stages, namely problem definition and choice of a solution. Each of the nine steps is present and is fully explained in the previous chapter. There is no missing element wherever a decision needs to be made. The process covers the activities to be carried out when identifying civil engineering infrastructure projects from the identification of a problem to be addressed to the generation of a solution to solve the problem.

On the other hand, the consistency of the proposed two-stage process was verified by assessing that its provisions do not conflict with each other or with governing specifications. This was done in a way that each step in the process was designed to feed into the next step in the process. Information gathered in one step is used as input to the following without conflicts, as demonstrated in the previous chapter. In addition, the proposed process was developed in response to real-life issues identified based on empirical evidence – case studies. The development of the two-stage process relied on theories from the extant literature. This includes internationally recognised standards for the project management profession: *BS 6079: Principles and guidelines for the management of projects, PRINCE2* and *The Royal Institute of British Architects (RIBA) Plan of Work 2013* as well as well-recognised bodies of knowledges: *The APM Body of Knowledge and The Guide to the Project Management Body of Knowledge (PMBOK Guide)*. This ensured that provisions of the proposed process do not conflict with these internationally-recognised project management standards and bodies of knowledge.

The proposed two-stage project identification process was also based on adapting ideas from problem solving process models and incorporating those ideas into the identification process of civil engineering infrastructure projects. This confirms that there is no conflicts between the provisions of problem solving and the proposal. This implies that the contents of the proposed process conform the requirements of the needed process for improvement. Consequently, the proposed two-stage project identification process is complete and consistent.

8.2 Validation of the proposed two-stage process

The purpose of validation is to assess whether the proposed two-stage project identification process has the potential to improve the project identification process of civil engineering infrastructure projects through the means of effective external stakeholder involvement. This section presents the validation of the proposed two-stage process based on the research method (interview survey) demonstrated in Chapter 4 **section 4.5.2**. The section first provides an overview of the research participants (interviewees) who took part in the validation of the proposed process, and then presents the outcome of conducting the interviews.

8.2.1 Research participants' information and data accuracy

In all, 80 email invitations were sent to external stakeholder groups from the two case studies investigated as well as other project and stakeholder managers from similar civil engineering infrastructure projects inviting them to validate the two-stage process. The participants were formally invited to assess (through an interview) whether the proposed two-stage process has the potential to improve the identification process of civil engineering infrastructure projects through the means of effective external stakeholder involvement.

All participants were given sufficient time to decide if they wish to participate. Once the participants had accepted to take part and confirmed their interest in participating, arrangements for the interview date, time and venue were made with them directly. Although 80 invitations were sent, 20 participants from 14 organisations agreed to take part and were interviewed, **Table 8-1**. Among this number were 18 industry experts among which 6 are from three different transport authorities (Highways England, TfL, and Network Rail), 8 are from four project management consultancies (Arup, Remarkable Engagement, Pcubed and Copper Consultancy), 4 are from local authorities and the remaining 2 are from transport interest groups.

Table 8-1 Overview of the research interviewees

Interviewee	***Designation***	***Type of organisation***	***Years of experience***
Interviewee 1	Project Manager	Transport authorities	Over 20
Interviewee 2	Associate Director	PM consultancy	Over 20
Interviewee 3	Stakeholder Engagement Manager	PM consultancy	Less than 10
Interviewee 4	Consultation Manager	Transport authorities	10 - 20
Interviewee 5	Stakeholder Manager	Transport authorities	Less than 10
Interviewee 6	Project Manager	Local authorities	Over 20
Interviewee 7	Project Manager	Transport authorities	10 - 20
Interviewee 8	Senior Engagement Manager	Transport authorities	Less than 10
Interviewee 9	Assistant Director	Local authorities	10 - 20
Interviewee 10	Programme Director	Interest groups	Less than 10
Interviewee 11	Director	PM consultancy	Over 20
Interviewee 12	Chief Executive	Interest groups	Over 20
Interviewee 13	Director of Stakeholder Engagement	Transport authorities	Less than 10
Interviewee 14		PM consultancy	Over 20
Interviewee 15	Chief Officer	Local authorities	Over 20
Interviewee 16	Project Manager	Local authorities	Over 20
Interviewee 17	Community Relations Manager	PM consultancy	10 - 20
Interviewee 18	Project Manager	PM consultancy	Over 20
Interviewee 19	Director	PM consultancy	Over 20
Interviewee 20	Principal PM consultant	PM consultancy	10 - 20

In total, 20 interviews were conducted (5 face-to-face interviews, 14 telephone interviews and one Skype interview). During the interview, the author presented the proposed process and explained in detail each element of the proposal. The interviewees were able to seek clarification and ask questions about the proposal. This enabled the interviewees to get a robust understanding of the proposal. Subsequently, the interviewees were asked to assess whether the proposed two-stage process has the potential to improve the identification process of civil engineering infrastructure projects based on the evaluation plan presented in **Appendix E.2**. The interviews were conducted between April 2017 and January 2018, and each interview lasted between 30 and 70 minutes. The interviews were digitally recorded subject to the interviewees consent and then transcribed and analysed using SQR NVivo 11 software and IBM SPSS Statistics 22. The findings from this exercise are presented in the following section.

8.2.2 Responses from the research interviewees

This section presents the findings from implementing the research method described in Chapter 4 **section 4.5.2** (interview survey). The section presents the analysis of the interviewees' responses to the questions in the evaluation plan (**Appendix E.2**). This includes the interviewees'

1. perceptions on the usefulness of the proposal,
2. perceptions of hindrance to applying the proposal,
3. perceptions of the effectiveness of the proposal to improve external stakeholder identification practice,
4. perceptions of the effectiveness of the proposal to improve external stakeholder involvement practice,
5. perceptions of the effectiveness of the proposal to address the limited external stakeholder involvement,
6. perceptions of cost-effectiveness of the proposal, and
7. perceptions on the applicability of the proposal.

Each of these variables is examined in detail in the following sub-sections.

8.2.2.1 Perceptions on the usefulness of the proposal

The purpose of this evaluation is to assess the usefulness of the proposal. This was examined by asking the research interviewees about what they found most useful about the proposed two-stage project identification process. The interviewees were asked the following question:

> *What did you find most useful about the proposed two-stage project identification process?*

Responses to this question indicate that:

- The proposed two-stage process could achieve cost saving, because there would be the opportunity to deal with stakeholder related issues before they happened rather than after when they happened. Involving external stakeholders at an early stage can save money and help come to a quicker solution more cost effectively [Interviewees 7, 10, 13, 12, 14 and 15].
- The proposal could, through the early identification of the full list of stakeholders, give the project time to develop relationships with external stakeholders. Identifying the right stakeholders helps build the right relationships, thus make the whole process much simpler and easier [Interviewees 3, 8, 14, 17 and 20].

- The proposal gives a structure through which external stakeholders can be engaged more easily. It could bring about early involvement of external stakeholders that would enable stakeholder groups and project teams to work together, balance needs and thus get better solutions to problems. This collaboration generates fresh ideas around the project which creates societal value [Interviewees 3, 5, 7, 8, 9, 11, 13, 14, 17 and 19].
- The proposed process improves the identification practice of external stakeholders by showing the need to think very carefully at the very early stage about everybody who might be affected by the project, and to consider the broadest range of stakeholders at the project identification phase. Identifying the full list of stakeholders at an early stage to begin with is very useful [Interviewees 1, 7, 8, 11, 15, 17 and 18].
- The proposal improves problem identification because it starts with a real understanding of what the issues are and what the problem to be solved is. Defining the problem faced by the stakeholders should help quantify benefits and make the next project phases much easier [Interviewees 2, 7, 12, 13, 14 and 18].
- The proposed two-stage process could increase stakeholder support, and could achieve public investment in a project before the project proposal is finalised. The proposal is a real opportunity to create societal value through early external stakeholder engagement, thus generate a greater level of stakeholder support for the project. Achieving public investment in the project before when the project proposal is finalised makes the project easier to deliver [Interviewees 1, 2, 3, 5 and 11].

The interviewees' perceptions on the usefulness of the proposed two-stage process suggest that the proposed process is useful in terms of achieving cost savings in a project, developing relationships with stakeholders, enhancing collaboration, improving external stakeholder identification and involvement, improving problem identification and increasing stakeholder support necessary to project success. This demonstrates the robustness of the proposed two-stage process which can be relied upon to improve the identification process of civil engineering infrastructure projects through the means of effective external stakeholder involvement.

8.2.2.2 Perceptions of hindrance to applying the proposal

The purpose of this evaluation is to identify any hindrance/challenge to implementing the proposed two-stage process in the real word. This was examined by asking the interviewees to identify what they found to be a hindrance about the proposal. The research interviewees were asked the following question:

> *What did you find to be a hindrance about the two-stage project identification process?*

In response to the question above, the interviewees have observed that:

- Funding the proposal would be a challenge. The identification phase is not an area where infrastructure developers apply most resources, whereas implementing the proposal in a meaningful way would need significant resources at the very outset [Interviewees 1, 5, 9, 10 and 18].
- Implementing the proposal would lengthen the development time, and thus adds to the project time span [Interviewees 1, 5, 6, 7, 11, 14, 15 and 19].
- There needs to be a sufficiently developed scheme to pave the way for stakeholder consultations. Four interviewees indicate that a project proposal would be needed to attract resources and also to be able to engage with affected stakeholders in meaningful way [Interviewees 2, 7, 9 and 17].
- Cultural change would be a challenge. Getting infrastructure organisations to adapt new ideas, new processes and new ways of working would be a challenge. Decision makers in these organisations often do not appreciate the importance of early external stakeholder engagement, so there needs to be a big mind set change. In addition, society as a whole does not like change, so implementing new ideas/processes would be a challenge. External stakeholders tend to not be interested until the project is around to be built [Interviewees 3, 5, 6, 7, 8, 9, 11 and 16].
- The implementation of the proposal could be expensive and would increase the up-front cost of the project [Interviewees 6, 9, 11, 14, 15, 17 and 18].
- Managing external stakeholders' conflicting needs and expectations at an early stage would be a challenge. Every stakeholder/stakeholder group will have a different opinion on what is the problem and what the right solution is. So, managing the conflicting problems and issues that affected stakeholders will come up with will be a challenge [Interviewees 1, 2, 4, 5, 13, 16, 19 and 20].
- In the context of civil engineering infrastructure projects, political commitment is a key factor in getting a project off the ground. However, the lack of gross party agreement to some of these projects often results in society being discouraged

to trust the way how a project evolves. So, politics would be a challenge [Interviewees 2, 10, 11 and 16].

- Ordinary stakeholders can identify problems, but cannot translate the problem to a solution. Ordinary stakeholders are not experts, so their opinions may not be based on any kind of evidence. Implementing the proposal in a meaningful way needs getting the people with the right skills to conduct stakeholder assessment which can be a challenge [Interviewees 3, 6 and 7].

The interviewees' observations are important, and indicate that the development of the two-stage proposal creates new lines of research inquiries. The author accepts these observations, and argues that challenges identified by the interviewees should not prevent the two-stage process from being implemented. However, the author strongly recommends future studies to build on the findings of the present research and consider those observations. For example, future research into the assessment of the cost implication of applying the proposed two-stage project identification process on real world projects can be conducted.

8.2.2.3 Perceptions of effectiveness of the proposal to improve external stakeholder identification practice

The purpose of this evaluation is to assess whether the proposed two-stage project identification process has the potential to improve the practice of external stakeholder identification during the identification phase of civil engineering infrastructure projects. This was assessed by examining the perceptions of the research interviewees regarding the extent to which the proposal could improve external stakeholder identification practice during the identification process of civil engineering infrastructure projects. The research interviewees were asked the following question:

> *Based on your experience, to what extent could the proposed two-stage process improve external stakeholder identification practice during the identification process of civil engineering infrastructure projects?*

Responses to this evaluation question were recorded based on a Likert scale of: 0 = not at all, 1 = to an extremely small extent, 2 = to a very small extent, 3 = to a small extent, 4 = to a moderate extent, 5 = to a large extent, 6 = to a very large extent, 7 = to an extremely large extent, and are illustrated in **Table 8-2**.

Table 8-2 Perceptions on the effectiveness of the proposal to improve external stakeholder identification

*Based on your experience, to what extent could the proposed two-stage project identification process improve **the external stakeholder identification practice** during the project identification process of civil engineering infrastructure projects?*

	Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
	0	1	2	3	4	5	6	7
Interviewee 1						✓		
Interviewee 2						✓		
Interviewee 3				✓				
Interviewee 4					✓			
Interviewee 5					✓			
Interviewee 6				✓				
Interviewee 7						✓		
Interviewee 8							✓	
Interviewee 9						✓		
Interviewee 10					✓			
Interviewee 11						✓		
Interviewee 12								✓
Interviewee 13						✓		
Interviewee 14								✓
Interviewee 15							✓	
Interviewee 16							✓	
Interviewee 17					✓			
Interviewee 18						✓		
Interviewee 19							✓	
Interviewee 20							✓	

As it can be seen from **Table 8-2**, the research interviewees gave different scores to the effectiveness of the two-stage proposal to improve the external stakeholder identification process during the identification phase of civil engineering infrastructure projects. In order to identify the effectiveness of the proposal to improve external stakeholder identification practice, the central tendency of the statistical scores presented in the table above is measured using IBM SPSS Statistics 22. The central tendency is measured by calculating the mean, median and mode of the interviewees' statistical scores. In the context of the present thesis, the mean is an arithmetic average of the data that is calculated by adding all of the scores and dividing by the number of scores. The median is defined as the central datum when all of the data are arranged (ranked) in numerical order (McCluskey and Lalkhen, 2007). The mode, on the other hand, is the most frequently occurring data point in a set of data (Adamson and Prion, 2013). The outcome of this analysis is presented in **Table 8-3**.

Table 8-3 Descriptive statistics of perceptions on the effectiveness of the proposal to improve external stakeholder identification

Statistics		
N	Valid	20
	Missing	0
Mean		5.05
Median		5.00
Mode		5

The central tendency of the interviewees' statistical scores shows that the proposed two-stage process has the potential to improve external stakeholder identification process during the identification phase of civil engineering infrastructure projects. The mean is 5.05 which indicates that the average score given the effectiveness of the proposal to improve stakeholder identification is "to a large extent effective". The median is 5 which indicates that half of the interviews ranked the effectiveness of the proposal to improve stakeholder identification above "to a large extent effective". The mode, on the other hand, is 5 which indicates that the most commonly occurring score is "to a large extent effective".

8.2.2.4 Perceptions of effectiveness of the proposal to improve external stakeholder involvement practice

The purpose of this evaluation is to assess whether the proposed two-stage project identification process has the potential to improve the practice of external stakeholder involvement in the identification process of civil engineering infrastructure projects. The effectiveness of the proposed process was assessed by examining the perceptions of the research interviewees regarding the extent to which the proposal could improve external stakeholder involvement in the identification phases of civil engineering infrastructure projects. The interviewees were asked the following question:

> *Based on your experience, to what extent could the proposed two-stage process improve external stakeholder involvement practice in the identification process of civil engineering infrastructure projects?*

Responses to this evaluation question were recorded based on a Likert scale of: 0 = not at all, 1 = to an extremely small extent, 2 = to a very small extent, 3 = to a small extent, 4 = to a moderate extent, 5 = to a large extent, 6 = to a very large extent, 7 = to an extremely large extent, and are illustrated in **Table 8-4**.

Table 8-4 Perceptions on the proposal's effectiveness to improve external stakeholder involvement practice

Based on your experience, to what extent could the proposed two-stage project identification process improve ***the external stakeholder involvement practice*** *during the project identification process of civil engineering infrastructure projects?*

	Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
	0	1	2	3	4	5	6	7
Interviewee 1						✓		
Interviewee 2						✓		
Interviewee 3					✓			
Interviewee 4						✓		
Interviewee 5							✓	
Interviewee 6							✓	
Interviewee 7							✓	
Interviewee 8							✓	
Interviewee 9					✓			
Interviewee 10					✓			
Interviewee 11						✓		
Interviewee 12							✓	
Interviewee 13						✓		
Interviewee 14						✓		
Interviewee 15							✓	
Interviewee 16							✓	
Interviewee 17						✓		
Interviewee 18							✓	
Interviewee 19							✓	
Interviewee 20							✓	

Table 8-4 shows a near-consensus among the research interviewees on the effectiveness of the two-stage proposal to improve external stakeholder involvement practice during the identification process of civil engineering infrastructure projects. In order to identify the effectiveness of the proposal to improve external stakeholder involvement practice, the central tendency of the statistical scores presented in the table above is measured using IBM SPSS Statistics 22. The central tendency is measured by calculating the mean, median and mode of the interviewees' statistical scores. The outcome of this analysis is presented in **Table 8-5**.

Table 8-5 Descriptive statistics of perceptions on the effectiveness of the proposal to improve external stakeholder involvement

Statistics		
N	Valid	20
	Missing	0
Mean		5.35
Median		5.50
Mode		6

The central tendency of the interviewees' statistical scores shows that the proposed two-stage process has the potential to improve external stakeholder involvement process during the identification phase of civil engineering infrastructure projects. The mean is 5.35 which indicates that the average score given the effectiveness of the proposal to improve stakeholder involvement is "to a large extent effective". The median is 5.5 which indicates that half of the interviews ranked the effectiveness of the proposal to improve stakeholder involvement above "to a large extent effective". The mode, on the other hand, is 6 which indicates that the most commonly occurring score is "to a very large extent effective".

8.2.2.5 Perceptions of effectiveness of the proposal to address the limited external stakeholder involvement

The purpose of this evaluation is to assess whether the proposed two-stage project identification process has the potential to address the limited external stakeholder involvement in the project identification process of civil engineering infrastructure projects. The effectiveness of the proposed process was assessed by examining the perceptions of the research interviewees regarding the extent to which the proposal could address the limited external stakeholder involvement in the project identification process of civil engineering infrastructure projects. The interviewees were asked the following question:

> *Based on your experience, to what extent could the proposed two-stage process address the limited external stakeholder involvement in the identification process of civil engineering infrastructure projects?*

Responses to this evaluation question were recorded based on a Likert scale of: 0 = not at all, 1 = to an extremely small extent, 2 = to a very small extent, 3 = to a small extent, 4 = to a moderate extent, 5 = to a large extent, 6 = to a very large extent, 7 = to an extremely large extent, and are illustrated in **Table 8-6**.

Table 8-6 Perceptions of the proposal's effectiveness to address the limited external stakeholder involvement

Based on your experience, to what extent could the proposed two-stage project identification process ***address the limited external stakeholder involvement*** *in the project identification process of civil engineering infrastructure projects?*

	Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
	0	1	2	3	4	5	6	7
Interviewee 1						✓		
Interviewee 2				✓				
Interviewee 3							✓	
Interviewee 4					✓			
Interviewee 5						✓		
Interviewee 6								✓
Interviewee 7						✓		
Interviewee 8						✓		
Interviewee 9							✓	
Interviewee 10					✓			
Interviewee 11						✓		
Interviewee 12							✓	
Interviewee 13	✓							
Interviewee 14							✓	
Interviewee 15							✓	
Interviewee 16						✓		
Interviewee 17				✓				
Interviewee 18							✓	
Interviewee 19						✓		
Interviewee 20							✓	

Table 8-6 shows that the scores given to the effectiveness of the two-stage proposal to address the limited external stakeholder involvement in the identification process of civil engineering infrastructure projects are somehow scattered. Therefore, the central tendency of the statistical scores is measured using IBM SPSS Statistics 22 in order to identify the effectiveness of the proposal to address the limited external stakeholder involvement. The central tendency is measured by calculating the mean, median and mode of the interviewees' statistical scores. The outcome of this analysis is presented in **Table 8-7**.

Table 8-7 Descriptive statistics of perceptions on the effectiveness of the proposal to address the limited external stakeholder involvement

Statistics		
N	Valid	20
	Missing	0
Mean		4.75
Median		5.00
Mode		5

The central tendency of the interviewees' statistical scores shows that the proposed two-stage process has the potential to address the limited external stakeholder involvement in the identification phase of civil engineering infrastructure projects. The mean is 4.75 which indicates that the average score given the effectiveness of the proposal to address the limited external stakeholder involvement is "to a moderate extent effective". This could have been as a result of the influence by the outlying score given by Interviewee 13. However, the median is 5 which indicates that half of the interviews ranked the effectiveness of the proposal to address the limited external stakeholder involvement above "to a large extent effective". The mode, on the other hand, is 5 which indicates that the most commonly occurring score is "to a large extent effective".

8.2.2.6 Perceptions of cost-effectiveness of the proposal

This evaluation considers the cost implications and benefits of implementing the proposal. The cost-effectiveness of the proposed process assessed by examining the perceptions of the research interviewees regarding the extent to which the proposal is cost-effective. The interviewees were asked the following question:

> *Based on your experience, to what extent the proposed two-stage process is cost-effective?*

Responses to this evaluation question were recorded based on a Likert scale of: 0 = not at all, 1 = to an extremely small extent, 2 = to a very small extent, 3 = to a small extent, 4 = to a moderate extent, 5 = to a large extent, 6 = to a very large extent, 7 = to an extremely large extent, and are illustrated in **Table 8-8**.

Table 8-8 Perceptions of the proposal's cost-effectiveness

Based on your experience, to what extent the proposed two-stage project identification process is cost effective?

	Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
	0	1	2	3	4	5	6	7
Interviewee 1							✓	
Interviewee 2						✓		
Interviewee 3					✓			
Interviewee 4						✓		
Interviewee 5							✓	
Interviewee 6								
Interviewee 7						✓		
Interviewee 8							✓	
Interviewee 9				✓				
Interviewee 10				✓				
Interviewee 11					✓			
Interviewee 12								✓
Interviewee 13						✓		
Interviewee 14						✓		
Interviewee 15							✓	
Interviewee 16							✓	
Interviewee 17				✓				
Interviewee 18							✓	
Interviewee 19						✓		
Interviewee 20							✓	

Table 8-8 shows that the cost-effectiveness of the two-stage proposal is ranked to different extents. In order to identify the overall cost-effectiveness of the proposal, the central tendency of the statistical scores presented in the table above is measured using IBM SPSS Statistics 22. The central tendency is measured by calculating the mean, median and mode of the interviewees' statistical scores. The outcome of this analysis is presented in **Table 8-9**.

Table 8-9 Descriptive statistics of perceptions on the cost-effectiveness of the proposal

Statistics		
N	Valid	20
	Missing	0
Mean		5.00
Median		5.00
Mode		6

The central tendency of the interviewees' statistical scores shows that the proposed two-stage process is cost-effective. The mean is 5.00 which indicates that the average score given the cost-effectiveness of the proposal is "to a large extent effective". The median is also 5.00 which indicates that half of the interviews ranked the cost-effectiveness of the proposal above "to a large extent effective". The mode, on the other hand, is 6 which indicates that the most commonly occurring score given by the interviewees to the cost-effectiveness of the proposal is "to a very large extent effective".

8.2.2.7 Perceptions on the applicability of the proposal

This evaluation considers the applicability of the proposed two-stage project identification process. This is assessed by examining the perceptions of the research interviewees regarding the extent to which the proposal fits into formal and informal procedures of identifying civil engineering infrastructure projects. The research interviewees were asked the following question:

> *Based on your experience, to what extent the proposed two-stage process fits into formal and informal procedures of identifying civil engineering infrastructure projects?*

Responses to this evaluation question were recorded based on a Likert scale of: 0 = not at all, 1 = to an extremely small extent, 2 = to a very small extent, 3 = to a small extent, 4 = to a moderate extent, 5 = to a large extent, 6 = to a very large extent, 7 = to an extremely large extent, and are illustrated in **Table 8-10**.

Table 8-10 Perceptions of the proposal's applicability

Based on your experience, to what extent the proposed two-stage project identification process fits into formal and informal procedures of identifying civil engineering infrastructure projects?

	Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
	0	1	2	3	4	5	6	7
Interviewee 1							✓	
Interviewee 2	✓							
Interviewee 3							✓	
Interviewee 4					✓			
Interviewee 5							✓	
Interviewee 6			✓					
Interviewee 7			✓					
Interviewee 8						✓		
Interviewee 9			✓					
Interviewee 10				✓				
Interviewee 11					✓			
Interviewee 12								✓
Interviewee 13						✓		
Interviewee 14								✓
Interviewee 15				✓				
Interviewee 16								✓
Interviewee 17					✓			
Interviewee 18								✓
Interviewee 19							✓	
Interviewee 20						✓		

Table 8-10 shows that the scores given to the applicability of the two-stage proposal are scattered. As a result, the central tendency of the statistical scores presented in the table above is measured using IBM SPSS Statistics 22. The central tendency is measured by calculating the mean, median and mode of the interviewees' statistical scores. The outcome of this analysis is presented in **Table 8-11**.

Table 8-11 Descriptive statistics of perceptions on the applicability of the proposal

Statistics		
N	Valid	20
	Missing	0
Mean		4.55
Median		5.00
Mode		6[a]

a. Multiple modes exist. The smallest value is shown

The central tendency of the interviewees' statistical scores shows that the proposed two-stage process is applicable and fits into existing formal and informal procedures of identifying civil engineering infrastructure projects. The mean is 4.55 which indicates that the proposal is "to a moderate extent effective" applicable. This resulted from the influence by the outlying score given by Interviewee 2. However, the median is 5 which indicates that half of the interviews think that the proposed to stage process is "to a large extent effective" applicable. The mode, on the other hand, is 6 (multiple modes) which indicates that the most commonly occurring score is "to a very large extent effective".

This section presented the validation of the proposed two-stage project identification process, and showed that the proposed process has the potential to improve the identification process of civil engineering infrastructure projects through the means of effective external stakeholder involvement. The next section, by contrast, provides reflections on how the validation exercise might impact the original two-stage process.

8.3 The impact of the validation exercise on the original proposal

This section presents the author's reflections on the impact of the validation exercise on the original two-stage project identification process. The validation exercise showed that the twenty interviewees were unified in perceiving the value of the new two-stage process in terms of its potential to improve the project identification process of civil

engineering infrastructure projects through the means of effective stakeholder involvement. The validation process indicated that the new proposal has the potential to

- improve existing external stakeholder identification process during project identification to a large extent (**section 8.2.2.3**),
- improve existing external stakeholder involvement in the project identification process to a very large extent (**section 8.2.2.4**),
- address the limited external stakeholder involvement in project identification to a large extent (**section 8.2.2.5**).

Moreover, the validation process revealed that the proposed two-stage project identification process is cost-effective (**section 8.2.2.6**), and that it fits into existing formal and informal procedures of identifying civil engineering infrastructure projects (**section 8.2.2.7**). In addition, the interviewees made a number of observations (**section 8.2.2.2**) that require attention. These are

1. funding the implementation of the two-stage process;
2. the impact of the two-stage process on the project schedule;
3. the impact of the two-stage process on the project cost;
4. the need for stakeholder capacity building;
5. managing conflicting needs and expectations; and
6. the need for a sufficiently developed scheme to trigger the two-stage process.

These observations are very interesting and provide a mechanism to improve the proposed process. On reflection, the author revised the original two-stage process and produced a modified version. The modified two-stage process (presented in greater detail in **Appendix Q**) takes into account the observations listed above by a preparatory work at the start of Stage 1.

The interviewees have observed that funding the proposal would be a challenge. The author acknowledges that conducting the two-stage process in a meaningful way can be resource-intensive. The project identification stage is not an area where infrastructure developers apply most resources, whereas implementing the proposal in a meaningful way would need significant resources at the very outset. Therefore, a new step has been added to Stage 1 of the original two-stage process. The new step is called “prepare for the two-stage process”. During this first step a budget to support the implementation of the proposed process is set up. This budget should be part of the overall project budget, and should not been seen as extra costs. Funding the two-stage process can be carried out collaboratively, wherever possible, between stakeholders. Infrastructure developers/promoters should be prepared to allocate sufficient financial and specialist

resources to support the implementation of the two-stage process during the pre-design phase. This is of high importance because the easiest time to make changes to a project is at the beginning of its life (Project Management Institute, 2017).

The interviewees have also observed that implementing the proposal would lengthen the development time, and would increase the up-front cost of the project. The author acknowledges that the two-stage process would impact the project cost and time, however, allocating sufficient time to the two-stage process is crucial because according to the Institution of Civil Engineers (2009a) resolving problems or changing direction when the project is already underway is far too expensive than extra time spent during the early stages. It is appreciated that consulting for too long will unnecessarily delay the process, and consulting too quickly will not give enough time for consideration and will reduce the quality of stakeholder consultation (UK Cabinet Office, 2016). Therefore during the new “prepare for the two-stage process” step a programme for the two-stage process will be defined. The two-stage proposal is a process, so project management principles can be applied to the process. A programme to the process can be defined, resourced and costed. A critical path for that programme can also be identified preventing the process from being endless process.

The interviewees have also observed that implementing the new proposal in a meaningful way needs getting the people with the right skills to conduct stakeholder assessment which can be a challenge. The author acknowledges that ordinary stakeholders can identify problems, but may not be able translate problems to solutions. Ordinary stakeholders are not experts, so their opinions may not be based on any kind of evidence. Therefore, the new preparation step in Stage 1 of the modified version of the two-stage process now enables infrastructure developers to consider stakeholder capacity building. The focus should be on skills, such as networking, negotiation, conflict resolution, problem solving, consensus building and mediation. In this manner, the modiefied process ensures that the project sponsor, project manager, team manager and team members are sufficiently competent and skilled to undertake some or all of the activities in the two-stage process. Typical competencies for project management roles can be found in (British Standards Institution, 2010). Typical competency areas required to implement the two-stage process in a meaningful way include, but are not limited to

- People management: individuals should be able to motivate and enthuse colleagues and stakeholders involved in the process;
- Evaluation and decision-making: individuals should be able to evaluate alternatives and make authoritative decisions;

- Communication: communications skills should cover the giving and receiving of information and should ensure that project communications are consistent, understandable and unambiguous;
- Negotiation: the ability to negotiate with internal and external stakeholders is an essential competence for project managers and team leaders;
- Legal awareness: individuals need to be aware of any statutory requirements that could affect the project; and
- Domain understanding: the project managers, team managers and team members should have a detailed understanding of the outputs from their particular activities during the implementation of the two-stage process.

This is not inteded to be a full competency list but a quide to the range of proejct management skills and comptetnces required for a meaningful implemtation of the two-stage process. These skills and competences shall also help with another observation made by the interviewees about managing external stakeholders' conflicting needs and expectations. The author acknowledges that every stakeholder/stakeholder group will have a different opinion on what is the problem and what the right solution is. Therefore, the modified two-stage process now provides advice on conflict resolution in addition to the list of skills and competences above.

The author understands that a conflict can arise among individuals/stakeholders during the implementation of the two-stage process. Therefore, skilful negotiation or appropriate use of authority can be utilized to avoid conflict escalation during Stage 1 and 2 of the two-stage process. British Standards Institution (2010) outlines methods to manage conflict. These can be used to manage conflicts that might arise during the implementation of the two-stage process. These methods include

- collaborating to determine a mutually acceptable solution;
- reaching a compromise where individual needs are traded;
- accommodating as many needs as possible;
- asserting personal needs/views over those of the other party.

The interviewees have also observed that there needs to be a sufficiently developed scheme to pave the way for stakeholder consultations. The author argues that engaging with external stakeholders during the two-stage process aims at gathering information and data from stakeholders that when analysed would help identify a scheme. In Stage 1 of the two-stage process, stakeholders are consulted about infrastructure problems that they are facing. Stakeholders are asked to identify infrastructure needs/problems within their communities and gather information about those problems in order to be

analysed to identify and define the most pressing problem. In Stage 2, stakeholders are involved in a solution finding process in which stakeholders and developers come together to generate possible solutions to address the problem, assess them and then decide on the most appropriate solution to be taken to the feasibility stage. As a result, the author asserts that a scheme is not needed to trigger the two-stage process because it is the implementation of the process which leads to a scheme being identified and taken to the feasibility stage.

This section provided critical reflections on the impact of the validation exercise on the original two-stage process. It also outlined some of the modifications made to the original proposal. The next section, by contrast, provides critical practical and theoretical discussions placing the modified model in a context.

8.4 Critical appraisal of the modified two-stage process

This section provides a critical appraisal of the modified two-stage project identification process. It is widely agreed that external stakeholder identification should start at an early stage of the project life cycle. Young (2006, p.69), for instance, asserts that it is essential to identify all the stakeholders “as early as possible” in the project life cycle. Young also proposes that stakeholder expectations should be identified before the project definition is finalised and the project scope is agreed. In an investigation into stakeholder influence in two construction projects, Olander and Landin (2005, p.327) concluded that identifying external stakeholders and then managing their needs and expectations through communication “in the early stages of a project” is an important issue for a project management team.

The importance of early external stakeholder identification and involvement is also underlined by internationally recognised organisations. For example, the Project Management Institute (2013, p.394) which contains that it is critical for project success to identify the stakeholders “early in the project”. The *APM Body of Knowledge, Fifth Edition*, contains that stakeholder management is an iterative process which starts during “project concept” (Association for Project Management, 2006, p.20). This suggests that the identification of external stakeholders should start at the concept phase.

Moreover, the BSI 6079-1:2010 *Project Management - Part 1: Principles and Guidelines for the Management of Projects* contains the following: “stakeholder management is required throughout the project, starting in the investigative phases and continuing right through to the final phase of the project” (2010, p.56, my italics). This suggests that the identification of external stakeholders should start at the investigative phases which BSI

defines as the phase “when the promoter determines how best to meet the objectives and the contractor determines the bid design, cost and price” (2010, p.7). Furthermore, the BSI adds that adds that there should be appropriate communication and involvement with external stakeholders throughout a project because external stakeholder involvement in projects adds considerable value in all phases of a project. BSI also adds that usually the earlier external stakeholders are involved, the better the result (ibid).

The foregoing paragraphs suggest that there is a consensus on the importance of early external stakeholder identification and involvement in infrastructure projects. The model developed in this thesis entrenches this consensus. The area of external stakeholder involvement in the identification process of civil engineering infrastructure projects has been under researched. The research presented in this thesis is one of the earliest studies to in-depth examine the extent of external stakeholder involvement in the identification process of two civil engineering infrastructure projects from the UK. The findings indicated limited external stakeholder involvement in project identification. The modified two-stage project identification process is a solution to this problem.

The modified two-stage process enables the identification of infrastructure needs/projects through the means of a problem solving process. It allows the start point of any infrastructure initiative to be problem identification, and ensures that infrastructure projects are built to address clearly defined problems with inputs from affected stakeholders. The modified process builds on comments and feedback from twenty experts from the UK infrastructure industry who have the experience of interacting with stakeholders and the front-end of infrastructure projects. Therefore, it can be argued that it now fits better in the context of stakeholder interaction and the UK infrastructure planning process.

The modified two-stage process is one of the earliest attempts to bring about sufficient external stakeholder involvement in the identification process of civil engineering infrastructure projects. It is the start point, if the problem of limited external stakeholder involvement in project identification to be addressed. The validation exercise has shown that the proposed process is applicable, although it has yet to be fully implemented in real-world scenarios. Therefore, a comprehensive future study to assess the full implications of applying the modified two-stage process in real-world scenarios is strongly recommended.

8.5 Chapter summary

This chapter presented the evaluation (verification and validation) of the proposed two-stage project identification process for improving the identification process of civil engineering infrastructure projects through the means of effective external stakeholder involvement. The proposed process was verified by assessing its consistency and completeness. Validation of the proposal, by contrast, was achieved through an interview survey in which twenty project managers, stakeholder managers and project stakeholder organisations took part. The findings from the interviews showed that the proposal has the potential to improve the identification process of civil engineering infrastructure projects and, thus facilitates the alignment of project purpose and external stakeholder expectations. The interviewees' responses showed that the two-stage proposal has to potential to address the limited external stakeholder involvement in the identification process of civil engineering infrastructure projects, thus is capable of integrating external stakeholder identification and project identification processes. Comments and feedback from the interviewees on the original proposal were built upon to produce a modified two-stage project identification process.

Chapter 9 Conclusions and Recommendations

This chapter presents the research's conclusions showing the achievements of the research objectives. It also outlines the original contributions of the thesis to knowledge. Limitations to the present research and recommendations for future research are also discussed in detail in this chapter. The chapter is divided into four sections as follows:

- Section 9.1, 'Conclusions', provides conclusions to the thesis, and presents what was set out to be done, what was found and the significance of the findings in relation to the research objectives;
- Section 9.2, 'Original contributions to knowledge', outlines the original contributions of the research findings to existing project management knowledge;
- Section 9.3, 'Limitations of the research', discusses the limitations of the research presented in this thesis; and
- Section 9.4, 'Recommendations for future research', provides routs for future research.

9.1 Conclusions

The analysis of the economic and social importance of civil engineering infrastructure projects (Chapter 2 **section 2.2**) revealed that identifying what infrastructure needs/problems exist within a community would help identify the right civil engineering infrastructure project to address them. Discussions in Chapter 2 **section 2.3** demonstrated that if civil engineering infrastructure projects are accepted to be solutions to problems, these projects can be identified, developed and delivered through a problem solving process. However, the examination of current project management guidelines and bodies of knowledge (Chapter 2 **section 2.6**) indicated that little attention has been given to the process that leads to identifying new infrastructure needs/problems.

Therefore, in Chapter 2 **section 2.7** the author considered the pre-design phase (which comprises project identification and feasibility) of civil engineering infrastructure projects in the context of public policy development in the UK, and found that the identification process of infrastructure needs/projects often begins during the development of the NPSs. This is because the need for development of infrastructure projects is articulated during the design stage of these policy statements. However, discussions on the development of NPSs and stakeholder interaction and the UK planning process (Chapter 3 **section 3.6**) revealed limited stakeholder involvement and demonstrated a need for an overarching approach for identifying infrastructure needs.

The author examined the extent of external stakeholder involvement in the UK infrastructure planning regime (Chapter 3 **Section 3.6.1**), and found that although the developer of any national significant infrastructure project is legally required to consult with affected stakeholders about their proposals, the consultation does not start until the developer has prepared their proposal and notified the Planning Inspectorate that they intend to submit an application in the future. This suggests that affected external stakeholders are having limited (if any) input into key aspects of the project defined during the project identification process.

Further, the author examined external stakeholder involvement in the development of NPSs (Chapter 3 **Section 3.6.2**), and found that the identification of infrastructure needs is carried out with limited (if any) input from external stakeholders outside the core executive. External stakeholder groups are often asked to support the government policy to address infrastructure needs after the responsible government department had drafted its NPS and presented it to the Parliament for approval.

As a consequence, the author sought to improve the effectiveness of the pre-design phase of civil engineering infrastructure projects through the means of effective external stakeholder involvement in project identification. In order to meet the research aim, three objectives were set (Chapter 1 **section 1.2**). These objectives are linked together in order to collectively fulfil the research aim and, thus address the research problem (Chapter 3 **section 3.7**). The three objectives are:

1. to examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects,
2. to develop a means for enabling effective external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects, and
3. to evaluate the developed means for improvement.

This section presents the achievement of these objectives in relation to what was set out to be done, how it was done, what was found and the significance of the findings.

9.1.1 External stakeholder involvement in the pre-design phase

The author intended to examine the extent of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects (objective 1). Therefore, a case study research involving two major civil engineering infrastructure projects (Edinburgh Tram Network (ETN) project and Crossrail 1 (Elizabeth line) project) was conducted.

The author traced the origins of the projects and followed the procedures and work that was done to get the projects off the ground. This was done through the identification of a theme of events which the author calls ‘key events and milestones in the project’. For each project, this theme identifies key events and milestones that are related to the development of the project. This includes, but is not limited to, the formation of transport policies/strategies in which the need for the project is identified, feasibility studies, business cases, appraisal process, project decisions, etc. This enabled the story of the project to be unveiled and, thus revealed the project identification process.

Then, the author identified the project’s stakeholders/stakeholder groups, and examined the extent of external stakeholder involvement in the process through which the project was identified. When examining the extent of external stakeholder involvement in the project identification process the author identified a theme of events called ‘events relating to external stakeholders’. For each project, the theme identifies key events that are related to external stakeholder groups and their management during the development of project. This includes, but is not limited to, stakeholder consultation, public consultation, stakeholder communication, discussions, disputes and conflicts between the project management teams and the projects external stakeholder groups.

The ‘events relating to external stakeholders’ theme was then mapped onto the ‘key events and milestones in the project’ theme. The purpose was to visualise external stakeholder involvement in the project identification process. This was based on empirical evidence from the two projects. The empirical data consist of publicly available information on the two projects and information obtained through face-to-face interviews (Chapter 4 **section 4.3.1.3**) with project management team members who were directly involved in interacting with stakeholders during the development of the two projects.

In addition, a case study protocol (Chapter 4 **section 4.3.1.4.1**) was developed and used to guide the data collection and analysis processes. The case study protocol enabled the collection of the primary data that represent the implementation of external stakeholder involvement in the project identification process from the two case studies. Data Analysis process was supported by the use of a qualitative data analysis computer software package - QSR NVivo 11.

The examination of the pre-design phase of two civil engineering infrastructure projects makes a difference because it identified when project identification often begins – during the design stage of a public policy. The empirical evidence showed that the seeds of ETN project and Crossrail project were planted in government policies which, in turn, had their roots in the 1997 Labour election manifesto. It was found that the identification

process of the two projects was embedded in government transport polices, studies and strategies. It was also revealed that such a process was carried out within the core executive with limited input from external stakeholders. This is significant because it represents a major piece of empirical research that provides a complete description of project identification process of two major civil engineering infrastructure projects which has not been done before.

The examination of the extent of external stakeholder involvement in the project identification process of the two projects helped identify the nature of improvement needed. The results showed a limited external stakeholder involvement in the project identification process of ETN project and Crossrail project, and indicated that external stakeholder groups had limited (if any) input into key aspects of the projects defined during the project identification stage of the pre-design phase. This exposed an opportunity for improving the effectiveness of the pre-design phase, and informed the need for an overarching approach for project identification.

In addition, the findings showed that both projects are perceived as solutions to problems. This supports the author's contention that civil engineering infrastructure projects are at best solution to problems. However, the identification and analysis of the problems to be addressed by each project revealed a lack of problem solving process during the identification process of the two projects. This finding informs the need for enabling infrastructure projects to be identified, developed and delivered through a problem solving process. This eventually paved the way for the idea of using a problem solving approach to identifying infrastructure needs to be implemented.

The in-depth examination and analysis of the external stakeholder involvement in two major infrastructure projects provided empirical evidence of the extent of external stakeholder involvement in the identification process of civil engineering infrastructure projects. This contribution is significant because of the absence of empirical studies on external stakeholder involvement in the identification process of civil engineering infrastructure projects (which was unknown prior to this thesis). This contribution extends our knowledge on stakeholder involvement in civil engineering infrastructure projects, and can now be used to facilitate improvements in the identification process of similar infrastructure projects.

9.1.2 Integrating external stakeholder involvement and project identification processes

Based on the findings from Objective 1, the author sought to develop a means for improving the effectiveness of the pre-design phase of civil engineering infrastructure projects through the integration of project identification and external stakeholder identification processes (objective 2). To achieve this, a desk study was undertaken.

The desk study involved a review of two problem solving process models, and a comparison of the steps in these models with the project phases in a generic civil engineering infrastructure project life cycle. The purpose was to show that if civil engineering infrastructure projects are viewed as solutions to problems, the project life cycle can be mapped onto a problem solving process. Ideas in these models were then adapted and incorporated into the project identification process. This resulted in the development of a two-stage project identification process for civil engineering infrastructure projects.

Adapting ideas of problem solving and incorporating them into the project identification process allowed the start point of project identification to be a problem identification/definition. The integration of project identification, problem solving and stakeholder involvement processes enables effective external stakeholder involvement in identifying and defining the infrastructure problems to be addressed. This is significant because it allows infrastructure developers and affected stakeholders to get involved in a problem solving process as a means for identifying, developing and delivering infrastructure projects.

The new process brings together infrastructure developers and external stakeholders at a very early stage of the project life cycle to first define problems to be addressed, and second to generate solutions, assess them and then decide on the most appropriate solution to be taken to the feasibility stage. This is a major attempt to propose an overarching approach for integrating project identification with external stakeholder involvement processes which has been lacking within the context civil engineering infrastructure projects.

Stage 1 of the two-stage process enables infrastructure developers to work closely and collaboratively in a spirit of openness and transparency with external stakeholders/stakeholder groups who have relevant knowledge and interest in the infrastructure need/issue that is being considered. This collaboration, openness and transparency would enhance the developer’s understanding of the infrastructure needs/problems where various stakeholders with different knowledge, stakes and values

are involved. Stage 2, on the other hand, increases the likelihood that effective solutions to the problem can be found, because greater cooperation improves the prospect that diverse stakeholders may reach an understanding about what actions to take to address the problem. Identifying, developing and delivering infrastructure projects in this manner ensures that these projects are built to address clearly defined problems with sufficient inputs from affected stakeholders. This is a significant contribution to existing knowledge because it is the first time ideas of problem solving are adapted and incorporated into the project identification process to propose an overarching approach for identifying infrastructure needs/problems, which can now be used directly by infrastructure developers (often governments and public sector organisations).

9.1.3 Evaluation of the proposed project identification process

The author intended to assess the potential for the proposed two-stage project identification process to improve the effectiveness of the pre-design phase of civil engineering infrastructure projects through the means of effective external stakeholder involvement in project identification (objective 3). Therefore, an interview survey with project managers and stakeholder managers who have the experience of interacting with stakeholders at the front end of civil engineering infrastructure projects was conducted.

In total, 20 interviewees from 14 organisations were interviewed. Among this number were 18 industry experts among which 6 are from three different transport authorities (Highways England, TfL, and Network Rail), 8 are from four project management consultancies (Arup, Remarkable Engagement, Pcubed and Copper Consultancy), 4 are from local authorities and the remaining 2 are from transport interest groups.

The twenty interviewees were unified in perceiving the value of the new process in terms of its potential to improve the effectiveness of the pre-design phase of civil engineering infrastructure projects. The results showed that the proposal has the potential to

- improve existing external stakeholder identification process during project identification to a large extent,
- improve existing external stakeholder involvement in the project identification process to a very large extent,
- address the limited external stakeholder involvement in project identification to a large extent.

The findings also revealed that the proposed two-stage project identification process is cost-effective, and that it fits into existing formal and informal procedures of identifying civil engineering infrastructure projects. The validation exercise provided a mechanism

to improve the original proposed process based on interesting observations made by the interviewees. On reflection, the author revised the original two-stage process and produced a modified version. The modified two-stage process builds on comments and feedback from twenty experts from the UK infrastructure industry who have the experience of interacting with stakeholders and the front-end of infrastructure projects. This suggest that the modified process now fits better in the context of stakeholder interaction and the UK infrastructure planning process.

The modified two-stage process is a major contribution to the project management practice. The present thesis is a novel piece of research and is the first significant attempt to provide an overarching approach for project identification that has been validated. The modified two-stage process is a pioneering approach that entrenches the consensus on the importance of early stakeholder involvement in project identification. It is a solution to the problem of limited external stakeholder involvement in infrastructure projects.

The modified two-stage process is a major contribution to existing practice because infrastructure developers and external stakeholders can now get involved in a problem solving process as a means for identifying, developing and delivering infrastructure projects. The modified process makes a difference as it allows infrastructure developers and external stakeholders to work closely and collaboratively in a spirit of openness and transparency. This collaboration, openness and transparency would enhance the developer's understanding of the infrastructure needs/problems where various stakeholders with different knowledge, stakes and values are involved. It also increases the likelihood that effective solutions to the problem can be found, because greater cooperation improves the prospect that diverse stakeholders may reach an understanding about what actions to take to address the problem.

This section presented the achievement of the research objectives in relation to what was set out to be done, how it was done, what was found and the significance of the findings. The next section, on the other hand, highlights the original contributions of the research presented in this thesis to knowledge.

9.2 Original contributions to knowledge

Originality in scientific research can be achieved in several ways. Phillips and Pugh (2010), Bentley (2006) and Phillips and Pugh (2005) agree that any of the following is sufficient to claim originality:

1. undertaking empirical work for the first time;
2. making a synthesis that has not been previously made;
3. using already known material but with different interpretation;
4. trying out something that has been done elsewhere in a new area;
5. applying a particular technique in a new area;
6. bringing a new evidence to bear on an old issue;
7. being cross-disciplinary using different methods;
8. investigating areas that have not been looked at before;
9. adding to existing knowledge in a new way.

Consequently, four major contributions to knowledge outlined in this section are considered unique because they represent original work that has not been done before. The first noteworthy contribution to knowledge is the in-depth analysis of the identification process of two civil engineering infrastructure projects from the UK. This is significant because it represents a major piece of empirical research that provided a complete description of project identification process of two major civil engineering infrastructure projects which has not been done before. It indicated that project identification can begin during the design stage of a public policy and continues through the subsequent stage of policy implementation at which it finishes, but can also start and finish at the policy implementation stage. It also highlighted the need for overarching approach for project identification.

Another major contribution to knowledge is the in-depth examination of the extent of external stakeholder involvement in the identification process of two civil engineering infrastructure projects from the UK. This examination indicated limited external stakeholder involvement in project identification process that could lead to misalignment of project purpose and stakeholder expectations, thereby increasing our understanding of how to maximise the chances for project success in civil engineering infrastructure projects.

The third contribution to knowledge is the creation of a new two-stage project identification process – a robustly unique and theoretically rigorous overarching approach for identifying civil engineering infrastructure projects. The major gap

highlighted in this thesis is the limited external stakeholder involvement in project identification. In addition to the fact that this two-stage process is new within the context of civil engineering infrastructure projects, the synthesis demonstrated in the development of the new process has not been done before. It is the first time that ideas of problem solving process are adapted and incorporated into the identification process of civil engineering infrastructure projects. The novelty of the two-stage process developed in this thesis is in which project identification, problem solving and stakeholder involvement processes have been synthesised and integrated to fulfil the need for improving project identification while being theoretically rigorous.

The fourth contribution to knowledge demonstrated in this thesis is the validation of the two-stage process. The new process has been assessed through interviews with project managers, stakeholder managers, project stakeholder organisations and local authorities from the UK. The validation process provided a mechanism to improve the proposed process based on comments and feedback from twenty experts from the UK infrastructure sector. The validation exercise resulted in a modified two-stage project identification process that now builds on comments from the construction industry, and thus fits better in a context. The modified two-stage process is a solution to the problem of limited external stakeholder involvement in project identification. It entrenches the consensus on the importance of early external stakeholder involvement in civil engineering infrastructure projects.

In addition, the individual contributions together have made a bigger contribution to knowledge. The bigger contribution is that in addition to better understanding of external stakeholder involvement in the pre-design phase of civil engineering infrastructure projects (unknown prior to this thesis), a robustly unique and theoretically rigorous two-stage project identification process (that did not exist before) for improvement is now available. This section highlighted the original contributions of the thesis to knowledge. The next section, by contrast, discusses the limitations of the research.

9.3 Limitations of the research

The limitations of the research relate to:

- The research scope: scope always imposes limitations on research. The necessity to in-depth investigate the extent of external stakeholder involvement in project identification led to the choice of cross-case analysis of two cases only. This may limit the extendibility of the findings, however the two projects form an acceptable basis for claims to be generalised.

- The nature of data: secondary publicly available documents precludes the ability to answer particular research questions. More interviews with stakeholders/stakeholder groups involved in the two cases could be conducted to obtain primary data about the projects.
- The validation of the new proposal: as always research findings benefit from more validation. Thus, Delphi technique could strengthen the validity of the two-stage project identification process.

9.4 Recommendations for future research

The strength of the research still remain in spite of the limitations outlined in the previous section. The research presented in this thesis has opened opportunities for future work to be carried out. These opportunities are as follows:

- Future empirical studies may apply a similar research design for other infrastructure sectors to further understand the practice of external stakeholder involvement in civil engineering infrastructure projects.
- Future studies using case studies or other research methods in other European countries such as Germany, France and Netherlands are required to identify similarities and differences in the practice of external stakeholder involvement across different regions/countries.
- Future study may conduct additional interviews to strengthen the validity of the two-stage process. Delphi technique is recommended.
- A more comprehensive study to assess the full implications of applying the two-stage process in real-world scenarios is required. The study could define a programme to the process, resource and cost that programme and identify a critical path for that programme.

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Appendices

Appendix A Sample frame

No.	Sector	Project name	Client organisation
1	Energy	Little Barford (additional capacity)	npower
2	Energy	Tilbury C	npower
3	Energy	West Burton B	EDF Energy
4	Energy	Wilton 10	Sembcorp
5	Energy	Glenmoriston Hydro Group (Additional Capacity)	-
6	Energy	Gwynt Y Mor Offshore Wind Farm - Stage 1	RWE Innogy UK (formerly RWE npower renewables)
7	Energy	Gwynt Y Mor Offshore Wind Farm - Stage 2	RWE Innogy UK (formerly RWE npower renewables)
8	Energy	Gwynt Y Mor Offshore Wind Farm - Stage 3	RWE Innogy UK (formerly RWE npower renewables)
9	Energy	Lincs Offshore Wind Farm	DONG Energy UK
10	Energy	London Array Stage 1	London Array
11	Energy	Harestanes	Scottishpower
12	Energy	Harestanes	Scottishpower
13	Transport	Birmingham airport	Birmingham airport
14	Transport	Bournemouth airport	Bournemouth airport
15	Transport	Bristol airport	Bristol airport
16	Transport	Glasgow airport	Glasgow airport
17	Transport	Crossrail	Crossrail
18	Transport	National high speed rail network (phase one) - construction	HS2 Ltd
19	Transport	National high speed rail network (phase one) - rolling stock	HS2 Ltd
20	Transport	National high speed rail network (phase two) - construction	HS2 Ltd
21	Transport	National high speed rail network (phase two) - rolling stock	HS2 Ltd
22	Transport	Birmingham New Street	Network Rail
23	Transport	HLOS2 Enhancements	Network Rail
24	Transport	HLOS2 Renewals	Network Rail
25	Transport	Kings Cross Station improvements	Network Rail
26	Transport	Northern Urban Centres - Manchester	Network Rail
27	Transport	Northern Urban Centres - Yorkshire	Network Rail
28	Transport	Other CP4 investment	Network Rail

No.	Sector	Project name	Client organisation
29	Transport	Paisley Corridor improvements	Network Rail
30	Transport	Power supply upgrade	Network Rail
31	Transport	Reading	Network Rail
32	Transport	Southern train lengthening	Network Rail
33	Transport	Strategic freight network	Network Rail
34	Transport	Thameslink	Network Rail
35	Transport	Highways Agency PFI schemes	Highways Agency
36	Transport	A1 Dishforth to Leeming	Highways Agency
37	Transport	A3 Hindhead	Highways Agency
38	Transport	A46 Newark to Widmerpool	Highways Agency
39	Transport	M1 J10-J13	Highways Agency
40	Transport	M1 Junction 19/M6 (Viaduct)	Highways Agency
41	Transport	M25 J16-23 (DBFO Section 1)	Highways Agency
42	Transport	M25 J27-30 (DBFO Section 4)	Highways Agency
43	Transport	A14 Kettering Bypass	Highways Agency
44	Transport	A45 / A46 Tollbar End	Highways Agency
45	Transport	A453 Widening	Highways Agency
46	Transport	M1 / M6 Junction 19 Improvement	Highways Agency
47	Transport	M3 Junctions 2 to 4a	Highways Agency
48	Transport	M6 Junctions 10a to 13	Highways Agency
49	Transport	A11 Fiveways to Thetford	Highways Agency
50	Transport	A23 Handcross to Warninglid	Highways Agency
51	Transport	A556 Knutsford to Bowdon	Highways Agency
52	Transport	M1 Junctions 28 to 31	Highways Agency
53	Transport	M1 Junctions 32 to 35a	Highways Agency
54	Transport	M1 Junctions 39 to 42	Highways Agency
55	Transport	M25 Junctions 23 to 27	Highways Agency
56	Transport	M25 Junctions 5 to 6/7	Highways Agency
57	Transport	M4 J19 - 20 to M5 J15 - 17	Highways Agency
58	Transport	M6 Junctions 5 to 8	Highways Agency
59	Transport	M60 Junctions 8 to 12	Highways Agency
60	Transport	M62 Junctions 25 to 30	Highways Agency
61	Transport	SR10 Schemes scheduled to start in 2013/14	Highways Agency
62	Transport	A27 E/WB: M27-EstnRd 46/7-49/0	Highways Agency
63	Transport	A27 EasternRd-A3M E&WB Pavmnt	Highways Agency
64	Transport	A404 Cox Green N&SB Pavement	Highways Agency
65	Transport	Highway Agency capital renewals	Highways Agency
66	Transport	M180 J4 - J5	Highways Agency
67	Transport	M271 Southampton, South of M27	Highways Agency
68	Transport	M4 J4-15 Baydon Ph3 C/Res VCB	Highways Agency

No.	Sector	Project name	Client organisation
69	Transport	M5 J13 STROUDWATERI/C BRIDGE C	Highways Agency
70	Transport	OD3:A3 CLANFIELD SB LOW TEXT C	Highways Agency
71	Transport	TOD3: A404M Western Region C	Highways Agency
72	Transport	Highways Maintenance Block Funding	Highways Agency
73	Transport	Integrated Transport Block	Highways Agency
74	Transport	Local Authority Major Schemes - Committed and Approved	Highways Agency
75	Transport	Local Sustainable Transport Fund	Highways Agency
76	Transport	A130 PFI	Highways Agency
77	Transport	Birmingham Highway Maintenance PFI	Highways Agency
78	Transport	Doncaster Interchange PFI	Highways Agency
79	Transport	Nottingham Express Transit Phase 1, PFI	Highways Agency
80	Transport	Portsmouth Highways Maintenance PFI	Highways Agency

Appendix B Invitation template used to contact the project's client organisation

Dear XXXXXXXX,

I am writing to enquire if your organisation would be willing to participate in a research project (Integrating external stakeholder identification with project initiation in infrastructure projects) that is being undertaken in the School of Civil Engineering at the University of Leeds. The aim of the project is to contribute towards addressing the problem of minimising the time lag between the start of project initiation and the beginning of external stakeholder identification during the initiation phase of civil engineering infrastructure projects in order to facilitate the alignment of project purpose and external stakeholder expectations.

Participant organisations are being asked to contribute their experience of interacting with external stakeholders at the start of infrastructure projects. External stakeholder engagement had been demonstrated as a prime driver of project success. The findings of the research project will enable organisations to better understand external stakeholder engagement and will be shared on an individual basis with participants.

Participant organisations are requested to nominate two to three individuals from within their organisations who have direct experience of stakeholder engagement at the front end of projects. These individuals will then be interviewed by myself for a period of about an hour. Here, I firmly confirm that all information obtained as a result of the interviews will be used for the purposes of fulfilling the research project. All responses will be kept ***strictly confidential*** and all information obtained as a result of the interviews will remain ***anonymous***, participants will therefore not be able to be identified in any reports or publications.

If you do feel that your organisation would like to participate, please use the attached form to send us the name(s) and contact detail of your nominated person(s). If you have any queries, please do not hesitate to contact me.

I look forward to hearing from you,

Yours sincerely,

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Appendix C Interview documents (Fieldwork 1)

C.1 Participant Information Sheet for Fieldwork 1

Integrating External Stakeholder Identification with Project Initiation in Infrastructure Projects

Dear Participant**,**

You are being invited to take part in a research project. Before you decide it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

The aim of the study is to contribute towards addressing the problem of minimising the time lag between the start of project initiation and the beginning of external stakeholder identification during the initiation phase of civil engineering infrastructure projects in order to facilitate the alignment of the project purpose and external stakeholder expectations. In order to meet this aim, the following objectives have been set:

1. To evaluate the effectiveness of the current practice of external stakeholder identification during the initiation phase of civil engineering infrastructure projects.
2. To develop a framework for improvement through integration of external stakeholder identification and the initiation processes.
3. To evaluate the framework.

Because *you* are the one who can give us a correct picture of how project external stakeholders are identified during the initiation phase of civil engineering infrastructure projects, I request you to take part in the research project through a face-to-face interview. It is entirely up to you to decide whether or not to take part. If you agree to take part you will be given this information sheet to keep and be asked to sign a consent form, and you can still withdraw at any time. You do not have to give a reason.

Once you have agreed to take part, arrangements for the interview will be made directly between you and I. The interview will take about an hour, and will be conducted in your office or nearby public place, whichever suits you most.

Recording the interview on audio media will be entirely up to you. The questions are about external stakeholder management process, in particular, the current practice of

external stakeholder identification during the initiation phase of civil engineering infrastructure projects. Questions will enable open as well as closed answers to be given in relation to the topic above. Then, data will be analysed and you will be able to obtain a copy of the results.

I assure you that your response will be kept strictly confidential. Only the research team (my supervisors and I) will have access to the information you provide. Furthermore, all the information you provide will remain anonymous, you will therefore not be able to be identified in any reports or publications. In addition, if you agree us recording the interview, the audio recordings of your interview will be used only for analysis. No other use will be made of them without your written permission, and no one outside the research team will be allowed access to the original recordings.

Thank you very much for taking the time to read through the information and please do not hesitate to contact me if you require further information.

I look forward to hearing from you.

Yours sincerely,

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C.2 Interview questions

Section 1: Interviewee's Background

Name	
Company/Organisation	
Job Title	
Years in the construction industry	
Date & Time	
Venue	

Section 2: Project characteristics

Sector	Energy/ transport project
Funding source(s)	Public/ private/ combination
Cost estimates	£
Project location	
Project status	confirmed/ started/ under construction/ completed
Project purpose	
Earliest construction start date	
Date in service	

Section 3: Project initiation

The research considers identifying the problem to be addressed by the project as the start of project initiation process, and deems the articulation of the project's objectives to be the end of the initiation process. *Please refer to **show card 1** when answering the following questions.*

1. Could you explain the initiation process you followed?
2. What was the existing situation before defining the project's objectives?
3. How was the problem to be addressed by the project identified?
4. Who was involved in identifying the problem?
5. How did you arrive at the project's objectives?
6. Who was involved in defining the project's objectives?
7. What was the desired situation when the problem to be addressed was identified?
8. Any other comments relating to the process of initiating the project.

Section 4: External stakeholder identification

Define who is an external stakeholder?

Show card No. 2 outlines a number of identification tools and techniques

6. What techniques did you use to identify external stakeholders during the process of project initiation?
7. How often did you use each technique? Use the ***show card No. 2***
8. Could you rate the capability of the used techniques to reveal the importance of external stakeholders from 1 to 5 *(where 1 = very ineffective and 5 = very effective)*? Use the ***show card No. 2***
9. Could you rate the capability of the used techniques to reveal external stakeholders' interests and expectations from 1 to 5 *(where 1 = very ineffective and 5 = very effective)*? Use the ***show card No. 2***
10. When did the first external stakeholder identification take place? Please use ***show card No. 1***
11. Who was involved in identifying external stakeholders?
12. What were the major weaknesses and strengths of the used identification techniques?

Section 5: External stakeholder management

13. What approach did you implement to manage external stakeholders during the initiation phase? Compare with ***show card No. 3***
14. If the approach is different from what is in show card No 2, could you briefly outline the main process of the management approach you used?
15. Who was responsible for the overall external stakeholder management process during the initiation process?
16. When was the earliest external stakeholder involvement in the initiation process? Please use ***show card No. 1***
17. Could you specify the involvement strategies your organisation used to engage external stakeholders in the process of project initiation? Please use ***show card No. 4***
18. What levels of involvement were given to the identified external stakeholders? Please use ***show card No. 4***

Section 6: Attributes of the time lag

19. When was the earliest identification of the problem to be addressed by the project decision?
20. When were project objectives defined? How long did it take to have them articulated?
21. When did the first public consultation take place?

22. What were the activities that started before identifying external stakeholders? And what was the percentage of completion of each activity?
23. What were the activities that started before the first formal public consultation? And what was the percentage of completion of each activity?

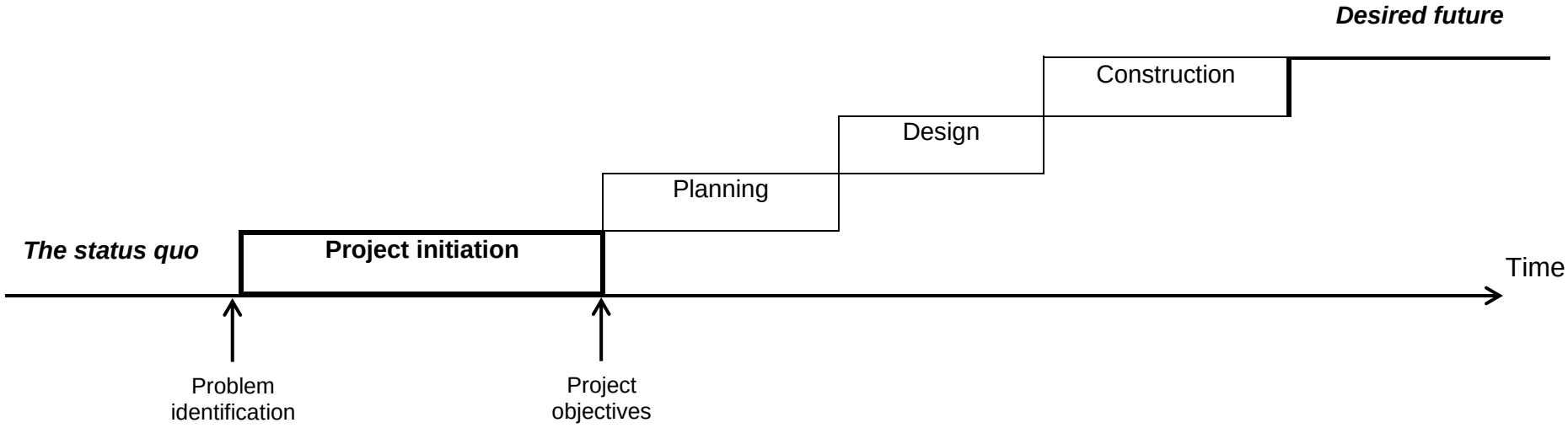
Section 7: Time lag explanations

24. Why do you think stakeholder identification and project initiation are carried out separately?
25. Do you think they can be integrated with each other?
26. If they were to be integrated, what barriers do you think may hinder such integration process?

C.3 Interview show cards

C.3.1 Show card No. 1: infrastructure project lifecycle

The research considers identifying the problem to be addressed by the project as the start of project initiation process, and deems the articulation of the project's objectives to be the end of the initiation process.



C.3.2 Show card No. 2: external stakeholder identification techniques

The participant uses this card to specify the identification tools that were used during the initiation phase to identify external stakeholders.

Identification tool	**Frequency of use**					**Capability to reveal importance**					**Capability to reveal interests and expectations**				
	Never	Rarely	Sometimes	Often	Very often	1	2	3	4	5	1	2	3	4	5
Directed by higher authorities															
Focus group meetings															
Forums															
Guidelines in the organisation															
Information hotline															
Interviews															
Meetings															
Personal past experience															
Professional services															
Questionnaires and surveys															
Snowball															
Social contacts															
Social network analysis															
Workshops															
Other, please specify															

C.3.3 Show card No. 3: Stakeholder management approaches proposed in previous studies

The participant uses this card to compare the management approach they implemented with approaches from the literature

Model	Stakeholder Management Process						
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**Step 6**	**Step 7**
Model 1	Identifying stakeholders	Planning stakeholder engagement and communications	Communicating	Monitoring stakeholder engagement			
Model 2	Identify stakeholders	Plan stakeholder management	Management stakeholder engagement	Control stakeholder engagement			
Model 3	The precondition	Information inputs	Stakeholder estimation	Decision-making	Sustainable support		
Model 4	Stakeholder Identification	General nature of stakeholder claims	Determine performance gaps	Prioritise stakeholder demands	Develop organisational responses	Monitoring and control	
Model 5	Identifying project success criteria	Identify resource requirements	Identify stakeholder groups and level of interests	Conduct stakeholder analysis	Develop strategy for each stakeholder	Monitor and review	
Model 6	Initial planning	Identification	Analysis	Communication	Action	Follow-up	
Model 7	Stakeholder Identification	Stakeholder Characterisation	Stakeholder Structuring and Degree of Involvement	Choice of Participatory Techniques	Implementation of Participatory Techniques	Evaluation	
Model 8	Identification of stakeholders	Gathering stakeholder information	Identification of stakeholder mission	Determining stakeholder strengths and weaknesses	Identification of stakeholder strategy	Prediction of stakeholder behaviour	Implementing stakeholder management strategy

C.3.4 Show card No. 4: external stakeholder involvement strategies

The participant uses this card to specify the involvement strategies used to engage external stakeholders during the initiation phase.

Involvement strategy	**Level of involvement**				
	Inform	**Consult**	**Collaborate**	**Co-decision**	**Empower**
Newsletter					
Reports					
Presentations, public hearings					
Internet webpage					
Interviews, questionnaires and surveys					
Field visit and interactions					
Workshops					
Participatory mapping					
Focus groups					
Citizen jury					
Geospatial/ decision support system					
Cognitive map					
Role playing					
Multi-criteria analysis					
Scenario analysis					
Consensus conference					
Other, please specify					

C.4 Consent to take part in a research project: Fieldwork 1

Project title: Integrating External Stakeholder Identification with Project Identification in Civil Engineering Infrastructure Projects

	Add your initials next to the statement if you agree
I confirm that I have read and understand the information sheet dated [/ /] explaining the above research project and I have had the opportunity to ask questions about the project.	
I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.	
I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research. I understand that my responses will be kept strictly confidential.	
I agree for the data collected from me to be used in relevant future research in an anonymised form.	
I agree to take part in the above research project and will inform the lead researcher should my contact details change.	

Name of participant	
Participant's signature	
Date	
Name of lead researcher	
Signature	
Date*	

*To be signed and dated in the presence of the participant.

Appendix D Ethical review

Performance, Governance and Operations
Research & Innovation Service
Charles Thackrah Building
101 Clarendon Road
Leeds LS2 9LJ Tel: 0113 343 4873
Email: ResearchEthics@leeds.ac.uk

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Mohamed H. Elmahroug
PhD Researcher
School of Civil Engineering
University of Leeds
Leeds, LS2 9JT

MaPS and Engineering joint Faculty Research Ethics Committee (MEEC FREC)
University of Leeds

30 April 2019

Dear Mohamed

Title of study	**Integrating External Stakeholder Identification with Project Initiation in Infrastructure Projects**
Ethics reference	**MEEC 14-002**

I am pleased to inform you that the application listed above has been reviewed by the MaPS and Engineering joint Faculty Research Ethics Committee (MEEC FREC) and I can confirm a favourable ethical opinion as of the date of this letter. The following documentation was considered:

Document	*Version*	*Date*
MEEC 14-002 Mohamed_s_Ethical_Review_Form.pdf	1	06/08/14
MEEC 14-002 All-Appendixes.pdf	1	06/08/14

Committee members made the following comments about your application:

- The reviewers agreed that a tick box is not sufficient for consent; the participant should sign the content form.
- It would be helpful if the information sheet were more specific about the intended location of the interview: it should communicate to the participant that it is expected that the interview will take place at or near their work place, and that this can be arranged once consent is in place.
- The information sheet should also include your supervisor's contact details.

Please notify the committee if you intend to make any amendments to the original research as submitted at date of this approval, including changes to recruitment methodology. All changes must receive ethical approval prior to implementation. The amendment form is available at http://ris.leeds.ac.uk/EthicsAmendment.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited. There is a checklist listing examples of documents to be kept which is available at http://ris.leeds.ac.uk/EthicsAudits.

We welcome feedback on your experience of the ethical review process and suggestions for improvement. Please email any comments to ResearchEthics@leeds.ac.uk.

Yours sincerely

Jennifer Blaikie
Senior Research Ethics Administrator, Research & Innovation Service
On behalf of Professor Gary Williamson, Chair, MEEC FREC

CC: Student's supervisor(s)

Appendix E Interview documents (Fieldwork 2)

E.1 Participant Information Sheet for Fieldwork 2

Integrating External Stakeholder Identification with Project Identification in Civil Engineering Infrastructure Projects

Dear participant,

You are being invited to take part in a research project. Before you decide, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

The aim of the study is *"to contribute towards improving the practice of external stakeholder identification during the identification phase of civil engineering infrastructure projects through integration of external stakeholder identification and project identification processes".* You are being asked to contribute your experience of interacting with stakeholders at the front end civil engineering infrastructure projects, and requested to take part in this research project through an interview.

The objective of the interview is *"to evaluate a proposed two-stage project identification process for improvement of external stakeholder identification practice during the identification phase of civil engineering infrastructure projects".*

It is entirely up to you to decide whether or not to take part. If you agree to take part, you give us permission to use the information you provide for the purposes of fulfilling this PhD research, and in relevant future research. You will also be given this information sheet to keep and you can still withdraw at any time. You do not have to give a reason.

Once you have agreed to take part, arrangements about when and where the interview will take place will be made. The interview will last about an hour, and recording the interview on audio media will be entirely up to you. The questions will enable open as well as closed answers to be given in relation to the proposed two-stage project identification process. Then, data will be analysed and you will be able to obtain a copy of the results.

I assure you that your response will be kept *strictly confidential*. Only the research team (my main and co-supervisors and I) will have access to the information you provide. All the information you provide will remain anonymous, you will therefore not be able to be

identified in any reports or publications. In addition, if you agree us recording the interview, the audio recordings of your interview will be used only for analysis. No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings.

Thank you very much for taking the time to read through the information and please do not hesitate to contact me if you require further information.

Yours sincerely,

Mohamed H. Elmahroug

Ph. D. Researcher
School of Civil Engineering
Faculty of Engineering
University of Leeds,
Leeds LS2 9JT, UK
M: +44 (0) 7446 862838
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Research supervisors

Dr. Apollo Tutesigensi	Prof. Nigel J. Smith
Institute for Resilient Infrastructure	Project and Transport Infrastructure Management
School of Civil Engineering	School of Civil Engineering
University of Leeds	University of Leeds
Leeds LS2 9JT, UK	Leeds LS2 9JT, UK
T: 0113-343-4678	T: 0113-343-2301
E: A.Tutesigensi@leeds.ac.uk	E: N.J.Smith@leeds.ac.uk

E.2 The validation interview questions

Background

Project Definition

A proposed two-stage project identification process for improvement of external stakeholder identification practice.

The two-stage project identification process is a proposal to improve the the identification process of civil engineering infrastructure projects. The aim of the proposal is to facilitate the alignment of project purpose and external stakeholder expectations through the integration of external stakeholder identification and project identification processes.

Evaluation Governance

Purpose of the Evaluation

The purpose of this evaluation is to assess whether the proposed two-stage project identification process has the potential to improve the identification process of civil engineering infrastructure projects through the means of effective external stakeholder involvement.

Core Evaluation Questions

1. What did you find most useful about the proposed two-stage project identification process?
2. What did you find to be a hindrance about the two-stage project identification process?
3. Based on your experience, to what extent could the proposed two-stage project identification process improve **external stakeholder identification practice** during the identification process of civil engineering infrastructure projects?

Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
0	1	2	3	4	5	6	7

4. Based on your experience, to what extent could the proposed two-stage project identification process improve **external stakeholder involvement practice** in the identification process of civil engineering infrastructure projects?

Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
0	1	2	3	4	5	6	7

5. To what extent could the proposed two-stage project identification process address the **limited external stakeholder involvement** in the identification process of civil engineering infrastructure projects?

Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
0	1	2	3	4	5	6	7

6. To what extent the proposed two-stage project identification process is cost effective?

Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
0	1	2	3	4	5	6	7

7. To what extent the proposed two-stage project identification process fits into your organisation's formal and informal procedures of identifying civil engineering infrastructure projects?

Not at all	To an Extremely Small Extent	To a Very Small Extent	To a Small Extent	To a Moderate Extent	To a Large Extent	To a Very Large Extent	To an Extremely Large Extent
0	1	2	3	4	5	6	7

Other questions

8. How long have you been working in the construction industry?
9. What is your role within your current organisation?

E.3 Interview show cards

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A Proposed Two-Stage Project Identification Process for Civil Engineering Infrastructure Projects

Mohamed H. Elmahroug
PhD Researcher
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University of Leeds, Leeds, LS2 9JT, UK
Email: cnmhe@leeds.ac.uk

Research supervisors:
Dr Apollo Tutesigensi and Prof Nigel J. Smith

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Rationale

Improving project identification could save up to **$200 billion** a year globally.

Inaccurate identification of the need for infrastructure is a key risk to value for money.

Initiating successful infrastructure projects requires the involvement of external stakeholders.

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Research aim and objectives

Aim:

"to improve the identification process of civil engineering infrastructure projects in order to facilitate the alignment of project purpose with external stakeholder expectations".

Objectives:

1. to examine the implementation of external stakeholder identification process during the identification phase of civil engineering infrastructure projects,
2. to develop a means for integrating project identification and external stakeholder identification processes during the identification phase of civil engineering infrastructure projects, and
3. to evaluate the developed means for improvement.

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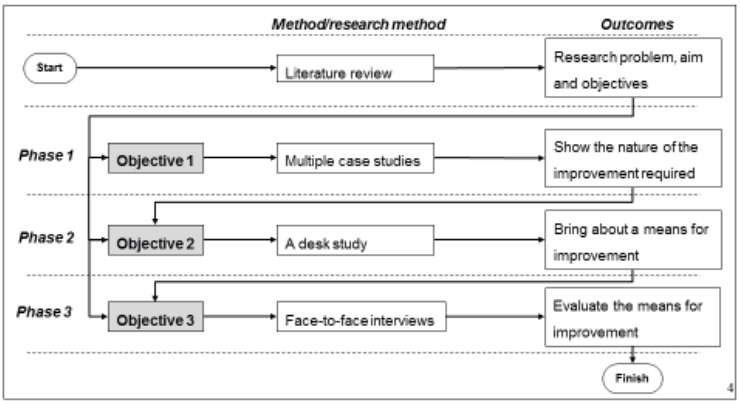
Research method



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Achievement of objective 1

The achievement of objective 1 was based on empirical data from **a multiple case studies**.

Edinburgh Trams

Crossrail

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Findings from the case studies

The findings from **Edinburgh Tram Network** project and **Crossrail 1** project revealed

- limited external stakeholder involvement in the project identification process,
- project identification and external stakeholder identification processes were performed separately,
- a time lag between the start of project identification and the first external stakeholder involvement,

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Findings from the case studies (continued)

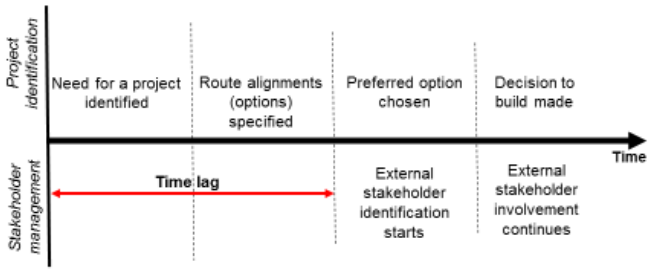

***Figure 1**: The time lag between project identification and stakeholder identification*

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Achievement of objective 2

The achievement of objective 2 was based on **a desk study**. This involved

- mapping of a generic infrastructure project life cycle onto two problem solving process models.
- adapting ideas of problem solving process and incorporating into the identification process of infrastructure projects.

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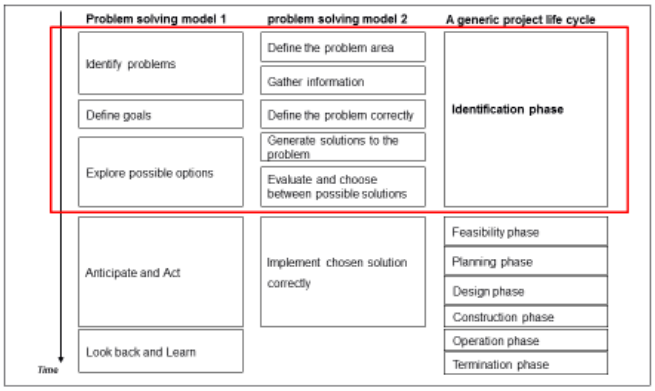
Achievement of objective 2



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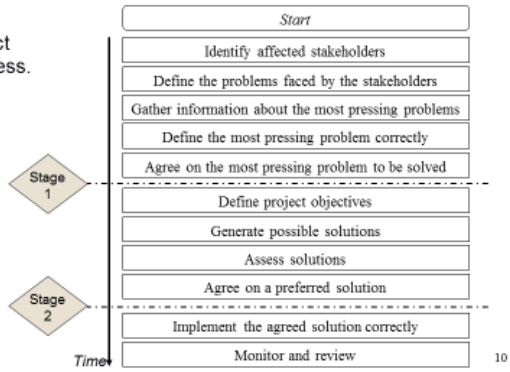
Outcomes of the desk study

A two-stage project identification process.



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The steps in the two-stage identification process

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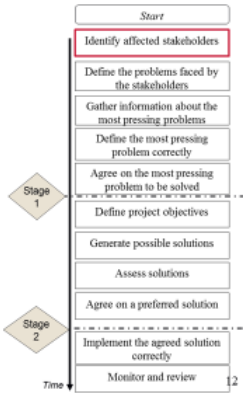
Identify affected stakeholders

- Infrastructure developers need to effectively identify all affected stakeholders using a variety of stakeholder identification techniques.
- Because problems and their corresponding solutions can be defined only within the context of the communities in which they exist, it is crucial to identify the communities and the people who live in them before any attempts at generating solutions are made.



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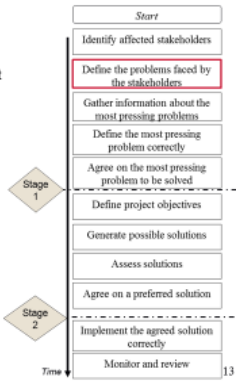
Define the problems faced by stakeholders

- Defining the problem to be addressed is probably the most important step during Stage 1, for unless the problem is already correctly defined it is unlikely that an effective solution can be found.
- Defining the problems involves generating a list of problems encountered by the stakeholders. These problems are then assessed to a level that enables developers and stakeholders to prioritise them.
- Once the problems have been assessed, the most pressing problem can be identified and the next step begins.



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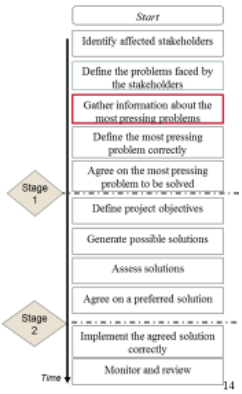
Gather information about the most pressing problems

- Developers and affected stakeholders collect relevant information about the most pressing problem in order to increase the overall comprehension of the problem.
- As a result, new ideas will be generated and the previously identified problem may now be seen from a new perspective.
- This requires the move to the next step of the process in order to define the most pressing problem correctly.



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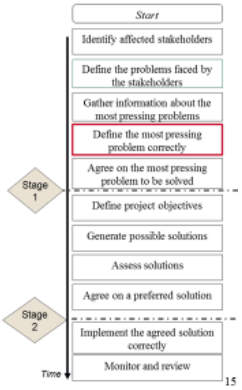
Define the most pressing problem correctly

- Developers and affected stakeholders examine the information obtained during the previous step to generate possible problem redefinitions.
- It should be indicated that since different stakeholders may have different perspectives of the most pressing problem, and hence different views to its precise nature, there is a need to consult all affected stakeholder before the most pressing problem is finally fully specified.
- The objective of this step is a precise definition of the most pressing problem.



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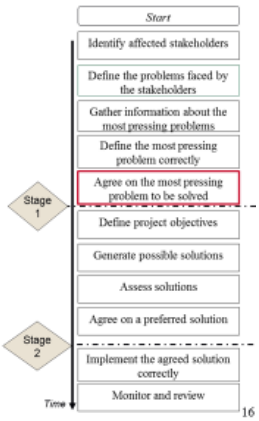
Agree on the most pressing problem to be addressed

- Once the most pressing problem has been precisely defined based on inputs from all affected stakeholders, it should be put into a context.
- The outcome of Stage 1 should be a well-defined problem to be addressed.
- Once this is done, Stage 2 begins.



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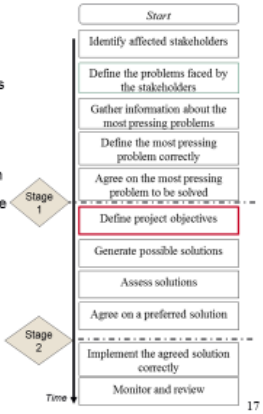
Define project objectives

- In the first step of Stage 2, developer and affected stakeholders should carefully define the project objectives in the problem situation.
- Defining objectives is a crucial step in moving towards a solution to a problem because if objectives have not been specified, solutions generated may not provide acceptable answers to the problem.



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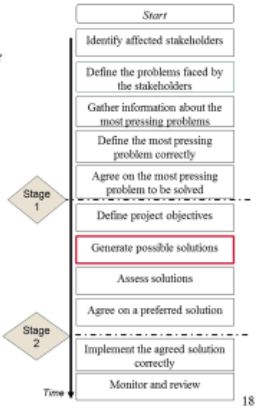
Generate possible solutions

- This involves ideas finding to help structure the search for potential solutions.
- This step uses mainly divergent activity to generate many ideas using a variety of idea-generation aids. The aim is to explore alternative approaches to solving the problem.
- Once a number of possible solutions/options have been identified, the developers and affected stakeholders are ready to move to the next step.



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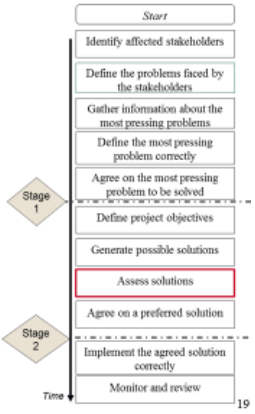
Assess solutions

- In this step developers and affected stakeholders choose the idea that can be transformed into a workable solution.
- Choosing a solution is likely to have a set of alternatives and also a set of assessment criteria. Therefore, assessing a list of alternative solutions involves measuring, trading-off or even scoring alternatives in terms of the assessment specified criteria.



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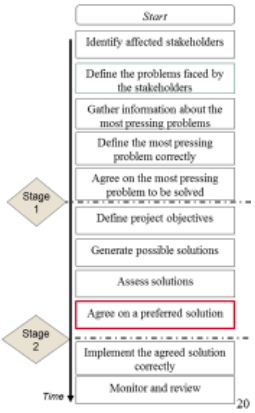
Agree on a preferred solution

- Once all possible, viable solutions have been assessed by the developers and affected stakeholders, a preferred solution can be chosen.
- Communication with affected stakeholders is significantly important in reaching agreement on the preferred solution.
- This requires developers and affected stakeholders to work closely and collaboratively in a spirit of openness and transparency.



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Thank you!

For further information please email Mohamed:
cnmhe@leeds.ac.uk

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Appendix F Key events and major milestones in ETN project

Event/milestone	Source of evidence
transport initiatives edinburgh limited (tie) was established in May 2002.	Audit Scotland (2007)
In September 2002, tie submitted its proposals to CEC, identifying three trams lines as the most promising in terms of economic viability and benefits to the city	
In March 2003, following CEC's decision to take these lines forward, the Scottish Executive announced its support for the construction of the northern loop and western line	
In January 2004, two Bills were submitted to the Scottish Parliament which received Royal Assent in spring 2006.	
the City of Edinburgh Council (CEC) gave its approval to the project's final business case in December 2007	Audit Scotland (2011)
The BBC wrote that: A £5m investment in the proposed West Edinburgh Tram Line has been announced by Transport Minister Iain Gray.	BBC (2002a)
In 2001 Waterfront Edinburgh Limited (WEL) commissioned a preliminary technical and economic feasibility study of a tram in north Edinburgh which would provide a link between the city centre and the proposals for the Waterfront redevelopment planned at Granton.	Transport Initiatives Edinburgh (2003a)
the story of trams in Edinburgh first started in 1998 when a White Paper was prepared by the Scottish government on Scottish transport's future, where one of the projects identified in the paper was Light Rail Scheme for Edinburgh.	Int-ETN-281014-FW1
Between 2004 and 2006, at the end of the Privative Bill process in 2006, we had the decision made by the Scottish government to give the powers to build the tram to city of Edinburgh council.	
Edinburgh's problem-plagued tram system opened to paying customers yesterday - three years behind schedule, more than two times over budget and limited to a route that covers less than half the network that had originally been planned for it.	McKie (2014)
Major roadworks got under way yesterday as the creation of a controversial new GBP600m tram network began.	Donnelly (2007)
Arup was commissioned in December 2001 by City of Edinburgh Council (CEC) to undertake this feasibility study for a light rail network in Edinburgh.	Arup (2003)
The Council Executive agreed to take forward proposals for the Edinburgh tram network on 28 January 2003.	The City of Edinburgh Council (2003)
Both the Edinburgh Tram (Line One) Act and Edinburgh Tram (Line Two) Act came into force following Royal Assent in May and April 2006 respectively.	Transport Initiatives Edinburgh (2006)
In January 2006, CEC made an in-principle commitment to make a contribution of &45m towards the capital cost of Phase 1.	
In 2001, Waterfront Edinburgh Limited (WEL) commissioned a preliminary technical and economic Feasibility Study of a rapid transit system in north Edinburgh, led by a Steering Group involving the City Council, which would provide a link between the city centre and the proposals for the Waterfront redevelopment planned at Granton.	Transport Initiatives Edinburgh (2003b, p.s-3)

Appendix G The identified stakeholder groups of ETN project

No	Stakeholder	Description
1	The City of Edinburgh Council (CEC)	• CEC is the promoter and a part-funder of Edinburgh Trams.
2	Transport Scotland	• Transport Scotland is the national transport agency for Scotland. • As the principle funder of the project it takes a close interest in the progress of project and its projected costs (Audit Scotland, 2007). • It was created under the Transport (Scotland) Act (2005).
3	Transport Initiative Edinburgh Limited (tie)	• tie was a non-profit private limited company wholly owned by CEC. • It was established in May 2002 to deliver major transport projects for CEC. • tie's remit was to provide the procurement, project management and financial management capabilities to ensure that a number of major transport-related projects are delivered (Audit Scotland, 2007).
4	The Scottish Executive/Government	• The Scottish Executive is known as the Scottish Government since 2007. • It is responsible in Scotland for all issues that are not explicitly reserved to the United Kingdom Parliament at Westminster by Schedule 5 of the Scotland Act (1998).
5	The UK government	• The central government of the United Kingdom of Great Britain and Northern Ireland.
6	Transport Edinburgh Ltd (TEL)	• Transport Edinburgh Ltd (TEL) is an arm's length company wholly owned by CEC. • It has overall responsibility for delivering an integrated tram and bus network for Edinburgh. • The original intention was that once the tram network is delivered, TEL would be responsible for delivering an integrated tram and bus service (Audit Scotland, 2011).
7	Tram Project Board	• Tram Project Board was a formal sub-committee of TEL. • It monitored execution of the project and had delegated authority to take the actions necessary to deliver the trams project (ibid).
8	Transdev	• Transdev was appointed as the tram operator in May 2004 to assist planning of an integrated service network with TEL. • The contract with Transdev was later cancelled in December 2009 as a cost saving measure. • CEC intended that TEL would be responsible for operating an integrated tram and bus service (ibid).

No	Stakeholder	Description
9	Parsons Brinkerhoff/Halcrow	• Parsons Brinkerhoff/Halcrow was appointed in September 2005 as SDS provider to facilitate the early identification of utility diversion works, land purchase requirements and traffic regulation requirements and the completion of design drawings (ibid).
10	Alfred McAlpine Infrastructure Services/Carillion	• Alfred McAlpine was appointed as the contractor responsible for utilities diversion work in October 2006. • Responsibility passed to Carillion when it acquired Alfred McAlpine in December 2007. • When Carillion completed its agreed work package in late November 2009, Clancy Docwra and Farrans were appointed to complete utilities diversion works (ibid).
11	Construcciones y Auxiliar de Ferrocarriles SA (CAF)	• Construcciones y Auxiliar de Ferrocarriles SA (CAF) is a Spanish firm was responsible for tram vehicle construction. • CAF was appointed in May 2008 (ibid).
12	Bilfinger Berger Siemens (BBS)	• Bilfinger Berger Siemens (BBS) Responsible for infrastructure construction. • Appointed in May 2008. At this point, responsibility for systems design and vehicle supply and maintenance passed to BBS, and Parson Brinkerhoff/Halcrow and CAF joint the consortium (ibid).
13	Arup	• Arup was commissioned by CEC to undertake a feasibility study for a light rail network in Edinburgh. • Arup reviewed the opportunities for a tram system along a number of routes in Edinburgh, and identified a number of priorities for developing the network.
14	Audit Scotland	• Audit Scotland is an independent public body responsible for auditing Scotland's public organisations.
15	Weber Shandwick	• Weber Shandwick is a specialist advisor. • It was appointed by tie to develop and implement an overall strategy for public relations and communications, including the organisation, monitoring and reporting of the major public consultations exercise carried out covering both Tram Line 1 and 2
16	DTZ Pieda Consulting	
17	Lothian and Enterprise Ltd	
18	The Scottish Parliament	• The Scottish Parliament is the devolved national legislature for Scotland. The current Parliament was convened by the Scotland Act (1998), and held its first meeting on 12 May 1999.

No	Stakeholder	Description
19	Steer, Davies and Gleave consultancy	• Compiled the trams project's business case (Evening News (Edinburgh), 2006).
20	Lothian Buses	• The dominant provider for bus services in Lothian which operates the majority of bus services in Edinburgh.
21	The Fedration of Small Businesses	• A UK business organisation representing small and medium-sized businesses.
22	Forth Ports	• Forth Ports is a UK-based multimodal ports owner and operator.
23	The Scottish National Party (SNP)	• A Political party/Politician.
24	City of Edinburgh residents	• The people of Edinburgh who live in Edinburgh
25	City of Edinburgh traders	• Traders of the city of Edinburgh
26	City of Edinburgh shop owners	• Owners of shops in the city of Edinburgh especially in the area directly affected by the tram project.
27	Turner and Townsend Consulting	• International consultants (BBC, 2011a).
28	The Moray Feu Residents Association	• A group of Edinburgh residents, from the west end of the city, who challenged the CEC's plans for a new tram system for years because of the noise and pollution created by traffic diverted onto residential streets. • The group took their arguments to a UN committee which sits in Geneva, and won a UN ruling against the city council over the environmental impact of the trams project in 2012 (BBC, 2012).
29	City of Edinburgh Council officials	• Officials who work for the City of Edinburgh Council.
30	City of Edinburgh Council councillors	• Councillors of the City of Edinburgh Council.
31	Waterfront Edinburgh Limited (WEL)	• A joint venture between the CEC and Scottish Enterprise Edinburgh and Lothian
32	Edinburgh businessmen	• Businessmen whose business is based in the city of Edinburgh
33	Edinburgh's Liberal Democrat group	• A Political party/Politician.
34	Capability Scotland	• A leading charity/campaign group (Roden, 2006a).

No	Stakeholder	Description
35	Friends of the Earth Scotland	• A leading charity/campaign group (ibid).
36	National Trust for Scotland	• A leading charity/campaign group (ibid).
37	Scottish Association for Public Transport	• A leading charity/campaign group (ibid).
38	Scottish Environment LINK	• A leading charity/campaign group (ibid).
39	Stop Climate Chaos Scotland	• A leading charity/campaign group (ibid).
40	TRANSform Scotland	• A leading charity/campaign group (ibid).
41	Voluntary Health Scotland	• A leading charity/campaign group (ibid).
42	WWF Scotland	• A leading charity/campaign group (ibid).
43	Edinburgh Airport	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (Roden, 2006b).
44	Edinburgh Chamber of Commerce	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
45	Marks & Spencer Edinburgh	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
46	University of Edinburgh	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
47	Heriot-Watt University	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
48	Telford College	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
49	Edinburgh City Centre Management Company	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).

No	Stakeholder	Description
50	Edinburgh International Conference Centre	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
51	Scottish Council Development and Industry	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
52	Institute of Directors Scotland	• A high profile business/education leader or company • The institute has a membership of around 2000 leading businessmen and women. • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
53	Royal Botanic Garden Edinburgh	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
54	Standard Life	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
55	Oracle	• A high profile business/education leader or company • A software giant • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
56	Scottish Widows	• A high profile business/education leader or company • Wrote to all CEC councillor urging them to vote through the project's business case (ibid).
57	The Friends of the Roseburn Urban Wildlife Corridor group	• A special interest group (Evening News (Edinburgh), 2007).
58	The Labour Party	• A Political party/Politician (Swanson, 2007).
59	The Greens Party	• A Political party/Politician (ibid).
60	The Conservative Party	• A Political party/Politician (ibid).
61	CEC (Planning and Strategy; Archaeology;	• Statutory Authorities/Agencies consulted during the Environmental Impact Assessment (Transport Initiatives Edinburgh, 2003a).

No	Stakeholder	Description
	Environmental & Consumer Services; Biodiversity)	
62	Health and Safety Executive	• Statutory Authorities/Agencies consulted during the Environmental Impact Assessment (ibid).
63	Historic Scotland	• Statutory Authorities/Agencies consulted during the Environmental Impact Assessment (ibid).
64	Scottish Environment Protection Agency (SEPA), East Region	• Statutory Authorities/Agencies consulted during the Environmental Impact Assessment (ibid).
65	Scottish Executive Environment and Rural Affairs Department	• Statutory Authorities/Agencies consulted during the Environmental Impact Assessment (ibid).
66	Scottish Executive Development Department, Planning Division	• Statutory Authorities/Agencies consulted during the Environmental Impact Assessment (ibid).
67	Scottish Natural Heritage (SNH)	• Statutory Authorities/Agencies consulted during the Environmental Impact Assessment (ibid).
68	Scottish Water	• Statutory Authorities/Agencies consulted during the Environmental Impact Assessment (ibid).
69	Architectural Heritage Society of Scotland	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
70	Cockburn Association	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
71	Cyclists Touring Club	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
72	Edinburgh and Lothians Badger Group	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
73	Edinburgh Architectural Association	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
74	Edinburgh World Heritage Trust	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).

No	Stakeholder	Description
75	Lothians Bat Group	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
76	Royal Fine Art Commission for Scotland	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
77	Royal Society for the Protection of Birds (RSPB) Scotland	• A leading charity/campaign group. • The RSPB is Europe's largest wildlife conservation charity. • The charity led a campaign of 11 organisations in support of the Edinburgh Trams project (Roden, 2006a). • Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (Transport Initiatives Edinburgh, 2003a).
78	Scottish Civic Trust	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
79	Scottish Enterprise Edinburgh & Lothian	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
80	Scottish Rights of Way and Access Society	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
81	Scottish Wildlife Trust	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
82	SPOKES Lothian Cycle Campaign	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
83	Sustrans	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).
84	VisitScotland	• Non Statutory Groups/Organisations consulted during the Environmental Impact Assessment (ibid).

Appendix H The classification of ETN project's identified stakeholder groups

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
1	The City of Edinburgh Council (CEC)	Internal stakeholder	Demand side	Client/financer
2	Transport Scotland	Internal stakeholder	Demand side	Financer
3	Transport Initiative Edinburgh Limited (tie)	Internal stakeholder	Demand side	Sponsor
4	Transport Edinburgh Ltd (TEL)	Internal stakeholder	Demand side	Sponsor
5	Tram Project Board	Internal stakeholder	Demand side	Sponsor
6	Lothian and Enterprise Ltd	Internal stakeholder	Demand side	Sponsor
7	Waterfront Edinburgh Limited (WEL)	Internal stakeholder	Demand side	Sponsor
8	City of Edinburgh Council officials	Internal stakeholder	Demand side	Client's employees
9	City of Edinburgh Council councillors	Internal stakeholder	Demand side	Client's employees
10	CEC (Planning and Strategy; Archaeology; Environmental & Consumer Services; Biodiversity)	Internal stakeholder	Demand side	Client's employees
11	Lothian Buses	Internal stakeholder	Demand side	Client's supplier
12	Transdev	Internal stakeholder	Supply side	Professional service provider
13	Weber Shandwick	Internal stakeholder	Supply side	Professional service provider
14	Parsons Brinkerhoff/Halcrow	Internal stakeholder	Supply side	First Tier Contractor
15	Alfred McAlpine Infrastructure Services/Carillion	Internal stakeholder	Supply side	First Tier Contractor
16	Construcciones y Auxiliar de Ferrocarriles SA (CAF)	Internal stakeholder	Supply side	First Tier Contractor
17	Bilfinger Berger Siemens (BBS)	Internal stakeholder	Supply side	Principal Contractor
18	Arup	Internal stakeholder	Supply side	Consultant
19	DTZ Pieda Consulting	Internal stakeholder	Supply side	Consultant

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
20	Steer, Davies and Gleave consultancy	Internal stakeholder	Supply side	Consultant
21	Turner and Townsend Consulting	Internal stakeholder	Supply side	Consultant
22	The Scottish Executive/Government	External stakeholder	Public	Local government
23	UK Government	External stakeholder	Public	National government
24	Audit Scotland	External stakeholder	Public	Regulatory agency
25	The Scottish Parliament	External stakeholder	Public	Regulatory agency
26	Health and Safety Executive	External stakeholder	Public	Regulatory agency
27	Scottish Environment Protection Agency (SEPA), East Region	External stakeholder	Public	Regulatory agency
28	Scottish Executive Environment and Rural Affairs Department	External stakeholder	Public	Regulatory agency
29	Historic Scotland	External stakeholder	Public	Regulatory agency
30	Scottish Natural Heritage (SNH)	External stakeholder	Public	Regulatory agency
31	Scottish Executive Development Department, Planning Division	External stakeholder	Public	Regulatory agency
32	Scottish Water	External stakeholder	Public	Regulatory agency
33	City of Edinburgh residents	External stakeholder	Private	Local residents
34	Scottish Environment LINK	External stakeholder	Private	Environmentalists
35	Stop Climate Chaos Scotland	External stakeholder	Private	Environmentalists
36	The Friends of the Roseburn Urban Wildlife Corridor group	External stakeholder	Private	Environmentalists
37	The Moray Feu Residents Association	External stakeholder	Private	Environmentalists
38	Friends of the Earth Scotland	External stakeholder	Private	Environmentalists
39	Royal Botanic Garden Edinburgh	External stakeholder	Private	Environmentalists
40	WWF Scotland	External stakeholder	Private	Environmentalists
41	Edinburgh Airport	External stakeholder	Private	Businesses
42	Edinburgh Chamber of Commerce	External stakeholder	Private	Businesses

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
43	Edinburgh businessmen	External stakeholder	Private	Businesses
44	City of Edinburgh traders	External stakeholder	Private	Businesses
45	Marks & Spencer Edinburgh	External stakeholder	Private	Businesses
46	University of Edinburgh	External stakeholder	Private	Businesses
47	Heriot-Watt University	External stakeholder	Private	Businesses
48	Telford College	External stakeholder	Private	Businesses
49	Edinburgh City Centre Management Company	External stakeholder	Private	Businesses
50	City of Edinburgh shop owners	External stakeholder	Private	Businesses
51	Edinburgh International Conference Centre	External stakeholder	Private	Businesses
52	The Fedration of Small Businesses	External stakeholder	Private	Businesses
53	Forth Ports	External stakeholder	Private	Businesses
54	Institute of Directors Scotland	External stakeholder	Private	Businesses
55	Oracle	External stakeholder	Private	Businesses
56	Standard Life	External stakeholder	Private	Businesses
57	Scottish Widows	External stakeholder	Private	Businesses
58	The Labour Party	External stakeholder	Private	Politician
59	Edinburgh's Liberal Democrat group	External stakeholder	Private	Politician
60	The Greens Party	External stakeholder	Private	Politician
61	The Conservative Party	External stakeholder	Private	Politician
62	The Scottish National Party (SNP)	External stakeholder	Private	Politician
63	Architectural Heritage Society of Scotland	External stakeholder	Private	Conservationists
64	Edinburgh and Lothians Badger Group	External stakeholder	Private	Conservationists
65	Edinburgh World Heritage Trust	External stakeholder	Private	Conservationists
66	Cockburn Association	External stakeholder	Private	Conservationists
67	Lothians Bat Group	External stakeholder	Private	Conservationists
68	Royal Society for the Protection of Birds (RSPB) Scotland	External stakeholder	Private	Conservationists

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
69	Scottish Civic Trust	External stakeholder	Private	Conservationists
70	Scottish Wildlife Trust	External stakeholder	Private	Conservationists
71	National Trust for Scotland	External stakeholder	Private	Conservationists
72	Royal Fine Art Commission for Scotland	External stakeholder	Private	None statutory group
73	Edinburgh Architectural Association	External stakeholder	Private	None statutory group
74	Scottish Enterprise Edinburgh & Lothian	External stakeholder	Private	Businesses
75	Scottish Council Development and Industry	External stakeholder	Private	Businesses
76	Scottish Rights of Way and Access Society	External stakeholder	Private	Interest group
77	SPOKES Lothian Cycle Campaign	External stakeholder	Private	Interest group
78	Sustrans	External stakeholder	Private	Interest group
79	Cyclists Touring Club	External stakeholder	Private	Interest group
80	Capability Scotland	External stakeholder	Private	Interest group
81	Scottish Association for Public Transport	External stakeholder	Private	Interest group
82	TRANSform Scotland	External stakeholder	Private	Interest group
83	Voluntary Health Scotland	External stakeholder	Private	Interest group
84	VisitScotland	External stakeholder	Private	Businesses

Appendix I Events relating to external stakeholders in ETN project

Event/milestone	Source of evidence
In June 2007, the Scottish Parliament conducted a major debate on the future of the Edinburgh trams and EARL projects. After a vote, the Scottish Parliament called on the SNP administration to proceed with the Edinburgh trams project within the £500 million budget limit set by the previous administration.	Audit Scotland (2011)
Proposals to reintroduce trams in Edinburgh have been approved by city councillors.	BBC (2006c)
The BBC wrote that: opponents of the scheme, estimated to cost £600m, argue that it should be scrapped altogether or changed.	

Event/milestone	Source of evidence
Councillors voted overwhelmingly in favour of going ahead with the project, with 56 out of 58 supporting the plans at the full council meeting.	
The BBC wrote that: plans for a tram line in the capital have been given approval by MSPs.	BBC (2006a)
The Evening News wrote that: politicians from four of Edinburgh's five political parties today sent a joint appeal to the new SNP government at Holyrood: "Don't trash our trams".	Swanson (2007)
The BBC wrote that: after two years scrutinising the proposals and listening to concerns, four MSPs have come out in support of the council's chosen route.	BBC (2003a)
The BBC wrote that: public consultation on plans for a new tram system in Edinburgh is reaching the end of the line … The six-week period ends on Thursday - but it will take several weeks to assess the results.	
The BBC wrote that: individuals and organisations have had an opportunity in recent weeks to submit their comments on the routing, and other aspects, of the first two lines.	
The BBC wrote that: plans to tackle Edinburgh's chronic congestion problem by introducing trams in the west of the city have been endorsed by the Scottish Executive.	BBC (2002b)
The Evening News wrote that: the National Trust for Scotland and wildlife charity RSPB are leading a new campaign in support of Edinburgh's tram scheme.	Roden (2006a)
The BBC wrote that: proposals to reintroduce trams on two routes in Edinburgh have been put out to public consultation.	BBC (2003b)
Following the extensive consultation programme carried out by the Council in autumn 2000, I believe that this Local Transport Strategy reflects well the aspirations of Edinburgh's citizens; it also illustrates the challenges that lie ahead.	The City of Edinburgh Council (2000a)
The BBC wrote that: transport campaigners and business leaders have urged councillors in Edinburgh to back the completion of the city's tram line to St Andrew Square.	BBC (2011b)
A programme of extensive consultations with environmental agencies and organisations has been undertaken to inform the environmental assessment.	Transport Initiatives Edinburgh (2003a)
The Evening News wrote that: some of Scotland's most powerful business and education leaders today lent their names to a powerful show of support for Edinburgh's tram network.	Roden (2006b)
The BBC wrote that: businesses in an Edinburgh street which has been closed for tram works say the disruption has cut their takings by up to 60%.	Brown (2014)
Extensive consultation has been undertaken in respect of the Edinburgh Tram network. tie has appointed a specialist advisor, Weber Shandwick, to develop and implement an overall strategy for public relations and communications.	Transport Initiatives Edinburgh (2003b)
The consultations commenced in September 2002.	

Appendix J Problems to be addressed by ETN project

J.1 Traffic congestion

Evidence of problem	Source of evidence
“One of the objectives of the Edinburgh trams project was to reduce traffic congestion and environmental damage caused by traffic.”	Audit Scotland (2011, p.30)
The BBC wrote that: “The Scottish Executive has endorsed plans for a tram network to ease congestion and has already announced a £6.5m investment in northern Edinburgh.”	BBC (2002a)
The Herald (Glasgow) wrote that: “A tram system could do much to ease Edinburgh's congestion”	Robertson (1997)
The BBC wrote that: “Plans to tackle Edinburgh's chronic congestion problem by introducing trams in the west of the city have been endorsed by the Scottish Executive.”	BBC (2002b)
The BBC wrote that: “Backers of the tram scheme argue that it is one of the best ways of tackling the capital's congestion problems.”	BBC (2003a)
The BBC wrote that: Transport minister Tavish Scott described the tram project as "historic", and argued that “trams could help ease congestion problems.”	BBC (2006b)
The Daily Record wrote that: The pounds 24million scheme's backers claimed the ultra-modern trams could cure the capital's traffic nightmare - without public subsidies.	Lironi (1998)
The Daily Mail wrote that: The tram project is part of a plan “to cut traffic congestion” and the first two lines, costing Pounds 473million, should be running by 2009.	(Robertson, 2004, p.49)
“There is substantial road traffic growth across the Edinburgh area combined with forecast population and employment increases which will lead to significant growth of road congestion.”	(Arup, 2003, p.1)
“The tram will offer a first class alternative to the car for many urban trips. Without the Initiative and trams, congestion would reach intolerable levels throughout the city.”	(The City of Edinburgh Council, 2003, p.2)
Growing congestion has meant that motoring is becoming increasingly unpleasant during parts of the day. Traffic jams reduce the efficiency of motoring for individuals and business alike. Without further action, increasing congestion will undermine Edinburgh’s economy, and its quality of life, as car use continues to rise. Business will suffer increasing costs as a result of traffic congestion. The economic impact of excessive traffic and associated congestion is a major concern.	The City of Edinburgh Council (2000a)
It was mentioned in the Scottish Parliament that:	SP OR (23 February 2005)

Evidence of problem	Source of evidence
The promoter feels that the tram project will "contribute to a maximisation of economic growth by relieving congestion" Bill Aitken (Glasgow) (Con). "If we are to tackle congestion, we must invest in high-quality, reliable and sustainable options … We must reduce congestion" The Minister for Transport (Nicol Stephen). "We think that Edinburgh needs a world- class public transport system as part of the process of tackling traffic congestion … in Edinburgh" Mark Ballard (Lothians) (Green). "The Executive considers that the tramline will make a significant contribution to reducing congestion in Edinburgh" The Minister for Transport (Nicol Stephen).	
"Congestion in Edinburgh alone is estimated to cost the economy £47 million per annum" Chris Ballance (South of Scotland) (Green). "One of the most pressing constraints on Edinburgh is traffic congestion" The Minister for Transport (Nicol Stephen). "The promoter predicts that severe congestion in Edinburgh will increase as car use increases by 50 per cent between 2011 and 2021. Trams will constrain that congestion to current levels by encouraging drivers to use the tram" Rob Gibson (Highlands and Islands) (SNP).	SP OR (2 March 2005)
"Edinburgh is a hugely successful city, but it suffers from traffic congestion" Margaret Smith (Edinburgh West) (LD). "In the west of the city, there is a real and growing problem of congestion" Margaret Smith (Edinburgh West) (LD). "We need trams because Edinburgh urgently needs to address its congestion problem. We cannot wait until congestion becomes insufferable" Mark Ballard (Lothians) (Green). "Trams are attractive because they address the perennial problem of chronic road traffic congestion-a problem that we have in Edinburgh-by offering people a more attractive alternative to their cars" Colin Fox (Lothians) (SSP).	SP OR (22 March 2006)

J.2 Social exclusion

Evidence of problem	Source of evidence
"many people do not share in the prosperity and quality of life that the region's dynamism has generated. Social equity requires that steps are taken to allow everyone access to opportunities, an effective public transport network is essential to achieve this."	Arup (2003, p.12)
"Trams help to meet social inclusion objectives."	The City of Edinburgh Council (2003, p.3)
"The tram services will enable non-car owners and the socially excluded increased access to the public transport network." "The tram will provide social benefits in terms of enhanced liveability on streets and accessibility to mobility impaired and deprived segment of the population."	Transport Initiatives Edinburgh (2003b, p.s-15)
"the social exclusion of those without cars, and their loss of freedom in car-dominated streets must be addressed."	The City of Edinburgh Council (2000a, p.1)
It was mentioned in the Scottish Parliament that: "The promoter feels that it [the tram] will contribute to a maximisation of economic growth by relieving congestion, providing connectivity within and beyond the city, reducing pollution and increasing social inclusion."	SP OR (23 February 2005)

Evidence of problem	Source of evidence
"the tramline will bring more indirect social inclusion benefits by opening up wider employment, education and leisure opportunities to people throughout the communities that the line will serve" The Minister for Transport (Nicol Stephen). Edinburgh is a world heritage city and trams will offer huge social and economic benefits" Sarah Boyack (Edinburgh Central) (Lab).	
"Line One seeks to contribute to … improvements in accessibility through the centre and north of the city"	Transport Initiatives Edinburgh (2003a, p.s-2)
"Without Tram, access to the major Waterfront developments will simply not be good enough."	The City of Edinburgh Council (2006, p.2)
"Line 1 has the potential to support the local economy and enhance the quality of living … by improving access to the public transport network and access to employment opportunities … in North Edinburgh … It will represent a step-change in accessibility with an integrated, efficient, accessible and quality public transport system."	Transport Initiatives Edinburgh (2003b, p.25)
"Trams will give us the essential tool we will all need to get to work and meet up with friends easily and quickly" Councillor Ricky Henderson, transport leader at Edinburgh Council told the BBC.	BBC (2006c)

J.3 Environmental problems

Evidence of problem	Source of evidence
"One of the objectives of the Edinburgh trams project was to reduce traffic congestion and environmental damage caused by traffic."	Audit Scotland (2011)
Transport is the biggest single source of most urban air pollution, and cars are responsible for most emissions. Transport is a major contributor to global climate change from which Edinburgh is not immune. Thousands of premature deaths result from transport related air pollution and lack of exercise associated with increasing car dependence.	The City of Edinburgh Council (2000a)
"Phase 1 of the tram will make a positive contribution towards objectives of reducing emissions and improving air quality in the City Centre and in the transport corridor to the west of the City and the airport."	Transport Initiatives Edinburgh (2006, p.3)
"Road traffic is now the biggest single contributor to urban air pollution."	The Scottish Office (1998, para. 2.1.4)
"Line One [of the tram project] seeks to contribute to … environmental benefits through reduced traffic noise and pollution."	Transport Initiatives Edinburgh (2003a, p.s-2)
The Herald (Glasgow) wrote that: "Plans to introduce environmentally friendly trams to Edinburgh suffered a setback yesterday after a study found the project would cost too much."	The Herald (1999)
It was mentioned in the Scottish Parliament that: "the [tram] scheme will help to protect our environment and to improve health by minimising emissions and the consumption of resources and energy" The Minister for Transport (Nicol Stephen).	SP OR (23 February 2005)
It was mentioned in the Scottish Parliament that: "Trams should also help to limit congestion and thereby constrain the pollution levels that arise" Mr Jamie Stone (Caithness, Sutherland and Easter Ross) (LD).	SP OR (2 March 2005)
The Herald (Glasgow) wrote that:	Robertson (1997)

Evidence of problem	Source of evidence
"A leading transport expert yesterday claimed traffic air pollution posed a health risk comparable to the cholera and typhoid epidemics of a century ago."	
It was mentioned in the Scottish Parlaiment that: "The scheme is hugely important … We need the trams to deliver economic and environmental benefits to our city" Sarah Boyack (Edinburgh Central) (Lab).	SP OR (22 March 2006)

Appendix K Key events and major milestones in Crossrail project

Event/milestone	Source of evidence
In Autumn 2001 the Crossrail Board agreed on broad corridors in east and west London as the starting point for the option selection process (building on the core route). These broad corridors reflect the Crossrail project objectives.	(Crossrail, 2002)
The Crossrail Bill was re-introduced in the House of Commons on 18 May 2005. It was previously introduced as HC Bill 62 of 2004-05 and was carried over into the new Parliament on 7 April 2005.	(Butcher, 2005)
In July 2003, CLRLL submitted the business case for Crossrail line 1 to Government.	(Cross London Rail Links Ltd et al., 2003)
Cross London Rail Links Ltd (CLRLL) is a joint venture company, established in 2001 and owned by Transport for London and the Strategic Rail Authority, to promote and develop Crossrail lines 1 and 2.	
On 14 July 2003 the Secretary of State announced in a written statement that the Government supported the principle of a new east-west Crossrail link but wanted to be assured that CLRLL's proposal was deliverable and financeable.	(Butcher, 2005)
The Government's 10 year transport plan, Transport 2010, published on 25 July 2000, envisaged that an east-west rail link would go ahead and allocated £150 million of funding for preparatory work. Crossrail was one option to be considered.	(ibid)
On 3 May 2001 the Government announced that work would start immediately on project definition and design development of a central cross-London rail link.	(ibid)
CLRLL's shortlist of route options for Crossrail line 1 (a variation of the original Crossrail plan) was announced in March 2002.	(ibid)
On 21 November 2002, CLRLL set out its final proposals on the central core route: following the safeguarded alignment through central London with stations at Paddington, Bond Street, Tottenham Court Road, Farringdon, Liverpool Street and Whitechapel.	(ibid)
In February 2003 CLRLL presented its interim business case to the Department for Transport (DfT) for Crossrail line 1.	(ibid)
On 11 July 2003 CLRLL submitted its final business case for Crossrail to the DfT and on 14 July the Secretary of State, Alistair Darling MP, announced in a written statement how the Government wished the scheme to go forward.	(ibid)
Initial construction started in May 2009.	(Mayor of London et al., 2010)

Event/milestone	Source of evidence
A Strategic Rail Authority review in 2000 found that new rail links were needed to relieve congestion on east–west routes across London.	(National Audit Office, 2014)
The idea of an east–west railway through London was first raised in the 1880s and reconsidered in the 1940s, 1970s, 1980s and 1990s.	(ibid)
In 2000, the Strategic Rail Authority recommended that new rail links should be built across London to relieve existing and forecast overcrowding and to reduce congestion on the rail network from east to west.	(ibid)
PM Brown gave the official go-ahead for Crossrail and hailed it as a great day for London.	(Beattie, 2007)
2001: the Government allocates £154 million for a feasibility study.	(Lydall, 2007)
The business case was updated: • in 2005, to reflect changes to the proposed route, and was submitted as part of the Crossrail Bill; • in 2010, to confirm the coalition government's support for the programme and to form part of the Mayor of London's 2010 transport strategy; and • in 2011, to reflect changes to the programme costs and schedule following the 2010 Comprehensive Spending Review.	(National Audit Office, 2014)
in 2007, the government announced a funding package of £15.9 billion for the infrastructure element of the programme.	(ibid)

Appendix L The identified stakeholder groups of Crossrail project

No	Stakeholder	Description
1	AECOM	• It a global network of experts working with clients, communities and colleagues to develop and implement innovative solutions to the world's most complex challenges.
2	Air & Waste Management Association (A&WMA)	• It is a nonprofit, nonpartisan professional organization. • It promotes global environmental responsibility and increases the effectiveness of organizations to make critical decisions that benefit society.
3	Airtrack	• Heathrow Airtrack is a proposed railway link in west London, England, UK. The line, as proposed by BAA, would have run from Heathrow Terminal 5 into central London and across the suburbs of south-west London.
4	Alan Dixon – Chelmsford Borough Councillor	• A Political party/Politician.

No	Stakeholder	Description
5	ATP Group Partnership	• A multi-disciplinary practice of professional consultants providing architectural, surveying and project management services within the construction industry.
6	Aylesbury Vale District Council	• A local authority.
7	Barratt Homes East London	• It is one of the largest residential property development companies in the United Kingdom.
8	Bechtel	• Project management contractor, working with Crossrail Limited to oversee construction of the central, tunnelled section (National Audit Office, 2014).
9	Berkeley Homes	• Contributing towards the funding of the Crossrail station at Woolwich (National Audit Office, 2014).
10	Berkshire Unitary Authorities	• A local authority.
11	Bexley Council	• A local authority.
12	Bombardier	• Supply, deliver and maintain 65 new trains and a depot at Old Oak Common (Butcher, 2017).
13	British Airports Authority (BAA)	• BAA was established by the passing of Airport Authority Act 1965, to take responsibility for three state-owned airports – Heathrow Airport, Gatwick Airport and London Stansted Airport.
14	British Airways (BA)	• BA is the largest airline in the United Kingdom based on fleet size.
15	British Railways Board (BRB)	• BRB was a public authority responsible for providing railway services in Great Britain. • It was created under the (*Transport Act*, 1962) to inherit the railway responsibilities from the British Transport Commission (BTC) Railway Executive. • BRB also traded under the brand names British Railways and British Rail. • BRB was then privatised under the Railways Act 1993 which introduced a new structure for the British rail industry. • On privatisation, responsibilities for track, signalling and other infrastructure was transferred to Railtrack and that for trains to the trains operating companies (Poole, 1995).
16	Buckinghamshire County Council	• A local authority.
17	Canary Wharf group	• It is a British property company headquartered in London.

No	Stakeholder	Description
		• Contributing towards the construction of the Crossrail station at Canary Wharf (National Audit Office, 2014).
18	Central London Partnership	• Central London Partnership is a non-profit organisation that focuses on improving the working environment in central London. • The organisation focuses on improving transport infrastructure, safety, and business environment.
19	CH2M Hill	• CH2M HILL, also known as CH2M, is a global engineering company that provides consulting, design, construction, and operations services for corporations, and federal, state, and local governments.
20	Change London	• Change London is a non-profit organisation which delivers commercially sustainable solutions and projects that can change people's lives for the better.
21	Charlton Athletic Football Club	• It is an English professional association football club based in Charlton, south-east London.
22	Chelmsford Borough Council	• A local authority.
23	Cheryl Gillan Mp	• A Political party/Politician.
24	Chesham District Council	• A local authority.
25	Chesham Town Council	• A local authority.
26	Chiltern Railways	• The company principally operates services between Marylebone and High Wycombe, Banbury and Birmingham Snow Hill and between Marylebone and Aylesbury (Poole and Dyer, 1999).
27	City of London Police	• The City of London Police is the territorial police force responsible for law enforcement within the City of London.
28	City Property Owners Association	• It represents a significant commercial property portfolio, and brings together property owners, developers, investors and professional advisors to inform policy and drive the economic prosperity of the City.
29	Clean Air in London	• Clean Air in London is a not-for-profit organisation that promotes cleaner air.
30	Client Earth	• Client Earth is a non-profit environmental law organisation, founded in 2008 working to protect the environment through advocacy, litigation and research.

No	Stakeholder	Description
31	Corporation of London	• The City of London Corporation supports and promotes the City as a business centre and provides local authority services for the City. • Agreed to contribute funding towards Crossrail (National Audit Office, 2014).
32	Crossrail Ltd	• Wholly-owned subsidiary of TfL, delivering the Crossrail programme (National Audit Office, 2014).
33	Crossrail project Representative	• A senior engineer, supported by a small team, who challenges and reviews Crossrail Limited's progress with the programme, and reports to the joint sponsors (National Audit Office, 2014).
34	Dartford Borough Council	• A local authority.
35	Department for Transport (DfT)	• DfT is the government department responsible for the English transport network. • Joint sponsor and funder (National Audit Office, 2014).
36	Devon & Cornwall Business Council	• A local authority.
37	Devon & Cornwall Business Council	• A local authority.
38	Disabled Persons Transport Advisory Committee (DPTAC)	• It advises the UK government on transport legislation, regulations and guidance and on the transport needs of disabled people, ensuring disabled people have the same access to transport as everyone else.
39	East of England Development Agency	• It was a non-departmental public body and the regional development agency for the East of England region of England. • The Agency was abolished in 2012.
40	East of England Local Government Conference	• It is a politically-led, cross party organisation which works on behalf of the 52 local councils in the East of England to harness their collective strength to shape and serve their communities and localities.
41	English Heritage	• It is a registered charity that manages the National Heritage Collection. • It cares for over 400 historic buildings, monuments and sites.
42	English Partnerships	• English Partnerships was the national regeneration agency, supporting high quality sustainable growth in England. • It was a non-departmental public body sponsored by the Department for Communities and Local Government. • It was replaced by the Homes and Communities Agency in 2008.

No	Stakeholder	Description
43	Environment Agency	• The Environment Agency is a non-departmental public body, sponsored by the United Kingdom government, with responsibilities relating to the protection and enhancement of the environment in England.
44	Environmental Protection UK (EPUK)	• A charity founded over 100 years ago as the “Coal Smoke Abatement Society”, and which campaigns on issues relating to air quality, climate change, noise and land pollution.
45	Environmental Transport Association (ETA)	• Providing information on green, reliable travel services.
46	Essex County Council	• A local authority.
47	Fiona Mactaggart MP	• A Political party/Politician.
48	First (Great Eastern)	• First Great Eastern Railway principally operates commuter services between London Liverpool Street and Ilford, Romford, Southend, Colchester, Clacton and Ipswich and local services to Upminster, Sudbury, Walton-on-Naze, Harwich, Braintree and Southminster (Poole and Dyer, 1999).
49	First (Great Western)	• First Great Western Trains operates high speed services principally between London Paddington and South Wales, Avon, the West of England and the Cotswolds (ibid).
50	FPD Savills	• It is a global real estate services provider.
51	Government Office for South East	• It represented the central government in the region and its role was to promote better and more effective integration of Government policies and programmes at a regional and local level.
52	Gravesham Borough Council	• A local authority.
53	Greenwich Chamber of Commerce	• It is a non-profit business organization. • The Chamber is an advocate for the interests of the business community, as well as for maintaining the town’s quality of life and its residential integrity.
54	Greenwich Council	• A local authority.
55	Greenwich Peninsula Partnership	• The Greenwich Peninsula Partnership is providing direction for local groups to progress one of Europe's largest regeneration projects. • It was established to broker relationships and encourage communication between all parties who are involved with or affected by the regeneration of the Thames Gateway.

No	Stakeholder	Description
56	H Montlake & Co	• H Montlake and Co are a firm of solicitors based in Ilford, Essex.
57	Harry Cohen MP	• A Political party/Politician.
58	Havering Local Group of Friends of The Earth	• Friends of the Earth considers environmental issues in their social, political and human rights contexts. Their campaigns stretch beyond the traditional arena of the conservation movement and seek to address the economic and development aspects of sustainability.
59	Health & Safety Executive	• It is the body responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare, and for research into occupational risks in Great Britain.
60	Heathrow Airport Ltd	• Agreed to contribute funding towards Crossrail (National Audit Office, 2014).
61	Heathrow Area Transport Forum	• It is a partnership between various organisations in the private and public sectors seeking to improving accessibility and increase public transport use to, from and in the area around Heathrow.
62	Hertfordshire County Council	• A local authority.
63	HM Treasury	• HM Treasury is the UK government's economic and finance ministry, maintaining control over public spending, setting the direction of the UK's economic policy and working to achieve strong and sustainable economic growth.
64	Kent County Council	• A local authority.
65	Land Securities Development	• It is the largest commercial property development and investment company in the UK.
66	London & Continental Railways	• It manages, develops and disposes property assets within a railway context, and in particular assets associated with major infrastructure projects.
67	London Assembly – Green Group	• A Political party/Politician.
68	London Borough Hammersmith & Fulham	• A London borough.
69	London Borough of Barking & Dagenham	• A London borough.
70	London Borough of Brent	• A London borough.

No	Stakeholder	Description
71	London Borough Of Camden	• A London borough.
72	London Borough of Ealing	• A London borough.
73	London Borough Of Harrow	• A London borough.
74	London Borough Of Havering	• A London borough.
75	London Borough of Hillingdon	• A London borough.
76	London Borough of Islington	• A London borough.
77	London Borough of Kensington & Chelsea	• A London borough.
78	London Borough of Newham	• A London borough.
79	London Borough of Redbridge	• A London borough.
80	London Borough of Southwark	• A London borough.
81	London Borough of Tower Hamlets	• A London borough.
82	London Buses	• London Buses is the subsidiary of Transport for London (TfL) that manages bus services within Greater London.
83	London City Airport	• It is an international airport in London, UK. • It is located in the Royal Docks in the London Borough of Newham.
84	London City Airport Consultative Committee	• It is an independent committee that was first convened in 1987. • The committee's role is to provide a positive, inclusive and interactive forum for discussion on all matters concerning the development or operation of the Airport which have an impact on the users of the airport and on people living and working in the surrounding area.
85	London Development Agency (LDA)	• LDA was the regional development agency for the London region in England. It existed as a functional body of the Greater London Authority. Its purpose was to drive sustainable economic growth within London.

No	Stakeholder	Description
		• The agency was closed in 2012.
86	London First	• It is an influential business membership organisation with the mission to make London the best city in the world to do business. • London First is a not-for-profit organisation, entirely funded by its members.
87	London Transport Users Committee (LTUC)	• It is the independent, statutory watchdog for transport users in and around London.
88	London Underground Ltd	• Responsible for operating the London Underground train network and owns (in whole or in part) more than 250 stations.
89	Meridian Delta Ltd.	• Meridian Delta Limited focuses on building and developing Greenwich Peninsula, a riverside community in the United Kingdom. • Its portfolio comprises homes, shops, restaurants, parks, healthcare facilities, schools, and an entertainment complex.
90	National Audit Office (NAO)	• The NAO scrutinises public spending for Parliament. • It helps to hold government departments and the bodies it audits to account for how they use public money. • NAO's work helps public service managers to improve performance and service delivery, nationally and locally.
91	National Express Group	• National Express Group is a leading transport provider delivering services in the UK, Continental Europe, North Africa, North America and the Middle East.
92	National Maritime Museum	• The National Maritime Museum, London, is the leading maritime museum of the United Kingdom and may be the largest museum of its kind in the world.
93	Network Rail	• Financing the surface works through borrowing which will primarily be repaid by fees from the Crossrail train operating company. • Network Rail is also a contractor to Crossrail Limited for the construction of the eastern and western surface sections in addition to its wider responsibility for the national rail network (National Audit Office, 2014).
94	Newham Local Strategic Partnership	• Newham Partnership is the Local Strategic Partnership for the borough, which brings together a range of organisations from the public, private, voluntary and community sectors.
95	Nichols Group	• The Nichols Group is an independent management consultancy specialising in advising on and managing large-scale, complex and rapid changes – covering both major capital investments and business change programmes.

No	Stakeholder	Description
96	Office of Passenger Franchising	• It is responsible for granting franchises for the twenty-five rail networks to private train operating companies under the Railways Act 1993 and for monitoring and enforcing the franchise agreements (Poole and Dyer, 1999).
97	Office of Rail Regulation	• Regulating Network Rail (National Audit Office, 2014).
98	Paddington Residents Active Concern on Transport	• This is an umbrella group founded by four major Westminster amenity societies. It aims to protect the Paddington area from damage caused by London-wide or national transport schemes.
99	Park Royal Partnership	• Park Royal Partnership was an urban regeneration partnership, promoting the economic development of Park Royal, London, Europe's largest industrial area.
100	Port of London	• The Port of London lies along the banks of the River Thames from the capital to the North Sea. • The port is governed by the Port of London Authority (PLA), a public trust established in 1908.
101	Rail Freight Group	• The Rail Freight Group was set up to promote freight on the railways. It has about 165 members and is financed by them (Poole and Dyer, 1999).
102	Rail Passenger Committee (Eastern England)	• It represents the passengers' interests to the industry and regulatory bodies. It monitors the level of service provided in their area such as train punctuality, safety and station facilities (ibid).
103	Rail Passenger Committee (Southern England)	• It represents the passengers' interests to the industry and regulatory bodies. It monitors the level of service provided in their area such as train punctuality, safety and station facilities (ibid).
104	Railfuture	• Railfuture is the UK's leading independent organisation campaigning for better rail services for passengers and freight.
105	Railtrack	• Railtrack was a separate Government owned company instead of a division of British Rail on 1 April 1994. • It owned and managed the vast majority of track, signalling and other infrastructure of Britain's railways after the privatisation of British Rail (Poole and Dyer, 1999). • Railtrack had never ceased to exist, but changed name after it was purchased by Network Rail in 2002 (Butcher, 2015).
106	Railway Passenger Committee (Western England)	• It represents the passengers' interests to the industry and regulatory bodies. It monitors the level of service provided in their area such as train punctuality, safety and station facilities (Poole and Dyer, 1999).

No	Stakeholder	Description
107	Reading Borough Council	• A local authority.
108	Redbridge Chamber of Commerce	• The Chamber provides businesses with recognised status within the community, opens gateways for networking and provides information on business opportunities and legislation. • The Chamber works actively with Redbridge Council and other agencies to stimulate business and help influence decision making in the Borough.
109	Romford Town Centre Partnership	• It is a collective of 23 Romford business owners and influencers dedicated to making Romford a prosperous, thriving and safe town centre.
110	Royal Borough Of Windsor & Maidenhead	• The Royal Borough of Windsor and Maidenhead is a Royal Borough of Berkshire, in South East England.
111	Slough Borough Council	• A local authority.
112	Slough Business Community Partnership	• It is a unique organisation that facilitates the creation of partnerships between the private, public and voluntary sectors for the benefit of the communities of Slough.
113	Slough Town Centre Business Initiative	• It works with retailers, businesses and town centre stakeholders to improve high street facilities, infrastructure, retail offer, public realm and promote economic growth in the high street.
114	South Buck District Council	• A local authority.
115	South East England Development Agency	• It was one of a number of regional development agencies in England. • It was set up as a non-departmental public body in 1999 to promote the region and to enable a number of more difficult regeneration projects which otherwise might not take place.
116	South East England Regional Assembly	• It was the regional chamber for the South East England region of the England.
117	Southend-on-Sea Borough Council	• A local authority.
118	St Marylebone Society	• It is Marylebone's oldest amenity society, having been set up in 1948 to help save the war-damaged Nash Terraces in Regent's Park. • The Society is a registered charity run by volunteers from amongst its members.

No	Stakeholder	Description
119	Thames Gateway London Partnership	• Thames Gateway London Partnership is a strategic partnership for the public, private and voluntary sectors across the Thames Gateway regeneration area.
120	Thameslink 2000 Consortium	• Thameslink operates rail services between Bedford to the north of London and Brighton on the south coast, using a route through London via Kings Cross Thameslink, Farringdon, City Thameslink and Blackfriars (Poole and Dyer, 1999).
121	The Carbon Trust	• The Carbon Trust is an independent, expert partner of leading organisations around the world, helping them contribute to and benefit from a more sustainable future through carbon reduction, resource efficiency strategies and commercialising low carbon technologies.
122	The Chilterns Conservation Board	• It is the public body established to conserve and enhance the Chilterns Area of Outstanding Natural Beauty.
123	The City of London	• The City is the financial district and historic centre of London. • It is one of the 33 areas with local authority responsibilities into which London is divided.
124	The Conservative Party	• A Political party/Politician.
125	The Greater London Authority (GLA)	• GLA was established in 2000 by the Greater London Authority Act 1999 following a referendum which was held in Greater London in May 1998 on the establishment of Greater London Authority (Greater London Authority (Referendum) Act, 1998), which was approved. • GLA is the top-tier administrative body for Greater London, and consists of the Mayor of London and the London Assembly which comprises 25 members. • It covers the area of 33 London boroughs, including the City of London Corporation (Greater London Authority, 2001).
126	The Greens Party	• A Political party/Politician.
127	The Labour Party	• A Political party/Politician.
128	The London Assembly	• It examines decisions and actions to ensure promises to Londoners are delivered. • The Assembly holds the Mayor and Mayoral advisers to account by publicly examining policies and programmes through committee meetings, plenary sessions, site visits and investigations.

No	Stakeholder	Description
129	The Mayor of London	• The Mayor of London is an elected politician who, along with the London Assembly of 25 members, is accountable for the strategic government of Greater London.
130	The Pinner Association	• It is an amenity society founded in 1932. Its aims are to conserve and enhance the quality of life in Pinner, a historic Middlesex village that dates from the 14th Century. Pinner is some 13 miles North West of Central London.
131	The shadow Strategic Rail Authority (sSRA)	• sSRA was set up in April 1999 following the privatisation of British Rail (Poole and Dyer, 1999). • The government then published the Railways Bill 1998-99 in July 1999 which abolishes the Office of Passenger Franchising and the British Rail Board, and establishes the Strategic Rail Authority (SRA).
132	The Spitalfields Small Business Association	• A commercial premises landlords.
133	The Strategic Rail Authority (SRA)	• The SRA was placed on a formal legal basis by the Transport Act 2000, and came into existence on 1 February 2001. • The Act transferred the functions, rights and liabilities of both the Franchising Director and the British Railways Board to the SRA (Butcher, 2010). • The purpose of this organisation was to promote rail use and plan the strategic development of the rail network (Poole, 1999). • On 8 June 2005, the SRA was abolished under the Railways Act 2005, and transferred its responsibilities to the Department for Transport (Butcher, 2010).
134	The UK government	• The central government of the United Kingdom of Great Britain and Northern Ireland.
135	Three Rivers District Council	• A local authority.
136	Transcend	• Joint venture between AECOM, CH2M Hill and Nichols Group. • Project management contractor, working with Crossrail Ltd to oversee the overall Crossrail programme (National Audit Office, 2014).
137	Transport for London (TfL)	• TfL is a local government body established by the Greater London Authority Act 1999 to replace London Regional Transport. Its purpose involves securing or facilitating the implementation of the Mayor's transport strategy. • Joint sponsor and funder (National Audit Office, 2014).

No	Stakeholder	Description
138	UK Parliament	• It is the supreme legislative body in the United Kingdom.
139	University of East London	• The University of East London is a public university in the London Borough of Newham, London, England, based at three campuses in Stratford and Docklands.
140	Victoria Coach Station Ltd.	• Victoria Coach Station is the largest coach station in London, located in the central district of Victoria in the City of Westminster. • It serves as a terminus for many medium- and long-distance coach services in the United Kingdom and is also the departure point for many countryside coach tours originating from London.
141	Watford Council	• A local authority.
142	West London Alliance	• It is a partnership of the borough councils in West London. • It bring together the public, private and voluntary sectors in West London to promote the economic, social and environmental interest of West London businesses and residents.
143	West London Business Alliance	• It is a non-profit business leadership forum. • It represents business and enterprise with any commercial focus across the seven 'West London Alliance' boroughs.
144	West Silvertown Village Community Foundation	• It was formed in 1995. • It works in partnership with various organisations to fund and deliver a comprehensive programme of activities for everyone in West Silvertown.
145	Westminster City Council	• A local authority.
146	Westminster Property Owners Association	• It is the voice of property in Central London. • The Association brings together property owners, developers, occupiers and professional advisers into a collective voice to inform policy makers and drive the economic prosperity of Westminster.
147	Wokingham District Council	• A local authority.
148	World Wildlife Fund (WWF)	• WWF protects endangered wildlife and environments, tackles climate change and promotes sustainable use of resources.

Appendix M The classification of Crossrail project's identified stakeholder groups

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
1	Transport for London (TfL)	Internal stakeholder	Demand side	Client/Sponsor/funder
2	London Underground Ltd	Internal stakeholder	Demand side	Client's employees
3	Railtrack	Internal stakeholder	Demand side	Client's employees
4	The shadow Strategic Rail Authority (sSRA)	Internal stakeholder	Demand side	Client's employees
5	The Strategic Rail Authority (SRA)	Internal stakeholder	Demand side	Client's employees
6	British Railways Board (BRB)	Internal stakeholder	Demand side	Client's employees
7	AECOM	Internal stakeholder	Supply side	Consultant
8	CH2M Hill	Internal stakeholder	Supply side	Consultant
9	Nichols Group	Internal stakeholder	Supply side	Consultant
10	Crossrail project Representative	Internal stakeholder	Demand side	Consultant
11	Bechtel	Internal stakeholder	Supply side	Contractor
12	Bombardier	Internal stakeholder	Supply side	Contractor
13	Transcend	Internal stakeholder	Supply side	Contractor
14	Berkeley Homes	Internal stakeholder	Demand side	Financer
15	Canary Wharf group	Internal stakeholder	Demand side	Financer
16	Network Rail	Internal stakeholder	Demand side	Financer
17	Heathrow Airport Ltd	Internal stakeholder	Demand side	Financer
18	Corporation of London	Internal stakeholder	Demand side	Sponsor
19	Crossrail Ltd	Internal stakeholder	Demand side	Sponsor
20	The City of London	Internal stakeholder	Demand side	Sponsor
21	The Mayor of London	Internal stakeholder	Demand side	Sponsor
22	Department for Transport (DfT)	Internal stakeholder	Demand side	Sponsor/funder
23	Airtrack	External stakeholder	Private	Businesses
24	ATP Group Partnership	External stakeholder	Private	Businesses
25	Barratt Homes East London	External stakeholder	Private	Businesses

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
26	British Airways (BA)	External stakeholder	Private	Businesses
27	Charlton Athletic Football Club	External stakeholder	Private	Businesses
28	Chiltern Railways	External stakeholder	Private	Businesses
29	City Property Owners Association	External stakeholder	Private	Businesses
30	First (Great Eastern)	External stakeholder	Private	Businesses
31	First (Great Western)	External stakeholder	Private	Businesses
32	FPD Savills	External stakeholder	Private	Businesses
33	Greenwich Chamber of Commerce	External stakeholder	Private	Businesses
34	Greenwich Peninsula Partnership	External stakeholder	Private	Businesses
35	H Montlake & Co	External stakeholder	Private	Businesses
36	Heathrow Area Transport Forum	External stakeholder	Private	Businesses
37	Land Securities Development	External stakeholder	Private	Businesses
38	London & Continental Railways	External stakeholder	Private	Businesses
39	London Buses	External stakeholder	Private	Businesses
40	London City Airport	External stakeholder	Private	Businesses
41	London City Airport Consultative Committee	External stakeholder	Private	Businesses
42	London Development Agency (LDA)	External stakeholder	Private	Businesses
43	Meridian Delta Ltd.	External stakeholder	Private	Businesses
44	National Express Group	External stakeholder	Private	Businesses
45	Newham Local Strategic Partnership	External stakeholder	Private	Businesses
46	Park Royal Partnership	External stakeholder	Private	Businesses
47	Port of London	External stakeholder	Private	Businesses
48	Rail Freight Group	External stakeholder	Private	Businesses
49	Redbridge Chamber of Commerce	External stakeholder	Private	Businesses
50	Romford Town Centre Partnership	External stakeholder	Private	Businesses
51	Slough Business Community Partnership	External stakeholder	Private	Businesses

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
52	Slough Town Centre Business Initiative	External stakeholder	Private	Businesses
53	Thames Gateway London Partnership	External stakeholder	Private	Businesses
54	Thameslink 2000 Consortium	External stakeholder	Private	Businesses
55	The Spitalfields Small Business Association	External stakeholder	Private	Businesses
56	University of East London	External stakeholder	Private	Businesses
57	Victoria Coach Station Ltd.	External stakeholder	Private	Businesses
58	West London Alliance	External stakeholder	Private	Businesses
59	West London Business Alliance	External stakeholder	Private	Businesses
60	Westminster Property Owners Association	External stakeholder	Private	Businesses
61	St Marylebone Society	External stakeholder	Private	Conservationists
62	The Chilterns Conservation Board	External stakeholder	Private	Conservationists
63	The Pinner Association	External stakeholder	Private	Conservationists
64	Havering Local Group of Friends of The Earth	External stakeholder	Private	Environmentalists
65	Air & Waste Management Association (A&WMA)	External stakeholder	Private	Environmentalists
66	The Carbon Trust	External stakeholder	Private	Environmentalists
67	Change London	External stakeholder	Private	Environmentalists
68	Clean Air in London	External stakeholder	Private	Environmentalists
69	Client Earth	External stakeholder	Private	Environmentalists
70	Environmental Protection UK (EPUK)	External stakeholder	Private	Environmentalists
71	Environmental Transport Association (ETA)	External stakeholder	Private	Environmentalists
72	World Wildlife Fund (WWF)	External stakeholder	Private	Environmentalists
73	Central London Partnership	External stakeholder	Private	Interest group
74	Disabled Persons Transport Advisory Committee (DPTAC)	External stakeholder	Private	Interest group
75	London First	External stakeholder	Private	Interest group
76	London Transport Users Committee (LTUC)	External stakeholder	Private	Interest group
77	Paddington Residents Active Concern on Transport	External stakeholder	Private	Interest group

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
78	Rail Passenger Committee (Eastern England)	External stakeholder	Private	Interest group
79	Rail Passenger Committee (Southern England)	External stakeholder	Private	Interest group
80	Railfuture	External stakeholder	Private	Interest group
81	Railway Passenger Committee (Western England)	External stakeholder	Private	Interest group
82	West Silvertown Village Community Foundation	External stakeholder	Private	Interest group
83	Aylesbury Vale District Council	External stakeholder	Public	Local government
84	Berkshire Unitary Authorities	External stakeholder	Public	Local government
85	Bexley Council	External stakeholder	Public	Local government
86	Buckinghamshire County Council	External stakeholder	Public	Local government
87	Chelmsford Borough Council	External stakeholder	Public	Local government
88	Chesham District Council	External stakeholder	Public	Local government
89	Chesham Town Council	External stakeholder	Public	Local government
90	City of London Police	External stakeholder	Public	Local government
91	Dartford Borough Council	External stakeholder	Public	Local government
92	Devon & Cornwall Business Council	External stakeholder	Public	Local government
93	Devon & Cornwall Business Council	External stakeholder	Public	Local government
94	Essex County Council	External stakeholder	Public	Local government
95	Government Office for South East	External stakeholder	Public	Local government
96	Gravesham Borough Council	External stakeholder	Public	Local government
97	Greenwich Council	External stakeholder	Public	Local government
98	Hertfordshire County Council	External stakeholder	Public	Local government
99	Kent County Council	External stakeholder	Public	Local government
100	London Borough Hammersmith & Fulham	External stakeholder	Public	Local government
101	London Borough of Barking & Dagenham	External stakeholder	Public	Local government
102	London Borough of Brent	External stakeholder	Public	Local government
103	London Borough Of Camden	External stakeholder	Public	Local government

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
104	London Borough of Ealing	External stakeholder	Public	Local government
105	London Borough Of Harrow	External stakeholder	Public	Local government
106	London Borough Of Havering	External stakeholder	Public	Local government
107	London Borough of Hillingdon	External stakeholder	Public	Local government
108	London Borough of Islington	External stakeholder	Public	Local government
109	London Borough of Kensington & Chelsea	External stakeholder	Public	Local government
110	London Borough of Newham	External stakeholder	Public	Local government
111	London Borough of Redbridge	External stakeholder	Public	Local government
112	London Borough of Southwark	External stakeholder	Public	Local government
113	London Borough of Tower Hamlets	External stakeholder	Public	Local government
114	Reading Borough Council	External stakeholder	Public	Local government
115	Royal Borough Of Windsor & Maidenhead	External stakeholder	Public	Local government
116	Slough Borough Council	External stakeholder	Public	Local government
117	South Buck District Council	External stakeholder	Public	Local government
118	Southend-on-Sea Borough Council	External stakeholder	Public	Local government
119	The Greater London Authority (GLA)	External stakeholder	Public	Local government
120	The London Assembly	External stakeholder	Public	Local government
121	Three Rivers District Council	External stakeholder	Public	Local government
122	Watford Council	External stakeholder	Public	Local government
123	Westminster City Council	External stakeholder	Public	Local government
124	Wokingham District Council	External stakeholder	Public	Local government
125	The UK government	External stakeholder	Public	National government
126	East of England Development Agency	External stakeholder	Private	None statutory group
127	English Heritage	External stakeholder	Private	None statutory group
128	English Partnerships	External stakeholder	Private	None statutory group
129	National Maritime Museum	External stakeholder	Private	None statutory group
130	South East England Development Agency	External stakeholder	Private	None statutory group

No	Stakeholder	1st Order Classification	2nd Order Classification	3rd Order Classification
131	South East England Regional Assembly	External stakeholder	Private	None statutory group
132	Alan Dixon – Chelmsford Borough Councillor	External stakeholder	Private	Politician
133	Cheryl Gillan Mp	External stakeholder	Private	Politician
134	East of England Local Government Conference	External stakeholder	Private	Politician
135	Fiona Mactaggart MP	External stakeholder	Private	Politician
136	Harry Cohen MP	External stakeholder	Private	Politician
137	London Assembly – Green Group	External stakeholder	Private	Politician
138	The Conservative Party	External stakeholder	Private	Politician
139	The Greens Party	External stakeholder	Private	Politician
140	The Labour Party	External stakeholder	Private	Politician
141	Environment Agency	External stakeholder	Public	Regulatory agency
142	Health & Safety Executive	External stakeholder	Public	Regulatory agency
143	National Audit Office (NAO)	External stakeholder	Public	Regulatory agency
144	Office of Passenger Franchising	External stakeholder	Public	Regulatory agency
145	Office of Rail Regulation	External stakeholder	Public	Regulatory agency
146	UK Parliament	External stakeholder	Public	Regulatory agency
147	British Airports Authority (BAA)	External stakeholder	Private	Regulatory agency
148	HM Treasury	External stakeholder	Public	Regulatory agency

Appendix N Events relating to external stakeholders in Crossrail project

Event/milestone	Source of evidence
Over the period between October 2001 and February 2002 these corridors were subject to discussion with a wide range of key stakeholders and to a comprehensive assessment and sifting process.	(Crossrail, 2002)
Stakeholder Consultation (May – July 2002)	(Crossrail, 2005)
Environmental Scoping Report (September 2002)	(ibid)
Education Programme (2003)	(ibid)
Public Awareness (8 – 29 September 2003)	(ibid)

Event/milestone	Source of evidence
Public Consultation Round 1 (27 October 2003 – 3 December 2003)	(ibid)
Public Information Centres were held to introduce the proposed route and destinations. Staff were available to explain the proposals and answer questions.	(ibid)
Preview exhibitions were held for the Central Area on 20 October, the East on 22 October and the West on 10 November 2003.	(ibid)
Supplementary Public Awareness (2 August – 24 August 2004)	(ibid)
Public Consultation Round 2 (25 August – 27 October 2004)	(ibid)
Information Round (10 – 19 February 2005)	(Crossrail, 2005)
Two separate twelve- week rounds of public consultation were completed from September 2003 to January 2004 and from August 2004 to October 2004. The consultation rounds involved public information centres at key locations along the proposed route, mail drops to those potentially affected, newsletters, a dedicated web-site and a 24-hour telephone helpline.	(Butcher, 2005)
Before deposit of the Bill in Parliament, CLRLL undertook a final information round between 10 and 19 February.	(ibid)
It was stated in the House of Commons that: The first round of consultation (September 2003 to January 2004) that I asked CLRL to undertake to explain to the public in more detail their proposed scheme, and to canvass views on their route proposals.	(HC Deb, 13 September 2004)
The 19 option was the long list sifting, so we had a long list sifted down to a short list. We did that completely internally with no external stakeholders involved, but we then sent the short list out to consultation.	Int-CLRL-121214-FW1

Appendix O Problems to be addressed by Crossrail project

O.1 Journey times

Evidence of problem	Source of evidence
“Crossrail would generate significant benefits to users of the public transport network, primarily by reducing journey times”	Cross London Rail Links Ltd et al. (2003, p.16)
“Journey times to, from and across the central area will be dramatically improved … Some journey times could be halved”.	Greater London Authority (2001, p.324)
It was mentioned in the UK Parliament that: “Crossrail will massively cut journey times in east London” John Austin (Erith and Thamesmead).	HC Deb (26 November 2002)
The Evening Standard (London) wrote that: “The key benefits of Crossrail include relief of overcrowding on the Central London rail system and faster train journeys into Central London from both east and west.”	(Reiss, 1993)
It was mentioned in the UK Parliament that: “it [Crossrail] will reduce journey times by up to 40 per cent” Clive Efford (Eltham) (Lab).	HC Deb (19 July 2005)
It was mentioned in the UK Parliament that:	HC Deb (19 July 2005)

“it [Crossrail] will improve rail access to and across London, reducing existing journey times” Derek Twigg (The Parliamentary Under-Secretary of State for Transport).	
The Evening Standard (London) wrote that: “Crossrail will improve the quality of life by speeding up journeys and reducing overcrowding.”	(Maguire and Murray, 1993)

O.2 Overcrowding

Evidence of problem	Source of evidence
“Crossrail would generate significant benefits to users of the public transport network, primarily by reducing … levels of overcrowding on trains and in stations”.	Cross London Rail Links Ltd et al. (2003, p.16)
“Crossrail will make a significant impact towards relieving … growing pattern of congestion and crowding”.	Mayor of London et al. (2010, p.5)
“a new route through the central area … would relieve the most severely overcrowded parts of the Underground network whilst also addressing the constraining bottlenecks on the approaches to the National Rail Network termini”.	Strategic Rail Authority (2000, p.11)
The Evening Standard (London) wrote that: “LU points out that the Central route was specifically chosen to relieve congestion and overcrowding in the West End”	(Leonard, 1992)
It was mentioned in the UK Parliament that: “The purpose of Crossrail is to provide a significant increase in the capacity of the present rail networks into and across London so as to relieve congestion and overcrowding” Mr. Alistair Darling (The Secretary of State for Transport).	HC Deb (14 July 2003)
It was mentioned in the UK Parliament that: “It [Crossrail] should also relieve congestion and overcrowding on existing national rail and underground networks” Mr. John Spellar (The Minister for Transport).	HC Deb (26 November 2002)
It was mentioned in the UK Parliament that: “Investment in Crossrail is essential. I fear that if the present commitment to the project is not carried through now, it will be too late to save London from overcrowding” Linda Perham (Ilford, North).	HC Deb (21 October 2003)

O.3 Traffic congestion

Evidence of problem	Source of evidence
“Crossrail is expected to reduce pressures on road traffic, with an overall two per cent reduction across London. A more significant impact is expected on roads running parallel to the Crossrail route, with Crossrail also helping to alleviate future growth in road traffic by reducing the need for car trips to Central London, Canary Wharf and, particularly, Heathrow”.	Mayor of London et al. (2010, p.7)
“CrossRail should provide a direct link from the City to Heathrow Airport … reducing traffic congestion on west London roads serving Heathrow”.	Greater London Authority (2001, p.324)
The Evening Standard (London) wrote that: “LU points out that the Central route was specifically chosen to relieve congestion and overcrowding in the West End”	(Leonard, 1992)
The Evening Standard (London) wrote that:	Murray (1993)

Evidence of problem	Source of evidence
“The original objective of the line was to relieve central London congestion.”	
In a written statement to the House of Commons, Mr. Alistair Darling (The Secretary of State for Transport) wrote: “Crossrail has the potential to relieve some of the serious congestion across central London”.	HC Deb (09 September 2003)
The Evening Standard (London) wrote that: “The project - a joint British Rail-London Underground tunnel under the capital between Paddington and Liverpool Street - is aimed at easing chronic congestion.”	Murray (1994)
It was mentioned in the UK Parliament that: “It [Crossrail] should also relieve congestion and overcrowding on existing national rail and underground networks” Mr. John Spellar (The Minister for Transport).	HC Deb (26 November 2002)

O.4 Capacity problems

Evidence of problem	Source of evidence
“It [Crossrail] will increase the capacity of London’s rail transport system by over 10 per cent which represents the largest single increase in London’s transport capacity since before World War II”.	Mayor of London et al. (2010, p.5)
“CrossRail will provide a new high capacity east-west rail link across London, serving both the City and the West End … It would increase total rail and Underground capacity across the central area by about ten per cent”.	Greater London Authority (2001, p.324)
In a written statement to the House of Commons, Mr. Alistair Darling (The Secretary of State for Transport) wrote: “The purpose of Crossrail is to provide a significant increase in the capacity of the present rail networks into and across London”.	HC Deb (14 July 2003)
It was mentioned in the UK Parliament that: “the Government have long supported the principle of the Crossrail scheme and recognised that it could provide a significant increase in the capacity of the present rail networks into and across London” Mr. Tony McNulty (The Parliamentary Under-Secretary of State for Transport).	HC Deb (14 January 2004)
It was mentioned in the House of Lords that: “Crossrail will significantly increase the capacity of the rail network into and across London” Lord Bassam of Brighton.	HL Deb (09 January 2008)

Appendix P Operational approaches for stakeholder analysis and engagement

Source: (Jing et al., 2011)

Approaches	Strengths	Limitations	Level of engagement
Construction advice letters	• Can keep stakeholders informed • Can include details such as date of delivery and date of works	• Can be time consuming • May not send to all stakeholders due to information scarcity	• Inform
Darzin (a software tool)	• Easy to create custom fields for contacts and communications • Can record and manage restricted access to confidential communications • Easy distribution of data with built-in mail merge • View all contacts from an organization and communications with them on one screen • Integrated qualitative, quantitative and spatial analysis • Charts issue trends over time • Easy to create sophisticated, meaningful reports	• Can be time consuming to input the data • Costly	• Inform
Directed by higher authorities	• Provides advice for project managers	• Not suitable for all issues	• N/A
Displays and exhibits	• Can focus stakeholders' attention on the project • Can create interest from the media	• Stakeholders must be motivated to attend • Can damage the project's reputation if not done well	• Inform • Consult
Door knocks	• Face-to-face contact ensures stakeholders understand issues and information can be elicited about opinions they express	• Can be time consuming • Work better if informing the stakeholders earlier	• Inform • Consult
E-mail/mail/ fax/phone	• Easy and convenient to communicate • Can solve problems quickly	Difficult to document	• Inform • Consult • Involve • Collaboration

Approaches	Strengths	Limitations	Level of engagement
Feedback bulletins	• Keep stakeholders informed • Opportunity to satisfy stakeholders	• Can be time consuming to prepare • Not all feedback can be included in bulletins	• Inform
Focus groups	• Provide opportunity for a wider range of comments • Good for identifying the reasons behind stakeholders' likes/dislikes • Highly applicable when a new proposal is mooted and little is known of stakeholders' opinions	• Requires careful selection to be a representative sample • Skilled facilitators should be hired • Can be costly • Groups may not represent the majority opinion	• Consult
Formal memos	• Provides detailed information about stakeholders	• Can be time consuming to document the information	• N/A
Forums	• Encourage discussion between stakeholders • Opportunity for exchanging ideas	• Some stakeholders may not have time to join • May cause dispute	• Consult • Involve • Collaboration
Guidelines	• Easy to follow • Includes stakeholder management as duties	• Takes time to formulate • Stakeholders can change depending on situations	• N/A
Information hotline	• Offers an inexpensive and simple device for publicity, information and public input • It is easy to provide updates on project activities	• Must be adequately advertised to be successful • Designated contact must have sufficient knowledge of the project to be able to answer questions quickly and accurately • May limit a project officer from performing other tasks	• Inform • Consult

Approaches	Strengths	Limitations	Level of engagement
Interviews	• Allow in-depth discussion and understanding of issues • Individual contact means that the location of the meeting is flexible • Able to explain points in own language • Usually low cost and easy to arrange	• Can be time consuming for project team • Can be expensive • May not have sufficient time • Requires skilled interviewers • Little quantitative information gathered and not majority opinion	• Consult
Listening post	• Provides an engagement opportunity for those stakeholders who may never attend a formal engagement opportunity	• Stakeholders may not have time at the listening post session • Team members should arrange a regular time for it	• Consult
Media management	• Opportunity for promoting the project • Opportunity for informing a broad range of stakeholders	• Can be costly	• Inform
Meetings	• Cheap and relatively easy to organize • Makes use of existing networks and allows specific stakeholders to be targeted • Face-to-face contact ensures attendees understand issues and information can be elicited about opinions they express	• Unknown issues and previous relationships between the stakeholders may drive responses • Opinions might not be representative of the wider community	• Inform • Consult • Involve • Collaboration
Negotiations	• Cheaper and faster to solve problems	• Project team should well prepared • Concessions should be made sometimes	• Consult • Involve • Collaboration
Newsletters/ postcard series/ fact sheets	• Can provide regular updates on progress giving a sense of momentum • Opportunity for stakeholders to get familiar with project issues • Can give positive impression of desire to keep stakeholders informed	• Many stakeholders may never read them • Can be time consuming to prepare well on regular basis	• Inform

Approaches	Strengths	Limitations	Level of engagement
Open house/ open day	• Useful when a large number of stakeholders exist • Builds credibility • Allows other team members to be drawn on to answer difficult questions	• It is important to advertise in a number of ways • Difficult to document •	• Inform • Consult • Involve • Collaboration
Personal past experience	• Clear understanding about the previous stakeholders • Saves time for consultations	• May have cognitive limitations • Can be useless due to the unique nature of construction projects	• N/A
Power/interest matrix	• Project team can pay different attention and apply different engagement methods according to each type of stakeholder • Cheaper and easy to do	• Hard to assess power • The assessment cannot consider • the interrelationship between stakeholders •	• N/A
Professional services	• Provide complete plans for stakeholder management • Saves time for project managers	• Can be costly • May have bias on the project	• Consult • Involve
Questionnaires and surveys	• Respondents' anonymity can encourage more honest answers • Can reach respondents who are widely scattered or live considerable distances away • Provides information from those unlikely to attend meetings and workshops • Allows the respondent to fill out at a convenient time • Provide larger samples for lower total costs	• Low response rates can bias the results • Care must be taken that wording of questions is unambiguous to prevent skewed results • Care is needed in sampling to make sure representative samples are taken • Information gathered can be superficial and the reasons behind an opinion may not always be clear	• Inform • Consult
Snowball	• Helps to identify unknown stakeholders • Reduces project risks • Builds on resources of existing networks	• Choice of initial contacts is most important • Boundary of stakeholders should be decided properly	• Consult • Involve • Empower

Approaches	Strengths	Limitations	Level of engagement
Social contacts	• Build trust with stakeholders • Maximizes two-way dialogue	• Only suitable for some stakeholders • Requires creativity and resource investigation to reach a large number of people	• Inform • Consult • Involve
Social network analysis	• Views a specific set of linkages among a defined set of persons as a whole to analyse the interrelationship between stakeholders • Can identify influential stakeholders and the way to engage them • Can visualize the relationship network	• Data collection is difficult • Can be time consuming • A specialist in SNA methods is needed	• Involve
Stakeholder Circle (a stakeholder Management methodology)	• Allows project team to make a meaningful assessment of the stakeholders • Visualizes stakeholders' relative power and influence • Project team can develop engagement strategies according to the current and target levels of stakeholders' interest and support	• Costly	• Collaboration
Walking tour/ site tour	• Provides stakeholders with an understanding about the project • Can be easiest to remember and understand	• Can cause inconvenient in site • Facilities are needed	• Inform • Consult
Website	• Provides access point for information that can be revisited • Can provide an opportunity for direct feedback to project team or sharing of issues • Provides platform for regular updates for those who want to know more	• Time consuming to set up • Needs regular maintenance or will not have credibility • May not be accessed by all stakeholders •	• Inform • Consult • Involve • Collaboration

Approaches	Strengths	Limitations	Level of engagement
Workshops	• Ideal for looking at specific issues • Excellent for discussion on criteria or analysis of alternatives • Offers a choice of team members to answer difficult questions • Builds ownership and credibility for the outcomes • Maximizes feedback obtained from participants	• Not totally individualized discussion • Needs to be well facilitated with credible individuals who have the interpersonal skills to deal with challenging issues • If actions not followed through can destroy trust	• Consult • Involve • Collaboration • Empower

Appendix Q A modified two-stage process

The modified two-stage process illustrated below divides the project identification process into ten distinct steps. These are grouped into two broad stages, namely problem definition and choice of a solution to be taken to the feasibility stage.

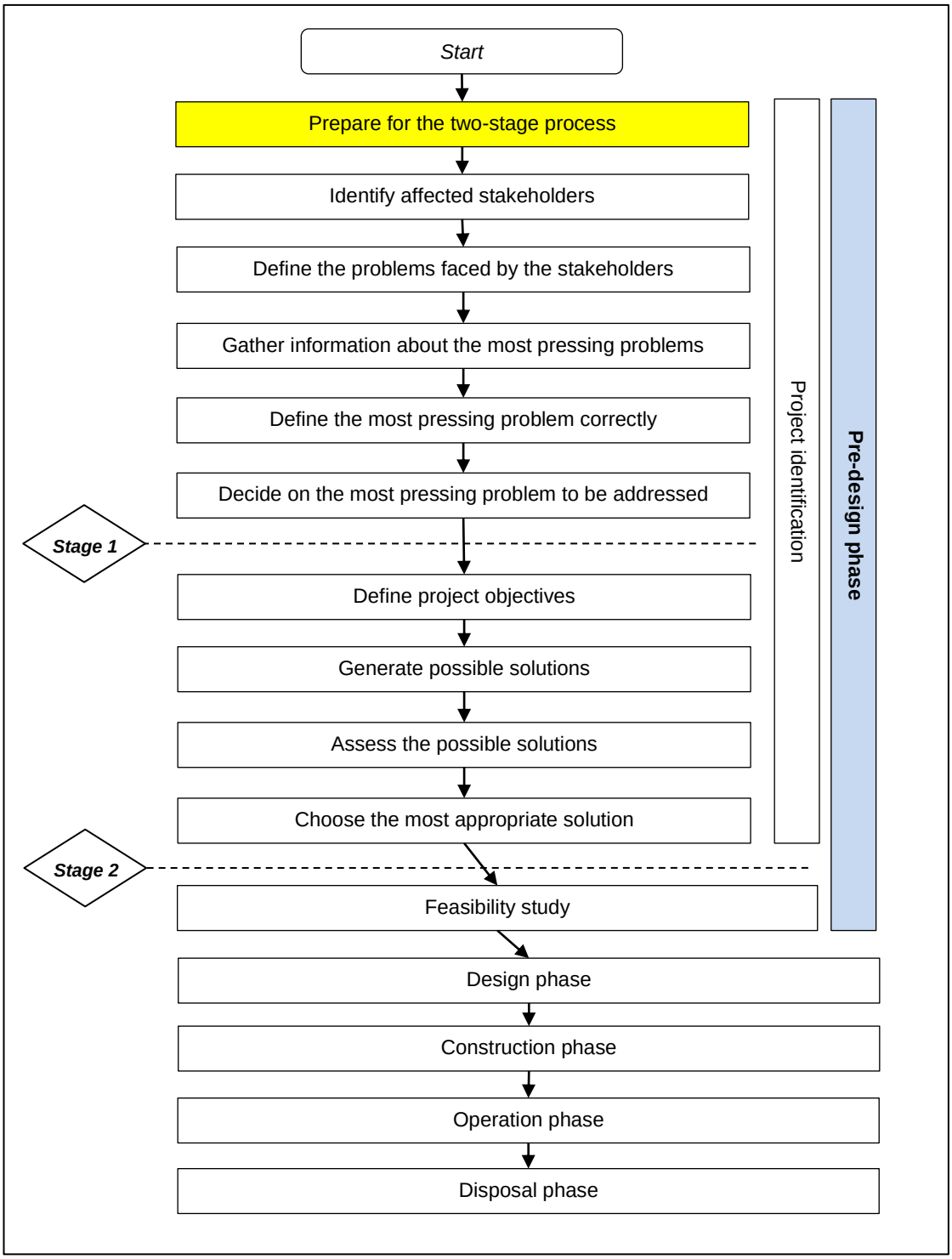

Figure 9-1 A modified two-stage project identification process

Q.1 Stage 1: problem definition

In Stage 1, infrastructure developers (often governments/public sector organisations) would work closely and collaboratively in a spirit of openness and transparency with external stakeholders/stakeholder groups who have relevant knowledge and interest in the infrastructure need/issue that is being considered. This collaboration, openness and transparency would enhance the developer's understanding of the infrastructure needs/problems where various stakeholders with different knowledge, stakes and values are involved (Head and Alford, 2015). Participating in this stage of the two-stage process should be voluntary. It is recommended that throughout the process infrastructure developers should consider the full range of people, businesses and stakeholders affected (Project Management Institute, 2017; British Standards Institution, 2010; Moodley et al., 2008; Association for Project Management, 2006; Young, 2006; Olander and Landin, 2005). The output of Stage 1 is a well-defined problem. This stage involves six steps as follows:

1. Prepare for the two-stage process,
2. Identify affected stakeholders,
3. Define the problems faced by the stakeholders,
4. Gather information about the most pressing problems,
5. Define the most pressing problems correctly,
6. Decide on the most pressing problem to be addressed.

Each of these six steps is discussed in great detail in the following subsections.

Q.1.1 Prepare for the two-stage process

In the beginning, in order to ensure a controlled start to the two-stage process, a preparatory work to prepare for the implementation of the process should be carried out. The preparatory work can take a number of forms. However, in all cases

- the sponsoring organisation should identify a senior project manager who will be responsible for the implementation of the two-stage process;
- the senior project manager should be supported by a team manager and supporting roles as appropriate;
- a management plan should be developed defining how the two-stage process is to be undertaken;
- a project plan should be developed defining the work to be undertaken, costs and resources;

- An acceptable schedule should be developed taking into account the sequence of activities, estimates of duration and time constraints to ensure that the two-stage process is undertaken in a timely manner and that risks of slippage are reduced to acceptable levels;
- Resources requirements should be identified against the activities in the two-stage process. The purpose of this is to ensure that resources required for the two-stage process are available in sufficient quantities and qualities at the right time;
- The cost of implementing the two-stage process should be determined taking into account the scope, schedule and resources. This enables a budget to be set up for the implementation of the two-stage process.

Once the preparatory work has been completed, the next step of the two-stage process commences.

Q.1.2 Identify affected stakeholders

During this step affected stakeholders are identified using a variety of stakeholder identification techniques. Stakeholder identification should be carried out constantly throughout the process, and should identify those individuals and organisations who might have an interest in the infrastructure matter being considered, and gather as well as document relevant information about them (Project Management Institute, 2017; 2013). When identifying stakeholders, a greater understanding of each stakeholder/stakeholder group should be gained, and the importance of all of them to implementing the two-stage process determined (British Standards Institution, 2010). This is important because according to Warner (1984), problems and their corresponding solutions can be defined only within the context of the communities in which they exist.

Therefore, it is crucial to first identify the communities and the people who live in them before any attempts at generating solutions are made. This is supported by the consensus amongst project management scholars (Moodley et al., 2008; Young, 2006; Olander and Landin, 2005) and professional organisations (Project Management Institute, 2013; British Standards Institution, 2010; Association for Project Management, 2006) on the importance of the early identification of affected stakeholders.

In order to ensure comprehensive identification of as many affected stakeholders/stakeholder groups as possible, the author recommends the use of a combination of stakeholder identification techniques as suggested by Luyet et al. (2012). Previous studies have presented various stakeholder identification techniques. Mitchell

et al. (1997), for instance, proposed a technique for stakeholder identification by taking into consideration the stakeholder's legitimacy, urgency and proximity. King et al. (1998) recommends the use of a specific identification technique, the snowball technique, in which a list of stakeholders is produced and is then submitted to one of the already identified stakeholders to add further stakeholders. Project Management Institute (2013) advocates the use of expert judgment in which judgment and expertise are sought from groups or individuals with specialised training or knowledge on the subject area.

The two-stage process management team (who represent the developer/sponsoring organisation) need then to engage with the identified stakeholders upon their identification in order to build up relationships (Jing et al., 2011; British Standards Institution, 2010; Association for Project Management, 2006). The early identification of affected stakeholders enables infrastructure developers to gain greater understanding of the stakeholders' interests, demands and expectations (Project Management Institute, 2017; British Standards Institution, 2010; Association for Project Management, 2006). This is because information/knowledge on affected stakeholders will be obtained from the stakeholders themselves, thereby basing their stakeholder engagement strategies on facts instead of assumptions. In this manner, decisions made by the process management team in relation to managing affected stakeholders will be informed decisions. This shall also enhance the effectiveness of the subsequent steps in the two-stage process.

The main purpose of this first step is to produce a comprehensive list of affected stakeholders - a stakeholder register. The stakeholder register should contain all details related to the identified stakeholders including but not limited to: name, designation, organisation name and contact details (Project Management Institute, 2017). The stakeholder register should be used to trigger the next step of the process, and should also be updated constantly throughout the process.

Q.1.3 Define the problems faced by stakeholders

Defining the problem to be addressed is probably the most important step in Stage 1 of the two-stage process, for unless the problem is already correctly defined it is unlikely that an effective solution can be found. The two-stage process management team needs to engage with affected stakeholders upon their identification in order to identify the infrastructure problems faced by stakeholders. It is important to define the problems faced by the stakeholders because what we often see according to Priemus (2010) is that lobby groups mobilising support for a project (solution) that may constitute

opportunities to the developers, but neither solve the stakeholders' problems nor meet their expectations.

Engaging with as many affected stakeholders as possible at this stage in order to identify the infrastructure problems faced by the stakeholders is supported by the consensus amongst project management scholars (Li et al., 2012; Jing et al., 2011; Atkin and Skitmore, 2008; Bourne and Walker, 2006; El-Gohary et al., 2006) and professional organisations (Project Management Institute, 2013; British Standards Institution, 2010; Association for Project Management, 2006) on the importance of the early involvement of external stakeholders.

Identifying and defining the infrastructure problems faced by the stakeholders would enhance the analysis of stakeholders and problems in the next step (Proctor, 2010; Bransford and Stein, 1993). Therefore, the process of identifying problems needs to be clear, concise and focused. Affected stakeholders must be asked to identify the most pressing infrastructure problems which should be addressed.

The process of identifying the problems faced by stakeholders should allow sufficient time. Consulting for too long will unnecessarily delay the process (UK Cabinet Office, 2016). Consulting too quickly will not give enough time for consideration and will reduce the quality of defining the problems faced by stakeholders. During this step there is a need to collect information/data from the stakeholders in a format that will enable the identification of the most pressing problems. As a result, the author recommends the two-stage process management team to draw up this exercises in line with the best practice guidelines for consultation (ibid). The management team should use the most appropriate approach to consult with affected stakeholders (Association for Project Management, 2012a; British Standards Institution, 2010). Examples of possible stakeholder engagement approaches including their strengths and weaknesses are presented in **Appendix P**.

The identified problems are then assessed to a level that they can be prioritised. Thus, ownership, priority and urgency of the problems should also be identified at this stage (Proctor, 2010; Bransford and Stein, 1993). The assessment of the problems should take into consideration the scale of the problem, how many stakeholders are affected by it, the impact of the problem on individuals and society as a whole. This enables the most pressing problems faced by the stakeholders to be identified, and paves the way for the next step of the two-stage process to commence.

Q.1.4 Gather Information about the most pressing problem(s)

This step involves collecting information in order to enable proper stakeholder and problem analysis to be undertaken (Proctor, 2010; Bransford and Stein, 1993). Once the most pressing problem(s) have been identified, more information about them should be sought from the stakeholders. In this step, the two-stage process management team seek views on the most pressing problem(s). This can be considered as a fact-finding mission in which the management team engages with affected stakeholders to collect relevant information about the most pressing problem(s). The purpose of this data collection is to increase the overall comprehension of the most pressing problem(s). For affected stakeholders, this early engagement means a chance to understand what issue/problem is being considered, to help define problems and to have their say in the process. For the management team, engaging with affected stakeholders can provide vital local knowledge about the infrastructure issue/problem being considered. This is in line with the Royal Town Planning Institute's guidelines on effective community involvement and consultation (The Royal Town Planning Institute, 2012; 2007), which suggests that good stakeholder engagement is an essential part of a good development process, especially when undertaken early on in the process when changes can more easily be made.

Here, it should be indicated that since different stakeholders/stakeholder groups may have different perspectives of the most pressing problem (Li et al., 2012; Randeree and Faramawy, 2011; Aaltonen and Kujala, 2010), and hence different views to its precise nature (Head and Alford, 2015), there is a need to engage with as many affected stakeholders as possible before the most pressing problem is finally fully specified (Young, 2006). At this stage, it is important to consult widely (HM Treasury, 2011), as this is often the best way to gain greater understanding of the most pressing problems based on information/knowledge obtained directly from the affected stakeholders themselves rather than on assumptions. This would also increase the likelihood that the nature of the problem can be better understood (Head and Alford, 2015).

Therefore, the management team should be sufficiently competent and skilled. They should be able to motivate and enthuse the stakeholders involved in the process in order to gain greater understanding of the most pressing problems. Recommended stakeholder engagement approaches that can be used during this step are provided in **Appendix P**. When gathering more information, attention should be given to the ownership, priority and urgency of the problems (Proctor, 2010; Bransford and Stein, 1993). The aim should be to collect sufficient information and data from the stakeholders

about the most pressing problems in order to enable the problems to be correctly defined. This will result in new ideas being generated and the previously identified problem(s) may now be seen from a new perspective, and pave the way for the next step of the process to begin.

Q.1.5 Define the most pressing problem(s) correctly

This step considers a variety of problem perspectives. At this stage, the two-stage process management team examine the information/data obtained about the most pressing problem(s) faced by the stakeholders in order to generate possible problem redefinitions. The objective of this step is a precise definition of the most pressing problem(s) (Proctor, 2010; Bransford and Stein, 1993) based on the information obtained from affected stakeholders.

The author acknowledges that some problems may not be definitively described. These problems have been called “wicked problems” – those that are complex, unpredictable, ill-formulated or intractable, and any proposed solution to address them often turns out to be worse than the symptoms (Rittel and Webber, 1973; Churchman, 1967). However, the proposed two-stage process facilitates a more understanding of the seriousness of these problems and puts forward possible responses to them through collaborative working, divergent and convergent thinking, openness and transparency. These strategies for dealing with wicked problems have been proposed and recommended by Head and Alford (2015).

The analysis of the information/data collected during the previous step should enable the most pressing problems to be defined correctly. This step identifies a clear infrastructure need which it is in the wider community’s interest to address. It provides a clear rationale for intervention which is in line with the UK’s guide for appraisal and evaluation in central government (HM Treasury, 2018; 2011), as it ensures that there is clearly defined problem to be addressed, and that any proposed intervention to address it is worthwhile. Once the most pressing problem(s) have been correctly defined, it should be put into context and the next step starts in order to decide on the problems to be addressed.

Q.1.6 Decide on the most pressing problem to be addressed

Once the most pressing problem(s) have been correctly defined, they should be communicated back to affected stakeholders. It is likely that more than one pressing problem occur at the same time. The two-stage process management team and affected stakeholders might have to simultaneously deal with more than one problem. However, in order to enable solutions to be generated, the management team and affected

stakeholders will need to decide on what problem(s) to be addressed (Proctor, 2010; Bransford and Stein, 1993). The author understands that a conflict can arise among individuals/stakeholders at this stage. Therefore, skilful negotiation or appropriate use of authority can be utilized by the management team to avoid conflict escalation.

The purpose of this step is to put the most pressing problem into a context and paves the way for a solution to be identified. It requires the correctly defined most pressing problem to be communicated back to affected stakeholders. The management team should draw up a consultation exercise in line with the best practice guidelines (UK Cabinet Office, 2016) to inform the affected stakeholders about the most pressing problem to be addressed. In addition, information about Stage 2 of the two-stage process should also be provided to the stakeholders during this step. Affected stakeholders should be briefed about Stage 2 of the process before Stage 2 actually commences.

Here, it is vital to evaluate and review the process of engaging with stakeholders (Olander and Atkin, 2010; McElroy and Mills, 2007; Olander and Landin, 2005). Monitoring and reviewing the engagement process should be carried out at regular intervals (McElroy and Mills, 2007). The output of Stage 1 is a well-defined problem to be addressed immediately. This requires the move to Stage 2 of the two-stage project identification process.

Q.2 Stage 2: choice of a solution

In Stage 2, the two-stage process management team would work closely and collaboratively in a spirit of openness and transparency with affected stakeholders/stakeholder groups who are affected by the most pressing infrastructure problem defined during Stage 1. This collaboration, openness and transparency increase the likelihood that effective solutions to the problem can be found, because greater cooperation improves the prospect that diverse stakeholders may reach an understanding about what actions to take to address the problem (Head and Alford, 2015). Once again, participating in this stage of the two-stage process should be voluntary. It is recommended that the management team should consider the full range of people, business and stakeholders affected (Project Management Institute, 2017; British Standards Institution, 2010; Moodley et al., 2008; Association for Project Management, 2006; Young, 2006; Olander and Landin, 2005). The output of Stage 2 is a workable solution to be taken to the feasibility stage. This Stage 2 involves four steps as follows:

1. Define project objectives,
2. Generate possible solutions,
3. Assess the possible solutions,
4. Choose the most appropriate solution.

Each step is discussed in more detail in the following subsections.

Q.2.1 Define project objectives

Once the most pressing problem has been decided upon, objectives are carefully defined. Defining objectives in the problem situation is a crucial step in moving towards a solution to a problem. Because if objectives have not been specified, solutions generated may not provide acceptable answers to the problem (Proctor, 2010; Bransford and Stein, 1993). Setting objectives allows the identification of the full range of alternative options which may be adopted to address the problem. This is in line with the UK's guide for appraisal and evaluation in central government – the Green Book (HM Treasury, 2018; 2011), which suggests that a lack of clear objectives limits effective appraisal, planning, monitoring and evaluation.

Objectives should be stated so that it is clear what proposed solutions are intended to achieve (Corrie, 1991). At this stage, in order to ensure the full range of options to meet the objectives are considered, objectives may be expressed in general terms. Moreover, the author recommends that alternative objectives should also be considered before moving to the exploration of possible solutions. Because solutions may well be generated which solve a given problem, but deciding which solution to choose then becomes a difficult problem (Proctor, 2010).

Consequently, the project objectives should be written down concisely. There may be principal objectives and a number of subsidiary goals. The objectives do not necessarily have to remain fixed, but rather can be adjusted in the light of subsequent development and information (Corrie, 1991). Once the desired outcomes and objectives of an intervention have been defined, the full range of options/solutions that may be available to achieve them can be identified and the next step begins.

Q.2.2 Generate possible solutions

Generating possible options (in outline) involves ideas finding to help structure the search for potential solutions. This step uses mainly divergent activity to generate many ideas using a variety of idea-generation aids. The divergent thinking involved in the process when generating ideas/solutions allows greater room to discover alternative

options of solving problems (Head and Alford, 2015). The aim of this step is to explore alternative approaches to solving the problem which may involve reanalysing the objectives (defined during the previous step) and considering options that might be employed to address the problem. This involves preparing a list of the range of options which could possibly achieve the defined objectives, and is in line with recommendations and advice in (HM Treasury, 2018).

This step devises various options (in outline), each meeting the objectives specified in the previous step, and then compares them (Corrie, 1991). An option is a written statement defining an intervention to address the problem. Developing options and comparing them is important at this stage because it ensures that no attractive scheme goes unrecognised, and also reveals the relative strengths, weaknesses and potential challenges of various solutions. During this step, each option should be identified by a description. The description is simply a method of clarifying what each option comprises, so that it can be appraised as precisely as possible (ibid).

The range of options to be defined depends on the nature of the problem to be addressed and objectives to be achieved (HM Treasury, 2018). The author therefore recommends that a wide range of possible options/solutions should be considered. This requires the management team to consult widely with affected stakeholders/stakeholder groups in order to create a list of the full range of project options which can possibility be implemented to achieve the desired objectives (ibid). This is vital for affected stakeholders, because this engagement means a chance to understand what is proposed, to explore how a development can bring value to an area, to identify which options would work best within a local context and to help shape solutions (Head and Alford, 2015). It is also crucial for developers, as it can provide vital local knowledge (Reed, 2008), reduce the risk of challenges and delays (Atkin and Skitmore, 2008), identify how a scheme can bring value to a local area and enhance the reputations of all involved (International Finance Corporation, 2007). Therefore, the management team should be sufficiently competent and skilled. They should be able to motivate and enthuse stakeholders involved in the process. They should be able to evaluate alternatives and make authoritative decisions, and be able to negotiate with external stakeholders. Other typical competencies for the project management team can be found in British Standards Institution (2010).

The requirement to consult with stakeholders at this step is in line with the Royal Town Planning Institute's guidelines on effective stakeholder involvement (The Royal Town Planning Institute, 2012), and the UK's guide for appraisal and evaluation in central government (HM Treasury, 2018; 2011). Once a list of the full range of possible options

has been identified, the management team and affected stakeholders are ready to move to the next step.

Q.2.3 Assess the possible solutions

This step involves a preliminary appraisal of the project options generated in the previous step. The purpose of this appraisal is to review the characteristics of the options and the extent to which each option can meet the objectives set (Corrie, 1991). The options should be assessed by the management team in terms of how well the meet the defined project objectives (HM Treasury, 2018). This should form the basis for deciding which option should be further examined in the feasibility stage.

The proposed two-stage process does not require specific assessment criteria to be implemented when assessing options. However, it requires that all options to be subjected to the same specific assessment criteria. The author suggests that the preliminary appraisal of the options should cover technical, financial, economic, environmental and social assessments of the options as recommended by Corrie (1991).

The author recommends that each option should be examined to determine whether or not it will work technically. Each option should be considered in terms of whether or not it is an effective technical solution worthy of inclusion in the feasibility phase. Moreover, outline costs for each option should always be produced. These costs could be produced based on historical data, and should be used for calculating preliminary costs.

In this step, the worth of each option to the community at large should also be assessed. The preliminary assessment of the economic benefits and associated costs should be estimated to determine whether or not an option is worth inclusion in the feasibility stage. In addition, the preliminary appraisal of the options should define the likely effects of each option on the environment. Furthermore, the implications of each option for the stakeholders affected directly and indirectly should be explored. The preliminary appraisal should also consider the social advantages and disadvantages of each option as recommended by HM Treasury (2018).

In this step, the extent to which each option can meet the objectives is set in order to determine whether or not an option is effective solution worthy of inclusion in the feasibility stage. Once this has been done, the next step commences in order to decide which option should be taken to the feasibility stage.

Q.2.4 Choose the most appropriate solution

The purpose of this step is to decide which option should be taken to the feasibility stage. When exercising choice it is usual to have a set of alternatives and a set of assessment criteria. Appraising a list of alternatives involves measuring, trading off or scoring them in terms of the specified criteria and determining the relative importance of the criteria (Proctor, 2010). Following the technical, financial, economic, environmental and social analysis of the options from the previous step, it is a fairly simple task to assess all the factors and decide which option should be taken to the feasibility stage.

It should be noted that the preliminary appraisal of the options from the previous step may result in new information which in turn could place the original project objectives in a new light (Proctor, 2010; Bransford and Stein, 1993). Therefore, the original objectives should be revisited before choosing which option to be included in the feasibility study.

At this stage, if the results of the preliminary appraisal show that the options do not fulfil the original objectives, either the objectives or the options have to be reconsidered. However, if more than one options are shown to meet the objectives, the comparative merits of each option are listed and a tentative ranking order should be established as suggested by Corrie (1991). The most appropriate option should then be taken into the feasibility stage.

Engaging with stakeholders at this stage is important as it informs affected stakeholders about the chosen option to be assessed in terms of their feasibility (HM Treasury, 2018). It also reduces the risk of challenges and delays, identifies how a scheme can bring value to a local area and enhances the reputations of all involved (The Royal Town Planning Institute, 2012). The author understands that a conflict can arise among individuals/stakeholders at this stage. Therefore, skilful negotiation or appropriate use of authority can be used to avoid conflict escalation. Unresolved conflict can become destructive, increasing uncertainty and damaging morale. As a result, the author suggests that where conflict cannot be resolved, the management team should consider escalation to a higher authority, or specialists may be engaged to broker a resolution as recommended by British Standards Institution (2010).

Here, it should be indicated that at this step stakeholder engagement should be carried out in line with the best practice guidelines for consultation set by the government (UK Cabinet Office, 2016). The consultation should be clear, concise and focused. It must enable the stakeholders from understanding how the option had been assessed and chosen to be taken to the feasibility stage. The outcome of this Stage 2 is a workable solution/option to be taken to the feasibility stage.

The choice of the most appropriate solution to be taken to the feasibility stage marks the end of the two-stage project identification process, and triggers the feasibility stage. The feasibility stage takes as its starting point the output of the two-stage process – the choice of the most appropriate solution. It starts before the project design phase starts. The feasibility study will be required to determine options for the way ahead (Office of Government Commerce, 2009). It can be short or lengthy, simple or complex, depending on circumstances. It is one of the principal stages in the pre-design phase, and should be design to give an early assessment of the viability of the project (Corrie, 1991). The outcome of the feasibility stage should be the selection of a defined project which meets the stated project objectives – a project brief/mandate.