Contributing to Intrinsic Sustainable Development: A Study of Environmental Management Accounting Implementation in Chinese Companies

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Abstract

China faces to a development dilemma and improving her sustainability is a relevant and significant issue in dealing with these problems. Environmental Management Accounting (EMA) is a practical tool that has a major opportunity to contribute to the sustainability of Chinese businesses. This is a study of the state of the art of EMA in two Chinese tourism companies and of the associated behavioural changes within the two companies. The study provides examples of the use of EMA in practice and identifies barriers and facilitators of EMA adoption in Chinese businesses. Overall the study provides insight into Chinese business sustainability that is essential for better sustainable performance in China herself.

The qualitative data comprising documents, observations, interviews and questionnaires from the site visits are used to examine the environmental performance related to EMA adoption and is also used to provide detailed information about the people running EMA. Hence another focus in this study is an exploration and interpretation of the behavioural changes exhibited by the people running EMA in the Chinese context.

Institution and Structuration theories are employed to help analysis and understand the data generated in the case studies. However, because of the impact of the traditional Chinese collective, “Guanxi” culture of a “Social-Authority Relations” that may have a significant affect individual choice and behaviour, additional philosophical and psychological are used to help interpret and reveal a holistic process of behavioural changes towards to sustainability in accordance with the understanding of Intrinsic Sustainable Development.

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Introduction

China today has a development dilemma. Its economic growth has disregarded the environmental cost which has damaged people and ecosystems: but China still needs economic growth. China's economic growth is as the West did in the past, but the pressures from environmental and social crises require that China has a new kind of growth that is more sustainable. This study aims to provide better understanding to improve China's sustainability by looking at the use of Environmental Accounting Management (EMA) within Chinese companies. EMA tools can improve the environmental performance of Chinese companies and this is urgently needed.

However, a study of EMA in Chinese companies revealed that "No evidence of EMA was found in the case study companies" (Rovira *et al.* 2007, p78). Rovira et al.'s study had looked at 40 companies in two Chinese provinces in 2006. Several more recent studies reveal that EMA remains undeveloped in China: Yao (2016) pointed out that EMA studies in China have not been developed and that relevant field work on EMA in Chinese companies was very rare; and Zhou *et al.* (2012) revealed that any EMA related studies in China were theoretical and had no consideration of behavioural aspects. Whilst Zhang *et al.* (2015) and Zhang (2016) present arguments that legislation and the establishment of new behavioural norms are required to initiate EMA implementation in Chinese companies. There is then an opportunity for the present study to add positively to the Chinese EMA literature and help further the implementation of EMA within companies in China.

To exploit this opportunity, this present study has the following overall aim: To observe, understand and assess the changes that occur in a group of Chinese companies when implementing EMA and to seek explanations for these changes as part of a learning process and as part of the sustainable development of China.

Implementing EMA in Chinese companies is no mere technical management task; the process with requiring extensive individual and institutional learning in the Chinese is following: context.

1. What are the facilitators and barriers existing in Chinese companies with regard to the implementation of EMA?

2. How does the Chinese context influence individual and company learning with regards to the use of EMA in China?
3. What form of EMA will best facilitate its adoption in China with regarding to intrinsic SD?

This process involves many issues. For example with regard to the technical management aspect of EMA implementation, the following issues have been identified:

The Cost Information System with regard to the additional management costs incurred, operating costs reduced and resource-use efficiency gains etc.;

- Eco-efficiency and environmental improvement audits;
- Management process involving planning, decision-making, communication, motivation, performance appraisal, and control;
- Innovations in processes and products;
- Communication and motivation;
- Decision making processes;
- Strategic management; and
- Systematic measurement procedures and goals.

A second set of issues arises with regard to people's awareness, knowledge, skills, expectations and rewards and how people cope with change. These particular issues may be further divided according to the classes of Internal and External Stakeholders and hence include the broader economic, societal and environmental context which in this study will be dealt with from a management viewpoint in terms of barriers and opportunities relating to EMA implementation.

A third set of issues relates to the Chinese context in terms of culture, customs and government and how these affect individual and company learning. In this study, this third set focuses mainly on relevant aspects of "people" and how they deal with change in society.

In summary, there will be five major aspects to this study:

First, part one to four is going to employ relevant theoretical frameworks, and to introduce research objects and its context.

Second, part five will set up the cases in the field study.

Third, in part six, with regard to the technical management issues, implementing EMA will be a matter of economic and environmental performance improvement, as well as the evaluation of environmental performance will be analysed and the key problems will be discussed for better management planning, decision-making, and control.

Fourth, the core of this study deals with the processes of change and how Chinese people learn to cope with new situations by considering the specific differences that arise in China that are not found in the West. Part seven will uncover this complex context and try to interpret the change

in environmental performance through EMA implementation in the specific context. This is the key to this study revealing intrinsic sustainable development relating to people's behavioural changes, psychological and philosophical thinking, as well as relevant theoretical frameworks. Fifthly, part eight will provide conclusions and suggestions for the companies to further improve from a management perspective.

In its broadest and most generic analytical approach and understanding, this study will use an Intrinsic Sustainable Development (ISD) perspective from which a Sustainable Business Model may be derived (Birkin and Polesie 2011). Institutional Theory will be used to explore and better understand the relations between companies and their context. For a better understanding of social background, the people-related issues and the influence of the Chinese context, Structuration Theory (Giddens 1984) will be used. In particular, Structuration Theory will help to reveal the on-going changes in the intersections of human agency and social structure. This is anticipated to be the more useful theory for analysing the critical interactions between people's behaviours and the changes brought about by EMA implementation.

Part One: China and EMA

1.1 China's Dilemma

China is an interesting country in which to study EMA implementation. It has substantial international suppliers and buyers who, together with China itself, impact the Earth very significantly both environmentally and economically. China also has a profound dilemma with on the one hand a very urgent need for economic growth to alleviate poverty, and on the other hand the destruction of the environment with unsuitable forms of economic development. Furthermore, China is a country with a culture most distinctly different from that in the West yet it has been embroiled in capitalism for the last 30 years. All of these issues make this study most intriguing.

Furthermore, China now has an economy of major global significance. What happens in China affects the whole planet. Consequently, there are global pressures from trade standards, customers, other governments and international agencies that are increasingly applied to China. There is an expectation from the world that China should have a far more sustainable form of development - otherwise there could be very tragic consequences for everyone. This is therefore an important study to help China and Chinese companies change to more sustainable ways of developing and conducting business.

1.1.1 China Today & Tourism

China is a vast and heterogeneous country with many different cultures, languages and traditions which have lasted for over five-thousand years. It is now the world's second largest economy with a dynamic free market and it is a potential challenger to being one of the world's "great powers" like the United States of America (Sina News 2011).

China's eminence and success result from not only an accumulation of many great national efforts, but also by a very narrow focus on strictly economic development since 1978. From that time, the Chinese government worked to shift people's attention away from debates relating to the formation of a communist society and its metaphysics, towards free-market economic development and its promises of increased social satisfaction. For example, the criterion of success for a government officer's career was changed to focus upon the GDP growth achieved in the areas over which they governed (AIESEC 2005).

China's economic achievements have been impressive and it has averaged around 10 percent GDP per year growth for the last 30 years (Welford 2007). By 2006, China had more than $1 trillion US Dollar of foreign-exchange reserves and its average per capita income had risen by a factor of six times since 1978. China is the world's second largest importer of oil and is the world's largest exporter of goods (Hutton 2007).

But there has been a huge cost resulting from this extraordinary economic growth. Whilst many Chinese people enjoyed the fruits of the economic achievements and found their lives to be completely changed and, whilst the whole world's customers paid less for the profusion of "made in China" goods, the cost to many other people and to the planet is staggering as Harney (2008) argues in his latest book "China Price".

Just as China's influence has increased and become global in extent, she herself has suffered many serious crises affecting large areas of land and huge populations of people. These devastations threaten the whole planet: China cannot simply be ignored (Hawkins 2006).

In 2011, clear signs of a change in China's approach to development came in a "White Paper" that foresaw many challenges and difficulties because of the Chinese reliance on heavy industry and chemicals that had depended on the mass consumption of natural resources, land and labour. Quite simply, availability of resources would not be so readily accessible in the future. Hence, the People's Republic of China's (PRC) 12th Five-Year-Plan (12th FYP) emphasised the transformation of traditional Chinese industry to be more creative and

sustainable in ways of developing (China News 2011).

The 12th FYP also had implications for China's tourism sector. Wu Wenxue, a member of the leadership team of China Tourism Bureau, claimed that the tourism industry will be one of the most important and valuable industries contributing to the GPD in future because of its low consumption of natural resources; its wide impacts on related support industries; its high employment opportunities; and, its potentially better all-round benefits (CTA 2011).

The 13th FYP for 2016 to 2020 was endorsed by President Xi in September 2015 and it translated more sustainability ideas to action. This latest FYP focuses on five perspectives: creation, collaboration, greening, opening and sharing (Hexun News 2015). For the first time, the tourism sector in China was identified as a key development component since it uses less resource and causes less pollution than many other sectors in China, so its development will be significantly encouraged and supported by the Chinese government in the near future (Lv. 2016).

Therefore, Chinese tourism and helping it to become more sustainable has been adopted as the subject for this study. Tourism has a wide impact beyond its immediate economic sector and satisfying customers from around the world and satisfying local communities are among its core aims. However, sustainable tourism needs more effective guidelines in China according to Wu (CTA 2011) which makes this study most timely and important.

1.1.2 Facing-Up to China's Development Dilemma

Harney (2008) points out that Chinese people and China's environment are paying a high price for the cheap goods that they supply to the world. In the last 20 years, China has lost 7-20% of its GDP per year to pollution and other environmental damage. The losses resulting from environmental pollution in China were around 10 billion Euros in 1992 alone (Welford 2007).

The dilemma for China is either to pay less attention to economic growth and to pay the price for the inflicted environmental damage, or to engage unreservedly with more economic development that will consume more natural resources and will cause more damage. With regard to the first choice of redressing environmental damage, environmental issues are recognized as a serious crisis in China. For instance of 412 sites on China's seven main rivers in 2004, 58% of them were monitored to be too dirty for human consumption; of the 20 most polluted cities in the world, 16 are Chinese; and an estimated 30% of China's cropland is suffering from acidification at an estimated cost of $US13 billion (Nierenberg 2006, p7). Chan (2004) identified more

problems caused by environmental issues in China:

- One third of the country suffers from severe soil erosion;
- 60 per cent of its people are drinking water that does not meet the World Health Organisation's minimum acceptable standard;
- One in four Chinese die of respiratory diseases;
- China is one of the world's largest contributors to global climate change; and
- An international survey on the environmental sustainability of 24 selected countries in 2001 put China near the bottom of a ranking of environmentally clean countries.

Furthermore, China's natural resources are not abundant; they are insufficiently low per capita according to national statistics: China's per capita water resource is only a quarter of the world's average; her per capita arable land is less than half of the world's average; and China has available only 10 percent of the world's arable land and yet she has to feed 22 percent of the world's population (AIESEC 2005).

China is also one of the least energy-efficient nations on earth. She consumes more than 3 times the world average of energy to produce just one dollar of GDP – this is 4.7 times the average in the USA and 7.7 times the average in Germany (AIESEC 2005). China's poor statistics are due to poor environmental performance, massive pollution and insufficient natural resources.

With regard to the second choice, continuing economic growth is still the key policy in China for dealing with poverty alleviation and many other social issues. Past economic achievements have successfully solved a major part of the Chinese unemployment issue over the last 30 years with up to 150 million workers moving into "boom-town" cities to cause the biggest migration in world history (Hutton 2007). Economic gains have also led to significant Chinese poverty reduction. For example by 2003, 250 million people had been lifted out of poverty, the Chinese per capita annual GDP exceeded 1,000 dollars for the first time to mark a growth point 4 times larger than that in 1980 (AIESEC 2005).

The economy or environment dilemma is understandably now fully recognised by the PRC. National strategic development plans have been prepared to deal with the dilemma and they try to find a balance in an Economy-Society-Environment Triangle which is equivalent to the three pillars of sustainable development as agreed at the "Rio Earth Summit", the United Nations' Conference on Environment and Development held in Rio de Janeiro in 1992. This policy change was enshrined in the PRC's 11th Five-Year-Plan (FYP) for 2006-2011 which was based upon the ancient Chinese concept of "Harmonious Development". Harmonious Development (HD) has become a Chinese national vision which combines the concept of Sustainable

Development with traditional Chinese thought. To this end in the 11th FYP, four broad objectives were established:

1. Sustainable growth with a circular-economy;
2. Social stability in cities and urban areas;
3. Development of western China and of second level cities; and
4. Rational use of energy and resources.

In addition, critical environment issues were recognised as requiring urgent attention and seven goals were established specifically for "Environmental Protection and Control". These goals addressed issues in air pollution; fresh water supplies; waste water disposal; solid and hazardous wastes treatments; monitoring and analysis systems; environmental consulting services; ecological and natural resources protection; and nuclear safety and radiation management. Some specific environmental targets were cited as follows:

- 10% reduction in total pollutants;
- 20% reduction in energy consumption per unit of GDP; and
- 30% reduction in water usage by industry.

A change in attitude towards economic development was also evident in the Plan. Instead of welcoming any kind of investment into China, there was established a new vision of economic development in China to provide an improved environmental performance and this required: 1) environmental capacity as an important consideration for the economic development of a region; and 2) strict environmental standards applied to all companies seeking access to Chinese markets.

As a result of these measures since 2006, there have been signs from local governments, regional authorities and businesses to show that the changes and improvements to economic development are being carried out. For example, 82 ongoing projects worth £75 billion were banned in 2006 alone (GOV.COM 2007). Xie Zhenghua (QQ.COM 2008), Vice-Chairman of the National Development and Reform Commission (NDRC), stated that more projects were to be closed including inefficient and polluting electric producers of approximately 13 million Kilowatts, together with concrete and steel industries with total production of 50 million tons per year. Additionally in 2007 alone, there was in the region of 3.5 billion US dollars invested in energy efficiency and emission reduction projects.

Many major environmental and efficiency improvements were achieved by 2007 (YNET2008): energy consumption per GDP decreased by 3.27% to save 89.8 million tons of coal; emissions of SO2 declined by 4.66%; and carbon emissions were down 3.14%. Nonetheless, these significant improvements were not good enough to achieve the national goal of a 5% decrease in

energy consumption per unit of GDP per year as set by Xie, Vice-Chairman of the NDRC ((QQ.COM 2008).

Additionally, regional governors were required to take personal responsibility for the environmental performance of the regions under their mandate. Xie Zhenghua of the NDRC ((QQ.COM 2008) stated that the performance of improved energy efficiency and reduced emissions would not only be part of the performance appraisal of provincial officials and key enterprises, but it would also be information that will be made public. One result of these changes was that in 2007, the head of SEPA (State of Environmental Protection Administration) was forced to resign his post after the scandal of the drainage leakage that caused extensive pollution in Songhua Jiang. As Wu, Greater China Director for the Climate Group, points out, the political will is now extremely high in China to reduce emissions (Walter 2008).

The PRC government also paid more attention to practical programmes that were designed to direct and engage businesses to improve their environmental performance. Research into the use of financial and regulatory tools and trade-related and market-based instruments was encouraged (Walter 2008). More and more business sectors responded with technical innovations that improved their energy efficiency (AIESEC 2005, p13). However, it is the basis of this thesis that more support from systematic managerial tools is required to help businesses make environmental improvements. After all, technical innovation cannot be isolated from efficient management and ultimately environmental performance improvements depend on motivating people to deliver better environmental performance.

Hence in this thesis it is argued that EMA is needed for it is a proven useful tool that has been increasingly recognised for environmental performance improvements in the West. It will be the focus of this thesis to help business in China cope with the changing Chinese development agenda. Whilst Chinese “Harmonious Development” was clearly placed on the national development agenda some years ago in thought and practice, the task is far from complete. Significant and persistent pressure from the Chinese government for meeting national environmental goals will demand the interest and commitment of companies to improve their environmental performance for years to come, so the demand for EMA in China can only increase.

Part Two: Environmental Management Accounting (EMA) Development Literature

EMA has developed from Management Accounting with regard to environmental performance and management. It is a set practical tool for the appraisal, analysis, controlling and reporting of the environmental aspects of organizational, usually business, performance. According to the APE project （Rovira *et al.* 2007）that studied 40 companies in two Chinese provinces; EMA had not been systematically established in China in 2007. Nevertheless, a trend for using EMA in China may be anticipated both from the history of accounting development in the West and from the urgent practical demands of businesses and government for coping with environmental issues in China.

2.1 Development of Accounting and EMA

"The history of accounting illustrates how accounting is a product of its environment and at the same time a force for changing it." (Glautier and Underdown 2001, p4)

Accounting in its earliest times was called "Stewardship Accounting" and was a means of safeguarding investors from embezzlement. Since the Industrial Revolution in 18th century the significantly enlarged scale of business and new technologies changed the context of accounting and this "changed completely the method by which business was financed" (Glautier and Underdown 2001, p 5). Increasing pressures from the developing 18th stock market led to the development of a form of accounting designed to satisfy shareholders. Even during the period 1948 to 1949, the established conventional Financial Accounting Systems served only to record assets and how those assets were financed within organisations for use by management and for those external reporting purposes required by statute (Glautier and Underdown 2001).

However, accounting systems continually change. As the demand for improvements in corporate governance grew in the 1990s, new accounting systems were required to assist companies to implement disclosure requirements for internal controls in relation to identifying, evaluating and managing significant risks and for effecting cost savings and analysing profitable investments. The need to deal with this new task was fulfilled by the development of Management Accounting (MA) which has been emerging throughout 20th century (Glautier and Underdown 2001). These dramatic changes considerably extended the boundaries of accounting and the focus of MA shifted from accounting that records and analyses financial transactions; to using information for decision-making, planning and control (Glautier and

Underdown 2001).

MA developed in response to changing demands in socio-economics systems. Accounting is critically important to modern capitalism and together they have expanded the scale of production globally and have raised standards of living for millions of people. But the transformations of accounting have not reached their end.

In the last ten years, MA techniques have been moving with the times and rapidly changing. New MA techniques and approaches have developed in response to increasingly competitive markets, rapidly changing technology, new information regimes and the needs of sustainable development. Within this mix of change, it is the emergence of environmental concerns that has brought new information objectives and required a new accounting methodology - this has led to the development of Environmental Management Accounting (EMA).

2.2 Definition and Scope of EMA

A definition of EMA is given by the United National Expert Working Group (IFAC 2005, p.19):
"EMA is broadly defined to be the identification, collection, analysis and use of two types of information for internal decision making:

- Physical information on the use flows and destinations of energy, water and materials (including waste) and
- Monetary information on environment-related cost, earnings and savings."

Through these two types of information, EMA is be able to reveal mass balances with values and amounts of each of the above relevant types of physical information, and also monetary information to interpret physical information in economic terms (UNDSD 2001).

Figure 1: Organisation level accounting and reporting (IFAC 2005, p 16)

Accounting	Environmental Accounting (EA)	Associated Mandatory External Reporting	Other External Reporting Links
Financial Accounting (FA)	Environment-related information in FA for the organisation's environmental performance	Use the information for Financial Reporting by the national laws and international standards relating to their environmental and social performance	Use the information for Environmental or Sustainability Reporting for financial reporting purposes
Management Accounting (MA)	EMA	No Reporting	Use the information for Environmental or Sustainability Reporting under EMA

Accounting of course provides a well-established, comprehensive record of performance in many organisations and EMA has to fit in with other accounting functions. The relationship between EMA and other accounting functions is compared in figure 1.

The relationship between EMA and other forms of accounting may be analysed as follows. Firstly, EMA represents a combined approach that provides for the transition of data from FA, MA and mass balances to increase material efficiency, reduce environmental impacts and risks and reduce costs of environmental protection (Jasch 2003).

Secondly, EMA was developed to overcome the limitations of traditional MA with regard to environmental issues since in internal decision-making procedures, conventional MA practices do not give the environmental costs sufficient recognition and they are simply "lost" among undifferentiated overheads (ibid).

Thirdly as shown in Figure 1, EA is classified broadly into external EA within which information is disclosed to interested parties *outside* of a company which came to be known as Environmental or Sustainability Reporting. The other broad classification of EA relates to the use of environmental information *within* a company and this is EMA which helps management to improve the economic and environmental performances (ibid).

Fourthly, EMA has the same overall purpose as MA in internal decision making, but it has a specific content of environmental information derived from FA, MA and physical flow data. Jasch (2003, p 670) concluded that: "doing EMA is simply doing better, more comprehensive MA, while wearing an 'environmental' hat that opens the eyes for hidden costs. Therefore, the focus of material flow cost accounting is no longer on assessing the total 'environmental' cost, but on a revised calculation of production costs on the basis of material flows".

EMA then may be used to assess annual environmental expenditure on waste disposal, environmental protection and management, emission treatment and so on. This may include reporting and auditing within companies and may involve: life-cycle; full-cost accounting; benefits assessment; and, strategic planning for environmental management (IFAC 2005). To do this, EMA data can be collected, analysed and used at many different organisational levels including organisation, facility, material, product and process (Savage 2005).

Jasch (2003) argued that EMA does not deal with social costs and externalities since it has been developed from conventional accounting costs for internal calculations. She makes it very clear that social cost and externalities are not part of EMA because they have more focus on *estimating*

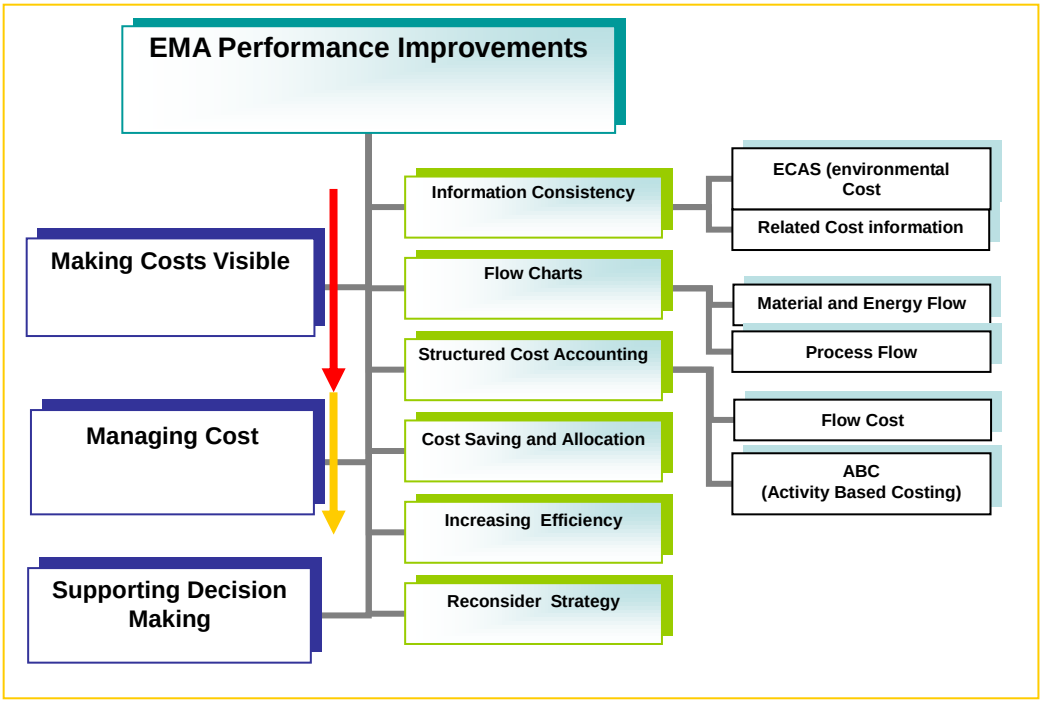
external effects and *soft* factors. However other people argue that those factors do have some impact on EMA implementation in practice. For instance, users' behaviour could be shaped by the social context within and outside organisations, which then might cause different attitudes and practices for improving performance with different applications of EMA. Furthermore, since the origin of EMA is based in the Western world of modern capitalism, there might be important and distinct conceptual and practical difference with its use in China, and between, for example, its use in Sustainable Development (SD) as conceived by the Western world and Harmonious Development (HD) initiated by the PRC in the 11th FYP in 2006. EMA implementation in China might be very different.

2.3 How EMA Works

Figure 2 shows how EMA works. It is based on Jonall's (2008) work which reviewed a comprehensive set of articles relating to EMA, EA and FA. The process of how EMA works is analysed into three broad groups of functions in figure 2, making costs visible, managing costs and supporting decision making. Gathering consistent cost information is the necessary foundation step. The EMA method as presented by United Nation Expert Working Group has been acknowledged as a suitable means for successfully making environmental costs visible (IFAC 2005). A top-down approach of environmental cost management starts from annual expenditures focussed not on disclosures of annual environmental cost but on the provision of information for further internal calculations. An environmental cost assessment may then be obtained and this entails two separate checklists of five environmental costs categories and each environmental medium such as waste, water, air, etc. (Annex 1). The two separate checklists provide information consistency (UNDSD 2001). Other relevant basic cost information for EMA may be extracted from the Balance Sheet and Profit and Loss Accounts (Annex 2).

Two flow charts, one for each of material and energy flows, may then be prepared to show values and amounts per year or month. This is based on an input-output analysis of "what comes in must go out or be stored". The system boundaries can be set on the corporate level for a starting point with subsequent analyses splitting up locations into sites and processes or going to product levels according to requirements. In addition to the input-output categories shown in Annex 3 and the tracking matrix for material flow balances shown in Annex 4, it is necessary to look for inconsistencies and the gaps in the existing information systems so that the resulting material flow analysis may be improved gradually following step-by-step procedures in order to trace materials as completely and consistently as possible. This is the basic procedure for improving the efficiency of materials management both economically and environmentally (UNDSD 2001).

Figure 2: How EMA Works (Jonall 2008).



The process flow information opens a "black box" that "gives insights into company specific processes and allows the determination of losses, leakages, and waste streams at the originating source" (UNDSD 2001, p 71). It is crucial that the process flow system is set up using technical monitoring and cost centres linked together to ensure consistency of data by cross-checking from both aspects. The structured cost accountings should be able to proceed according to established "traditional" procedures and, for example, Activity Based Costing (ABC) methods may be employed to reveal any hidden environmental costs. Once the costs are visible, managers may then make programmes and plan actions for saving costs, correcting allocation of products costs and increasing efficiency through product or process redesign.

Although this EMA method is promoted by United Nation and is well acknowledged, a case study by Gale (2006a) revealed managers raising many questions about it. This was interpreted as reflecting the human response on being faced with unexpectedly high environmental costs. Hence it is important, as Jonall (2008) points out; to evaluate and confirm the strengths and weaknesses of EMA against established accounting practices. Hence in the context of this present study, it is important to consider users' reflections and responses which may differ considerably in the Chinese context.

Jonall (2008) also points that there is a need to explore further what characterises good environmental business and sustainable business performance in order to fully integrate EMA in business models. Therefore, it is essential to recognise and use indices for sustainable business within the accounting procedures. This step may be important for the present study in regard to an organisation's unique problems arising in the Chinese context.

2.4 EMA Costs

A central-issue for EMA is estimating "costs". The EMA method provided by the UNDSD (2001) is "only dealing with corporate environmental costs, external costs which result from corporate activities but are not internalised via regulations and prices are not calculated." (Jasch 2006, p1196). EMA includes operating costs and involves identifying, analysing, managing and reducing them in a way that can benefit both the financial and environmental performance (Envirowise 2004). So the total environmental cost equation as defined by UNDSD (2001, p 12) is as follows:

> "Environmental protection costs (Emission treatment and pollution prevention)
> +) Costs of wasted material
> +) Costs of wasted capital and labour
> **= Total corporate environmental costs"**

Jasch (2003) argued that the most important goal of using EMA is to make sure that all relevant, significant costs are considered when making business decision. Hence dealing with costs is a priority and foundational issue for some EMA systems.

There are two kinds of environmental-related costs. Firstly, there are those costs that are usually hidden in overhead accounts and not fully recorded or required in a conventional accounting system (Gale 2006a). Secondly, there are "missing costs" that often arise from inconsistent information or interdepartmental communication problems as revealed by several case studies (Jasch and Lavicka 2006, Jasch 2006, and Lodhia 2003). However, as Jasch (2003, p 670) argued "Environmental costs are part of an integrated system of materials, energy and money flow through a corporation, and not a separate type of cost altogether." So care is needed to ensure that no costs are missed out or mixed up whilst collecting cost data.

In addition, environmental costs are generally higher than expected; they are at least twice as high as suggested by conventional accounting (Gale 2006b). Jasch's (2003) case study showed

that inefficiency in use of materials and energy on non-product outputs and wastes are the main causes of environmental costs and Jasch and Lavicka (2006) showed that the material purchase cost of non-product output is also one of the key environmental cost drivers.

For reasons such as these, managers are often not aware that the producing of waste and emissions is usually more expensive than disposing of them. Furthermore, failure to control environmental costs means that economic and ecological advantages in markets cannot be taken. So, if accurate environmental costs are available management decisions are going to lead to better actions for saving costs, for making cost re-allocations though product and process redesign and for reducing risks.

However, as Hawkins (2006, p 162) argued: "the first step towards eco-efficiency is to undertake an audit of the current operations with a focus balanced between cost improvement and sustainable issues". In other words, considerations of cost must not dominate and a balance needs to be found between the costs of a businesses and the need to maintain a healthy environment and society.

Since existing research suggest that there is no EMA system utilised in China, there are likely to be more obstacles to obtaining accurate environmental cost information. Getting this information is likely to require an even longer time and a continuous serious commitment from businesses including training to raise awareness in practice.

2.5 EMA Implementation Issues

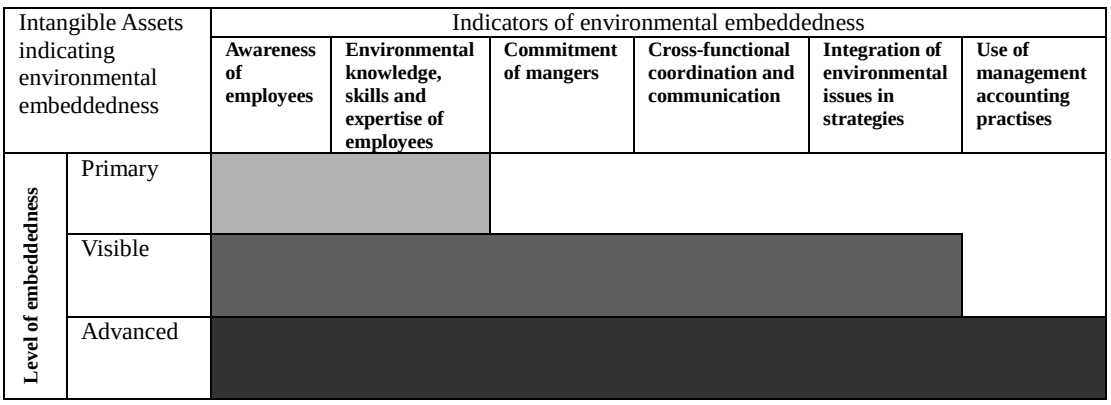
The successful implementation of an EMA system is influenced by four factors/points according Jonall (2008). First of all, external pressures as a stimulus from governments, the public, markets and other stakeholders play an important stimulating role. As public awareness is raised with regard to natural resource limitations and the kinds of crises we may be leaving future generations, governments are themselves coming under more pressure to force a transition in businesses towards more sustainable models. Jonall (2008) recognised a trend among stakeholders to require that organisations develop environmental information systems with appropriately reliable and accurate supporting performance measurements. Of course by doing so, managers would obtain detailed and accurate information and then be able to identify, estimate and measure financial benefits from environmental activities so that a better image and market standing would be achieved.

Secondly, poor communication of environmental information and knowledge within an organisation is a major implementation obstacle. Jasch (2003) advised that it is critical to establish a consistent information system that tracks material flows within a company and which combines with financial and cost accounting information. Jonall (2008) made suggestions about how this may be achieved which included (i) setting up a holistically-designed data model with performance objectives with full interdepartmental cooperation; and (ii) ensuring there is a continuous and systematic method for cost assessment and allocation which is used for planning, operation control and strategy formulation.

However, in many businesses environmental managers have poor access to cost accounting documents with the result that that they are often aware of only a fraction of the full environmental costs. Conversely, accountants are frequently limited within the frameworks of existing "traditional" accounting and are isolated with the result that they lack the awareness and the skills needed to differentiate the environmental aspects from the other accounting data. This situation is made worse by interdepartmental communication issues arising from different ways of thinking and even languages used (Gadenne and Zaman 2002). Therefore, it is of the utmost importance to coordinate the approaches, knowledge, skills and practices among departments and individuals to ensure the required levels of interdepartmental cooperation.

A third point is that full use should be made of existing accounting tools as far as that is practically possible for EMA development. Techniques such as Activity Based Costing and the Balanced Score Card can be used to reveal large amounts of environmental costs and can help to identify potential areas for improvement. Existing accounting expertise then can play an important role to contribute to the development and use of a new EMA system (Scavone 2006; Clarke & O'Neill 2006). This is a sensible practical alternative to building a new IT system for the "optimum" implementation of EMA since this method would be far more expensive.

Figure 3: Perez et al.'s (2007) Chart Levels of Environmental Embeddedness (Jonall 2008, p 28).



Fourthly and lastly, training and awareness building among employees to increase their environmental knowledge, skills and expertise is an important intangible asset that a company needs to have for successful EMA implementation (Perez *et al.* 2007). Six aspects of this key intangible asset are related to three levels of environmental embeddedness are shown in Figure 3.

In Figure 3, the primary level of environmental embeddedness serves to keep an environmental system active using a minimum level of continuous improvement; the visible level increases the environmental influence over managers and strategies; and it is at the advanced level where EMA is used to mark a complete integration of environmental issues within the organisation. The development of this intangible asset is therefore essential for continuous environmental improvement and the consideration of environmental issues in the strategic planning process and in management and accounting practises (Perez et al 2007).

However, the four factors discussed above are based on the case studies in the West. A study of governmental EMA perspectives in China by Li (2004) showed thinking similar to that in the West inasmuch as the Chinese government could use EMA information to direct markets more effectively. But the study implied that it is necessary to note that factors can be very different in China from in the West, in terms not only in terms of different external pressures and social values affecting organisations, but also for internal users of environmental information. Internally there are in effect different existing levels of use of management and financial accounting. Thus it is necessary in China to carefully explore the relationships between MA and FA as well as external factors when seeking to implement an EMA system.

2.6 EMA in Context

EMA provides a set of tools for improving environmental performance which is urgently required in China to help solve the "environment versus economic growth" dilemma identified above and to help reach the national target of Harmonious Development (HD). EMA then is a set of tools and procedures used for social ends and this section then will review two of these social ends that are important to the implementation of EMA: 1) the trends and arguments of SD; 2) the role of corporation within SD as exemplified by Corporate Responsibility.

2.6.1 Global Sustainability

Sustainability has been widely discussed in recent years and it is now widely acknowledged in the West. The concept of Sustainable Development (SD) was defined by the so-called Brundtland Commission as follows:

> "Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs." (UNWCED 1987).

The above definition is widely used but it does not provide insight into the practical implementation of SD. Some insight was provided at the Rio Earth Summit, the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, which stressed that SD rests on the three fundamental pillars of economic growth, ecological balance and social progress.

Learning from the history of the West, the issue of SD originated with an environmental crisis just as in China today. One hundred years ago the earth's natural resources seemed infinite. Although some people predicted that the environment would collapse during the 20th century, others were less concerned since they believed that technology would eventually solve all the world's environmental problems (AIESEC 2005).

However more and more increasingly serious environmental crises challenged the complacent technologically-orientated beliefs. A series of environmental incidents raised awareness of the need to take into account the environment impact of human activity. These incidents include for example, an oil spill in English Channel in 1968, a gas leak in India in 1984, the nuclear meltdown of the Chernobyl reactor in Russia in 1986, the depletion of the ozone layer, global warming and more. Furthermore, in the 1970s it was argued that economic growth would be limited by the availability of natural resources.

A Worldwatch report (Gardner and Prugh 2008) argued that the world was very different physically and philosophically from the time when economists established the key criteria of conventional economics in use in the 21st century. For instance, global population has expanded 6-fold from 1800, and the gross world product is 58-fold bigger than in 1820. These increasing figures have made people realise that "humanity's impact on the planet - its 'ecological footprint'- exceeds Earth's capacity to support the human race sustainably" (*ibid.*, p5). Therefore, the pressures to respond to the needs of SD in recent decades have been increasing.

This historical trend of the development of SD in the West is something that China now has to learn from to solve her own development dilemmas. Moreover, from an economic perspective, Talberth (2008) concluded that the issue of SD is now recognised and accepted by markets worldwide so that the economic context of the world has significantly changed. Customers and the public require an appropriately sustainable economic system with

sustainable business models that replace wasteful competition and become aligned with Earth's ecological limits to achieve a lasting high quality of life.

In addition, the focus of several global initiatives has been shifting. For example the Global Reporting Initiative (GRI), one of most influential reporting guidelines, increased the content of Greenhouse Gas (GHG) emissions reporting in 2006 and introduced three new indicators about GHG emissions by weight. As a result, two-thirds of the FT500 companies began reporting in this way. The Carbon Market provides another example of change since it is as a way of valuing and trading carbon emissions in markets and it has been accepted and used by many businesses. These important initiatives set precedents for others to follow (Frost 2008, p13).

Therefore, developing managerial tools to assist business sustainable development is now crucial even within a narrow focus upon economic growth. China needs to learn from these trends and initiatives to solve her own environmental crises whilst furthering economic development in her own specific context. Additionally, being a "first mover" often gives businesses better marketing positions so there is really no economic reason for not developing SD tools for management.

A way is needed then to have economic growth with a better environment. It is morally wrong if developing countries are denied the right to develop their economies to a similar point of economic development as that achieved by Western economies. You cannot tell one billion people who live on less than $1 US dollar per day "do not work for or contribute to unsustainable business" while every European cow is subsidised at $2.5 US dollars per day (Hawkins 2006).

Therefore, although EMA may be a practical managerial tool that aims only to improve environmental and financial performance, it is also a good solution for Chinese companies dealing with the Environment-Economic Growth dilemma. By contributing to China's national environmental goals, social benefits, such as better living conditions, reduced respiratory diseases, and better food safety, will also be improved.

However, the issue of SD has developed only in recent years. Gray *et al*. (1993) argued that the West had no experience from which to learn. Similarly, whilst such as GRI and Worldwatch have published influential organisation-level benchmarks for the improvement of SD, it is argued that these indicators lack embedded experience. More importantly, the three SD dimensions fail to establish a holistic view of the complex context in which business operates

within the ecosystem. In other words, there is a need to develop and try out new SD tools for management to be tested in practice and to build up experience.

Last but not least, Gray *et al.* (1993) observed that it is a high-risk gamble to pursue economic growth and hope to solve any problems that arise. To reduce this risk, he further argued that SD needed the full involvement and commitment of business: "any discussion about solutions towards sustainability must include the corporations, it is here that accounting, reporting, auditing and related matters have to make their contribution" (*ibid.*, p 287). Therefore, the role of the corporation is now considered.

2.6.2 Corporate Responsibility (CR)

Corporations as specialised institutions with their own legal identities play a very important role in sustainable development because: 1) the activities of corporations can have a high impact on changes of legislation and legitimacy, as well as on the establishment of benchmarks such as the GRI; 2) they are the best organisations to take significant actions in practice using their significant resources, technologies, financial ability, manpower, markets and influence. Therefore, encouraging more and more corporation involvement and motivating their interests to further the cause of SD is very important (Lovins 2008).

There are two aspects discernible for corporations moving towards to SD: 1) public pressure regarding social and environmental issues represents challenges for corporations; 2) business response to those challenges is a way of satisfying increasing expectation from different sectors of society (Blowfield & Murray 2008). With regard to these aspects, Gray *et al.* (1993, p 287) argue that "corporations control a dominant proportion of world economic activity as well as being the major mechanism". Corporations influence society's range of choice, control much of the world's resources, represent significant elements in employment, have more experiments with innovative business models and are hugely influential on governments. Hence society has a big expectation for corporations to achieve the dual goals of being profitable whilst making improvements for sustainability and global justice. Therefore, it is essential to provide the tools to help corporations address these challenges and risks.

In addition, among the SD debates among local and global stakeholders, corporations act like "corporate citizens" who have need to acknowledge and act in accordance with their responsibilities; the so-called "Corporate Responsibility (CR)" (AIESEC 2005). Bjorn Stigson, President of the World Business Council for Sustainable Development, pointed out that "Companies are an integral part of the communities in which they operate. And business cannot

continue to generate wealth if the society around it fails." (AIESEC 2005, p 6). Hence, the need for corporations to take positive actions in response to stakeholders' and societal concerns is now a critical part of their operating regime. By doing so, corporations gain beneficial influence on social legitimisation, legislation and public relations, which in turn give corporations better market positioning.

EMA implementation therefore has a wider remit to a broad range of stakeholders. Its wider role may now be stated as: 1) improving organisations' ability to efficiently and effectively use resources through more accurate information system and managerial tools; 2) proactively responding to stakeholders' concern for responsible and sustainable business; and 3) creating profit through efficient environmental cost savings.

Moreover, Blowfield and Murray (2008, p 115) argued that adopting CR as strategy is "an inseparable part of a larger complex and changing system". Talberth (2008, p 31) further stated that "maintaining credible sustainability metrics is a proven strategy for business success in the new century". However CR does not provide detailed techniques or management tools, it is more a strategic vision or plan for organisation level or case-oriented implementation. Hence, more technical tools and guides to forms of integrated strategic management are needed for achieving the corporate strategic SD plan. This effectively means that EMA does not just have an impact on environmental and economic aspects of corporate performance but also has a role to play in relating to more complex social SD issues.

In summary, although implementing EMA in Chinese companies will not be the full solution to address the needs of SD, it is nonetheless a very useful tool for dealing with many aspects of the environmental crisis and it will help solve China's Environment-Economic Growth dilemma. EMA implementation is then an urgent and essential issue for achieving China's national plan of HD. Also whilst EMA is a practical tool for businesses to deal with some aspects of the SD challenge, it will also contribute to broader the stakeholders' concerns in which corporations play a very important role as societies attempt to move towards being more sustainable on and within planet Earth. Hence it is a complex context that is of significance when implementing EMA and this study will not just provide and establish a practical EMA tool for companies in China. It will also be concerned with the interactions between various factors identified above in this study, notably with regard to diverse stakeholders. As a final layer of complexity, this study will also have to account for the effects of China's unique culture, history and traditional philosophy, which are quite often misunderstand in the West.

Part Three: Sensitising Perspectives

A lack of experience to guide EMA, and SD, implementation is a weakness as discussed above. Whilst there have been case studies of EMA implementation these have looked at technical aspects and not at the broader, less precise and less "concrete" aspects such as cultural context, people's attitudes to change and motivation. However, there have been a few detailed SD implementation case studies that have provided valuable points for businesses to enable them to cope with broader challenges and barriers. A series of such broader examples of SD case studies is provided by the Nordic Partnership which was founded in 2001 by the World Wide Fund for Nature. This series of cases are based in Nordic countries that have their own identities and cultures and that also are well known for their good progress made towards sustainability. These particular case studies also provide detailed practical guidance to encourage other companies to take action, and suggestions for taking actions. So the first part of this sensitising perspectives section will seek to learn from the Nordic case studies.

A second part of this section will look at some distinctions within China that may be relevant to EMA implementation. The questions examined include what is different about how Chinese people think and act and organise themselves and are these differences relevant to this study. The concept of HD is also examined more closely in this section.

3.1 Nordic Management Approaches to Implementing Sustainable Business

The Nordic Partnership combines a group of companies from different sectors and countries with a total turnover of over 73 billion Euro and more than half a million employees in 2002. These companies were already taking action and investing substantial resources in their efforts to develop and integrate sustainability in their strategies, organisations and business model. Their series of case studies reveals their management's approaches and relates their experiences and how they coped with different actors in developing the real, practical business case that others could learn from to implement more sustainable ways of doing business.

The report of the Nordic Partnership concluded that the key business drivers for SD are as below (Nordic Partnership 2002, pp 19-20):

- Economic, social and environmental risks including protection of brand and identity
- Attracting and retaining customers
- Innovation linked to sustainability

- Being able to retain and attract employees

Three other key issues relating to business drivers for SD are “cost saving”, “documenting value creation” and creating a “clear business case” for both external and internal communications. More importantly they concluded that “sustainability is opportunities and not just responsibilities” (Nordic Partnership 2002, p 27).

SD “Opportunities” were regarded as most important and needed to be profitable in order to be attractive for both businesses and their investors if they were to succeed. However, the opportunities are numerous and contextually specific so it is easier to learn from the challenges they faced which are more easily summarised and generalised.

3.1.1 Nordic Challenges

The main challenges of implementing SD as identified by the Nordic Partnership (2002) are to integrate the issues within strategic thinking and establish a clear sustainable strategic process. This involves several issues. One key issue is that SD involves much more complexity for businesses. Hence handling complexity is one of the primary challenges especially for companies; the key problem being how the company can turn complexity into action plans that is simple and doable. The plans need to show positive results relating to both financial benefits and sustainability improvements and taken together this was a serious and difficult challenge for the companies. Another difficult challenge was working with more partners for SD including customers, suppliers, and government departments. This was experienced as something far more complicated since they had many meetings and they found that being face to face with people introduced many different expectations and perceptions for consideration.

These challenges emphasise a need to employ specific managerial tools to deal with them. Blowfield and Murray (2008) argued that if corporations deal with the issues more appropriately and carefully, then the challenges they face can be regarded as opportunities to engage with new technologies, new approaches to deliver alternative products and process. Thus EMA could be presented as a practical tool to integrate environmental related performance issues within a strategic management process. In fact, without being integrated with the management process, EMA will not be established for long-term use; this will be discussed further below. EMA then can be used to address several of the challenges faced by the Nordic companies: it can help to create a clear illustration of financial benefit and sustainable improvements integrated together in a “hard” business case; it can influence and alter people’s expectations regarding the benefits

accruing to a business; and it is an overall practical and useful tool for motivating people to add to sustainable business.

However, the Nordic companies did not meet all the SD challenges they faced. As Blowfield and Murray (2008, p239) pointed out: "there is little evidence that any major corporation is truly sustainable." In essence, no business can deny that "growth" has meant additional resource usage which "both depletes the earth's stock of resources and leads to increased emissions" (ibid., p239). So, caution and circumspection are needed when developing new ways of doing business for SD for the situation is complex and not all the issues may have been considered by the Nordic Partnership.

3.1.2 Nordic Barriers and Opportunities

The main barriers and opportunities were closely related to their drivers for change in the Nordic case studies. First of all, proactive SD business activities played a role in moving society as a whole towards more sustainability. However, they identified a key issue here as the difficulty of identifying and documenting "value creation" appropriately enough to show how the business case would apply effectively over time. This key challenge could of course be turned around and if so done, it would then be a significant opportunity for business to reshape their management processes. The Nordic experience does indeed show that SD value creation can be a key business driver that motivates and shapes the nature of management for on-going improvements. Therefore, EMA needs to be a practical tool that addresses this "value creation" barrier possibly as a way of documenting cost saving details within improved management process and then promoting these real SD benefits to the public in reports.

Secondly, the Nordic cases identified a strong barrier arising from people's lack of understanding which caused notable resistance internal to the companies. This lack of understanding revealed itself as the resistance in individuals' everyday work, as well as in the negative influence coming from maintaining "traditional" functions in such as sales, finance, and market and procurement departments. In this regard, the Nordic case studies showed that it is middle management that is often more of a barrier than other levels. Nonetheless, middle management and their functions were very important factors for creating value both internally and externally to the companies. Additionally if well motivated, middle managers were in excellent positions to make SD an opportunity to attract and keep knowledgeable, able and well-motivated employees this would make the implementation of new programmes more effective and efficient. Hence, it is necessary to pay serious attention to understanding, interpreting and dealing with managers'

reactions when implementing EMA within Chinese companies.

Thirdly with regard to "value creation" and its recognition in new markets, paying any premiums for SD services and products as well as educating customers in their demands was seen as an important barrier by the Nordic companies. Of course this situation can be turned around so that opening a new market becomes an opportunity to engage with new products and technological innovations. The benefits of such a transformation may include for example being a first mover to access these new markets and technologies. Hence there is a major opportunity for a company adopting EMA and becoming a first mover in China where there is no EMA established as yet.

Overall, the Nordic Partnership (2002) case studies raised many issues and provided different perspectives such as: 1) a need for SD integrated thinking and a strategic system from the management viewpoint; 2) a requirement to create and maintain both long- and short-term visions with their own specific points of focus whilst prioritising key strategic areas; 3) a need to take small steps when creating and collaborating with new SD integrated teams and processes; 4) a special emphasis required when making the connection between environmental aspects and finance which needs to be done as early as possible; and 5) the importance of good communications both internal and external to the company and notably along the supply and value chains.

In summary, an integrated management process but with new tools in specific areas dealing with particular SD issues and taking small steps especially in the beginning are essential for moving a business forward for extra sustainability. Additionally and crucially, the more people that have a clear and full understanding of what roles the organisation and its individuals play in the whole complex process of SD improvements, the better will be the transformation and its results.

In the perspective of this present study on EMA implementation in China, it is a small practical step towards better SD since it helps to provide a way of dealing with particular issues within overall management systems but it does not aim at solving all the SD issues within complex ecosystems. This study is interested in EMA as a practical solution to deal with some of those challenges and barriers of SD arising in a unique Chinese context and it can learn from the ways the Nordic Partnership has experienced its own efforts for increasing SD.

However, one Nordic Partnership lesson not be forgotten is that "a small step" does not necessarily lead to desired solutions since it may lose sight of and damage other, bigger goals and tasks that are visible only when seeing SD in a more holistic way. So it is the case that the

significance of implementing EMA in China is more than just a single, small step; it can be a big change for those individuals who have the power to affect EMA implementation but who also can significantly influence organisational processes and strategies and change people's attitudes and ultimately even a whole societies' awareness and perceptions of SD. EMA is part of a much bigger process of change for individuals, organisations and societies. Therefore, the following section will explore those unique Chinese characteristics that may affect the implementation of EMA.

3.2 Unique China: Her Traditional Society and Philosophy

It is important to identify the characteristics of potential users of EMA in China because their unique factors as people or societies are likely to influence the implementation process. Such characteristics include culture, traditions and philosophy as well as management style and the informal relations that are strong in China. To consider and successfully cope with the characteristics would be "a small step" in actions that could make a significant "big step" for EMA and SD implementation in the unique Chinese context. Furthermore, not only may "a small step" in China cause a big impact but also on the world due to China's population size and polluting emissions, resource yields and supply chains. Hence in this project the unique context of China needs to be considered and how it will influence individuals and companies taking actions.

China has one of the most unique societies and culture that is strongly distinguishable from the West and the rest of the world. As previously argued, this is likely to influence EMA implementation in ways very different from those in the West. Therefore, two significant Chinese cultural/social issues are analysed in this section: (1) the collective society with its consequences for government and (2) harmonious development.

3.2.1 The collective society, government's role and its tradition in China

China is an amalgamation of collective societies which is an important contextual factor when developing EMA. Chinese history demonstrates how people's awareness and intentions have frequently been changed in major ways with "a small step" which resonates through the collective society to become "a big step". The 20th century's cultural and economic revolutions are examples of this. A small action in China can lead to a big change in individual and societal awareness, perception and will.

The economic revolution of the late 20th century was the initiator of reform at all levels of Chinese society within a short span of time. This example of the effective change caused by "a small step" in Chinese society for this eventual big change did not depend only on directives from government authorities, but needed a collective social response which significantly and fairly rapidly altered people's intentions and expectations. In other words, the "small step" had changed individual minds with regard to what they had recognised and know and hence it changed behaviour.

Nonetheless, throughout Chinese history it may be observed that authorities have played an important role in a country constituted by collective societies. Such authority was strongly supported by social ethics and norms. The collective society is deeply rooted in tradition and it originates in respecting and maintaining a strong set of "family" ties which traditionally extended to all people with the same *family*-name. This is the foundation of Chinese social ethics and norms. It later developed to a wider concept of a "family" to embrace a group of people in a community and then in a society. In time, respect for authority as an extended "family" became the established attitude throughout the whole of greater China area. That is why Chinese governments, and emperors in the past, had such a deep influence on individuals in society. This influential triangle of authority-social-family power now extends to business as a manager-social-family triangle. Therefore, it is necessary to consider the relations and extent of the influence of "authority" in China when analysing EMA implementation within corporations which my model is drawn below; see Figure 4.

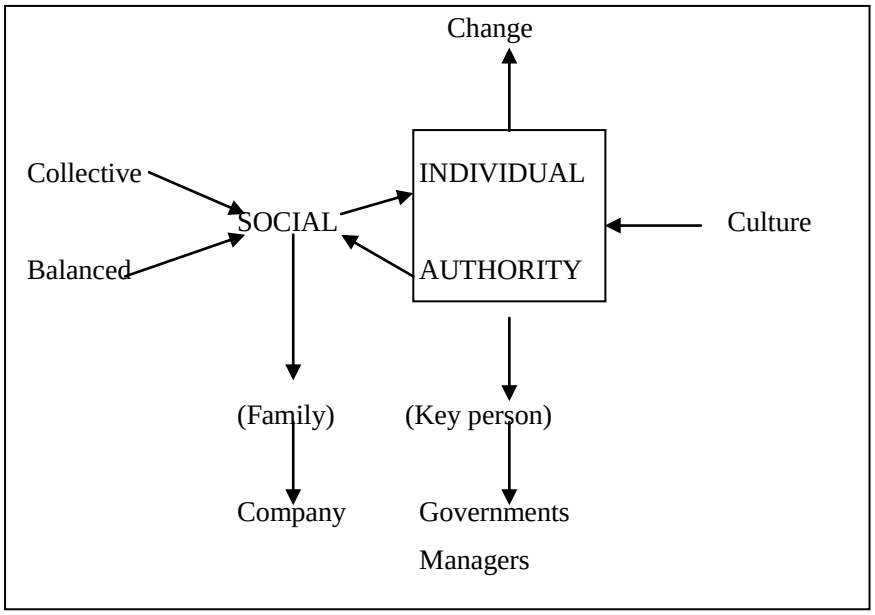


Figure 4: My Model:Relations and Extent of the Influence of "Authority" in China.

Conversely, the power of Chinese authority is necessarily balanced among the social groups. Power in China is not a form individual power but is power in a balanced collective. That was why the bottom-up movement in the 1970s in China eventually resulted in significant change for the whole nation since its success represented the will of many groups of people so that the State had to change to maintain the balance. Such collective balancing power could be a source of internal resistance in Chinese companies when implementing EMA. Similar internal resistance was also recognised by the Nordic Partnership studies.

Another distinctive Chinese traditional factor that we need to consider is the Chinese capacity to absorb and combine aspects from non-mainstream culture. For example, the imported religion of Buddhism was prosperous in China from around 500 AD and it successfully combined with the existing traditional Chinese religions of Taoism and with the traditional philosophy of Confucianism; "imported" Buddhism thrived in China in this way (Ma 2007). Chinese culture and philosophy developed in a sequential, aggregative process and has never been displaced or rejected by external influence. In other words, traditional mainstream Chinese culture learns from outside influences and adapts. This is why the 56 races of China eventually came to be united whilst maintaining their diverse cultures and traditions even after disruptive periods in history. Therefore, it is necessary to consider how EMA adoption will be "absorbed" in China.

In summary, a collective society is a key character of the Chinese people (Ma 2007). It is not only present within politics but also in people's everyday lives in families or organisations whereupon individuals act out their responsibilities by "fitting-in" with collective decisions, thereby maintaining the social "balance" within which, in return, their contribution is valued and respected. In this way, Chinese authority is influential because of its deep roots in traditions and social legitimacy. The final point is that Chinese culture, at some stage, does not reject but welcomes and absorbs outside influences.

Hence a key question for this study relates to how EMA implementation in China will interact with these characteristics, the traditional relations between existing social structure, people and authority whether as officials or managers. Following from this, it is necessary to consider how EMA implementation and China will reshape each other so another question emerges such as "does this Chinese ability of absorbing and combining things influence the adoption and behaviours of EMA implementation?" Obviously EMA as a technical entity cannot be expected to answer these questions. This is why Structuration Theory (ST) is employed in this study; it provides a methodological framework to explore and reveal the processes of change initiated by EMA implementation in China. It will be able to illustrate and explain

more clearly just how “a small step” in individual action may become “a big progress” in social reality.

3.2.2 Harmonious Development (HD)

The concept of “Harmonious Development” is based on a distinctive, extensive philosophy. It is often not well known in the West just what is the meaning and definition of HD so it is necessary to review it for this study. Chinese philosophy had nothing to do with natural science from its earliest beginnings. The first object of Chinese philosophy was a focus on the “meaning” of ontology which was taken as: 1) not to emphasise the truth or objective knowledge world but to understand people themselves and the relations between people and the objective world; 2) to be about irrational senses and the instinct of people who are regarded as being embedded in the world as a whole in a complex situation which will not be suitable to support strong logic or to provide a clear definition (Ma 2007).

There are two more important points that arise here. First of all, Chinese philosophy is concerned about “people” and the relations that support them. It is not the same as the concept in Western philosophy that focuses on a discrete “person” (Ma 2007). This is where the collective identity as discussed above has been interpreted from a philosophic viewpoint. The notion of relations helps to explain why the existence of “the family” is an important priority for every Chinese individual; it is the way in which to their personal philosophy and relations relates to the wider sets. In this way, the subject of HD needs to focus on people rather than on a person.

Figure 5: Yin-Yang

The second point is that traditional Chinese philosophy emphasises dialectical rather than formal logic because it believes that formal logic tends to ignore the irrational elements beneath consciousness and also that the irrational is the original motivation for action (Ma 2007). This dialectical logic is the foundation of the famous “Yin-Yang” motif and understanding; see Figure 5. It is also the foundation whereby dialectical materialism was linked to Marxism in 1949 and then employed to such extreme and tragic ends by Mao Zedong.

So traditional Chinese philosophy and culture is concerned more with relations than with individual people in an objective material world. In many ways, this relates closely to the core Western concept of SD whereby people are embedded in the world to the extent that they need to

survive together and find a balance among uncertain and dynamic relations.

Nonetheless the meaning of "HD" does not correspond precisely to "SD" as defined by Western society but it instead draws upon a thousand years of tradition in China. HD focuses on complex relationships between individuals and their communities; between communities and societies; and between people and natural world. All these relations in a Chinese understanding can be many and various and irrational under different contexts whereby they acquire diverse meanings. HD emphasises the balances within every individual and external relations; this represents a philosophical view of the world that is more organic and dynamic.

Applying the HD concept at an organisational or a small group level, being "harmonious" is still about balancing relations between individuals, groups of people and the outside world. Such "balanced relations" will have an important influence on EMA implementation and this could lead to significant change for Chinese EMA implementation; not only for individuals, but for the whole society. In this way, HD corresponds closely to intrinsic SD where the relations inside people, organisations and society constitute the "intrinsic".

3.2.3 Three Additional Reasons for China to Implement SD

As a final section to this part, a few additional Chinese motivations to adopt SD, and hence EMA, are considered. There are three reasons why the Chinese government would like China to become more sustainable in addition to the environmental concerns previously identified.

The first reason is that, as part of globalisation, China needs to become a responsible nation in the world and, as such, to contribute to the Earth's sustainability. This self-motivation was significant in the recent Five Year Plans, the national strategies, and other relevant initiatives by the government. It has also been revealed in Chinese public awareness and intentions. For example, from December 2004 to June 2005 more than 4 million Chinese people were involved in a survey regarding the "Report on National Environmental Protection Plan in the Eleventh-Five Years" (Zou. *et al 2006*, p 547). 94.9% of the participants regarded the need for more environmental protection as urgent. In addition by implementing more initiatives for sustainability improvement, China gains an improved global reputation which is a competitive advantage in economic development.

Following on, the second reason is that more sustainability will lead more directly to gains in national competitiveness for trade with new products and processes. These processes will also

further economic reforms as well as other internal reforms. Chinese competitiveness is no longer based on “cheap” labour and natural resource (360 Encyclopaedia 2011).

The third reason is that Chinese people are demanding better living conditions. The significant economic gains that have made China a major economy in the world have had a very positive impact upon the Chinese people: “Living standards have improved dramatically with life expectancy increasing from 35 in 1949 to 73 in 2005.” (Welford 2007, p1). As living standards rose, the Chinese people became more critical of China’s poor environment. Consequently environmental issues, once thought of as being unrelated to development, have become increasingly important to both economic development and social stability which is always given a high regard by the Chinese government.

In summary there are strong motivations for the Chinese government to implement more SD initiatives for both social and economic concerns. This Chinese context will impact on business organisations and will affect their attitudes and behaviours with regard to EMA implementation both through direct pressure from the authorities and also though indirect social concern.

So EMA implementation in companies needs to be examined not only through changes in national strategy at actual implementation levels within respective industrial sectors, but also in the context of a changing society. This is why this present study of EMA implementation needs to examine the on-going changing process within organisations and also between human agencies and social structures, which will be analysed here using Giddens’ Structuration Theory.

Part Four: Foundational Frameworks for Research

4.1 Methodology

Methodology is "the study and critical evaluation of the methods and logics of inquiry used for generating and justifying new claims to knowledge" (Blaikie 1993, p 8-9). This criteria of critical evaluation needs to have a foundation based on philosophical beliefs. Such a foundation is about knowledge and reality and the relationship between them. Hence, it is also foundational in research to derive an appropriate philosophical position that provides access to knowledge of the world and to express that foundation appropriately.

As discussed above, aspects of research in this present study are about the changes in EMA users' behaviours and attitudes when implementing EMA and the surrounding formal and informal organisational structures. To study this change during EMA implementation, it is necessary to differentiate a degree of independent existence for identifying the characteristics of subjects of the study. It is also necessary to establish the independence of the researcher even whilst acknowledging the socially constructed aspects of knowledge. To these ends, this study has accepted "ontological realism" as its methodology which has been defined by Saunders *et al.*'s (2003) as a reality that has an independent existence of commonly experienced stimuli in terms of generating a shared interpretation, which may be shaped by social forces or acceptable routinised behaviours by a group of people. Furthermore, from an epistemological perspective, the way of acquiring warranted knowledge of this form of "reality" is to neutrally engage with, describe and then interpret the cultural worlds of its actors. This process may be described as "epistemic subjectivism" which is to believe that the world has an external existence but to acquire knowledge of it, or not, there is a need to consider the epistemological influence of the processes of knowledge, language, culture and context (Forrester 1983). This is the appropriate philosophical position for the purposes of this study.

In this study then, the ontological status of human behaviour gains meaning and the researcher will explain and interpret this behaviour within the structured but on-going changes of wider phenomena. However, this study will build on the work of other social science researchers in order to direct the acquisition of data and its interpretation; this will be done by using appropriate theoretical frameworks.

4.2 Theoretical Frameworks

4.2.1 Institutional Theory

Institutional Theory (IT) provides one appropriate theoretical framework for this study seeking to understand institutions conducting EMA implementation within companies in the current context of China. IT focuses on the pervasive influence of institutions upon human behaviour through the establishment of rules, norms, and other frameworks (Ingram and Clay 2000). It provides insight and understanding about the capacities of institutions to cope with different contexts and to manage their own workloads which involves 'infusing a structure with value' (Peters 2000). IT has two approaches to interpreting the effects of institutions and these are known as Old and New Institutionalism respectively.

Old Institutionalism maintains that institutions influence individuals' actions for maximising the benefits that may be derived the institutions (as *regulative* institutions) and also in the form of an individual's awareness of what one is supposed to do (as *normative* institutions). New Institutionalism adds a cognitive influence to the interpretation of the effects of institutions whereby individuals comply with institutional routines simply because other types of behaviour are inconceivable. (Scott 2001). Additionally, New Institutionalism argues that institutions themselves influence each other by means of mimetic processes (as a form of *peer-group pressure*) and that the external environment may also initiate changes in the values and structures of institutions (Peters 2000). By these means, changes in institutions are undertaken so that an individual institution may gain *legitimacy* within the world of institutions. Hence once established, institutions have their own forms of self-regulation and maintenance and this is argued to be a powerful constraint on other change and will be a source of resistance to new internal systems such as changes in traditional management accounting and the introduction of EMA (DiMaggio and Powell 1983).

However, since the primary focus of IT is on the movement towards, and on the maintenance of, established institutional norms, the theory generally has little to say about how and why institutional norms change or about organisational diversity (Powell 1991). Clearly, organizations and institutional norms do change over time and Kondra (1998) posed two fundamental field questions which remain unanswered by IT: (1) where does the impetus for institutional change come from? And (2) how might organizations respond to pressures for change?

In other words, IT on its own does not provide the full explanation sought in this study which

relates to the transformations that a company may undergo when embedding environmental aspects of performance alongside the financial in its internal information systems. IT may be useful to explain some aspects of why companies refuse or adopt EMA tools but it may not be a complete explanation and it may not deal adequately with the pervasive Chinese context or the underlying, potentially negative attitude of companies and other barriers relating to EMA implementation. Therefore, additional theory is required to identify, understand and explain changes of organisation and its individual members. To this end, Structuration Theory will also be used in this study.

4.2.2 Structuration Theory

Structuration Theory (ST) is "a means to examine the interplay between the agent and structure…" so that "…the ongoing nature of society is a result of human action and the ongoing nature of human action is a result of society." (Buhr 2002, p 18). Therefore, Giddens' (1976, 1979 & 1984) Structuration Theory is capable of providing an accurate explanation of subjective knowledge formation that plays an important, reflexive and determinative role in determining individual behaviour. Methodologically, ST is appropriate for this study since it adopts ontological realism and epistemic subjectivism as a philosophic position to help understand and interpret the reality of the on-going changes which are the subjects of this study. ST also helps to recognise the relationship between changes in institutional reality and the knowledge and attitudes of human agency. Furthermore, as Rose (1998) observes, ST can make a significant a contribution to improving the capacity for effective action if used to develop practical guidance. Hence, ST will also be used as a theoretical framework to understand and reveal the processes of change in Chinese companies whilst implementing EMA and, in the longer-term, when furthering sustainable development.

Structure is of course central to ST and it is defined by Giddens (1984, p 377) as:

> "Rules and resources, recursively implicated in the reproduction of social systems. Structure exists only as memory traces, the organic basis of human knowledgeability, and as instantiated in action."

Structure in social systems refers to the structuring properties allowing the binding of time and space in social systems (Rose 1998). Thus social systems as reproduced social practices exhibit 'structural properties' and exist as a time and space presence in practices and also as memory-traces that orientate the conduct of knowledgeable human agents (Giddens 1984). In other words, "structure is a virtual order of transformative relations" (Giddens 1984, p 17).

More importantly it means that structure is not merely constraining: it is also enabling.

Moreover, the central notion of structuration rests on "the duality of structure". The two independent sets of phenomena (dualism) of structure and agency as a 'duality' are dependent upon each other and recursively related (Rose 1998). Giddens (1984, p 25) explained that "the structural properties of social systems are both medium and outcome of the practise they recursively organise". Therefore, the dynamic, reflexive interplay of social systems means that "structure is a process not a product or steady state" (Buhr 2002, p18).

The processes described by ST provide a central insight to this study but before their more detailed explanation it is necessary to discuss two of the terms used by ST: *Human Agency* and *Resources*. Human Agency is important to ST and it is the "capacity to make a difference" or "transformative capacity" (Giddens 1984, p 14). It is intimately connected with *power*, the power of understanding rules and the *capacity* to use *resources*. Capacity is key characteristics of the power that is formed by the rules and resources that are available to any particular social position. In this way, power is inextricably entwined with the exploitation of resources and human agency. Indeed, as Buhr (2002) argues, all power relations involve some sort of dialectic of control.

According to ST, the agent when operating in different ways may experience three levels of consciousness: (i) practical consciousness (what the agent knows about but without being able to express); (ii) discursive consciousness (what the agent can express the social conditions and the conditions of his or her own actions); and (iii) unconscious motives and cognition (Giddens 1984). In addition, agency comprises both individual and collective action and it will differ from situation to situation according to different social positions (Sewell 1992).

Resources play a formative role in ST: "Resources (focused by signification and legitimation) are structured properties of social systems, drawn on and reproduced by knowledgeable agents in the course of interaction" (Giddens 1984, p 15). There are two kinds of resources: *authoritative resource* derived from the activity of human agents and *allocative resources* stemming from objects or material phenomena. (Giddens 1994).

The core concept of ST is the Structuration process itself: "Structuration is therefore the process whereby the duality of structure evolves and is reproduced over time space" (Rose 1998, p 4). Agents in their actions constantly produce and reproduce and develop the social structures which both constrain and enable them, whilst structures empower agents differently and accordingly because of the duality of structure, they embody the desires, intentions and knowledge of agents

differently. In other words, the human need for ontological security leads us to repeat routine patterns of behaviour that unintentionally reproduces existing structures. Also all agents have the ability to utilise powers taking dialectic control (Burh 2002). For Burh (2002), ST is interpreted as the acquisition of subjective knowledge which is seen as dialectic transformation over time and space, constituted by human actors and embedded in social systems which are predominately the institutions in this present study.

Similarly, Clark and Giddens (1990) described ST as a series of interrelated propositions about social practises that are accomplished by knowledgeable human agents with powers. Human agents have a capacity for self-reflection in daily interaction with "tacit" consciousness of what they are doing and an ability, under certain circumstances, to do it. Such social practices are also "routinised" and recursive across space and time: "In producing social practises, which make up the visible patterns which constitute society, actors draw upon 'structural properties' (rules and resources) which are themselves institutionalised features of societies." (Rose 1998, p7). Hence Giddens (1984, p 14) argues that "we create society at the same time as we are created by it".

An illustration of the mode of social practise changing over time and space is given by Rose and Scheepers (2001). It starts with a simple model as mutually dependent structure and social interaction and then evolves as they are reproduced over time and space as shown in Figure 6 (*ibid*., p 8).

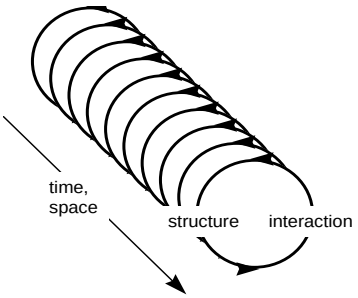


Figure 6: Structuration over time and space

Rose (1998, p 9) developed this model to provide three distinct purposes for ST: "1) to theorise to re-conceptualise or theorise aspects of the field; 2) to analyse as an analytical framework for the retrospective understanding of empirical situations or cases; 3) to operationalising– to provide operational guidance for practitioners." These three purposes further justify the use of ST on this current study.

Another scheme for understanding ST is provided by Giddens (1984, p 29) who provides a

framework that includes "three dimensions of the duality of structure", Figure 7. Structure is represented in the figure using two aspects of rules: *normative elements* (with legitimation and sanction aspects) and *codes of signification* (with interpretation and communication aspects).

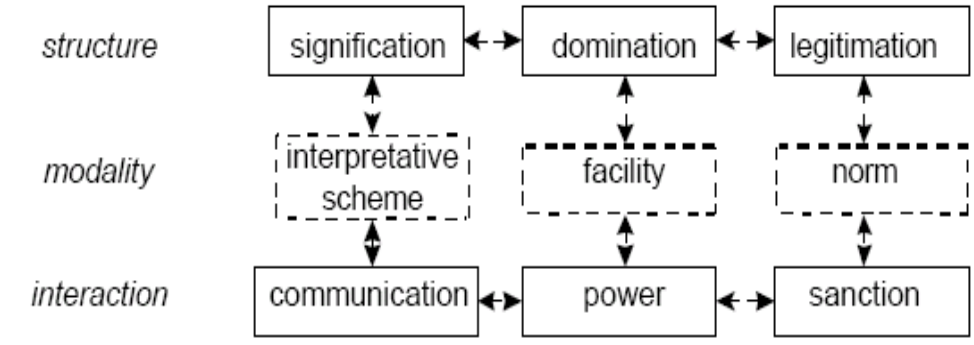


Figure 7: Three Dimensions of the Duality of Structure

Legitimation provides morality and is composed of the shared set of norms including values and ideals, normative rules, mutual rights and moral obligations (Rose and Hackney 2003). "Signification provides meaning. It is the abstract cognitive dimension used by agents for communicating and understanding." (Buhr 2002, p19). Signification includes organised webs of semantic codes, interpretive schemes and practices. Legitimation and Signification draw on rules and resources. It is Domination that provides influence as the power relations of autonomy- and dependency- based allocative and authoritative resources that coordinate and control people and things (Macintosh 1994).

Legitimation is important for this present study given the important role of the specific Chinese context. This is because it relates to a process in which the moral values are put into play by the corporation in order to guide activity accordingly (Dowling and Pfeffer 1975). Various strategies of legitimation have been studied (Dowling & Pfeffer 1975; Ashforth & Gibbs 1990; and Savage 1998). Suchman (1995) identified three groups of legitimation: gaining, maintaining, and repairing. Lindblom (1993) outlined four legitimation strategies used by organisations: 1) acts in accordance with popular views and corporate disclosure are used to communicate actual changes that have been made; 2) a focus on providing disclosure to change public perception; 3) an influential organisation possessing symbols that are in themselves highly legitimate; 4) does not attempt to change public perception but instead it seeks to change underlying social expectations. However, there is a crux to legitimacy and social acceptance in that it "is critical if the organisation is to avoid legal, economic and social sanctions." (Buhr 2002, p25).

A Signification dimension will always be implicated in legitimation-domination. It provides guidance to the role and purpose of the organisation through communication and discourse (Buhr 2002). As signification structures change, the organisations become a self-reinforcing, part of daily routine: "… in communicating reality we construct reality." (ibid., p27). Social and environmental reporting, for example, plays out roles to monitor and control business behaviours (Dierkes & Antal 1985).

Finally, the power of achieving outcomes is generated in and through the reproduction of the structures of domination (Giddens 1984). This draws on two types of resources, *authoritative* and *allocative*, which refer to the capabilities to generate command over persons or over objects respectively (Buhr 2002). Consequently, lack of power, as with lack of resources, would not be able to support the change of structures. Yet as legitimation and signification structures shape or change rules, they could develop the necessary resources for reshaping power. In other words, there is dialectic interaction in social intercourse whereby power relations are played out (Willmott 1987).

Since the process of establishing EMA requires the setting up of new information organisation systems in accounting, ST will be useful to reveal the inner changes of structure and the interactions relating to organisations and individuals (Walsham and Ham 1991; and Jones 1997); as well as to help guide a company towards improved sustainability in the long-term.

4.2.3 Intrinsically Sustainable Business

As discussed above, a significant complexity is to be found not only in Chinese traditional culture but also in the Harmonious Development ideas from CCP in recent years. This level of complexity has previously not been recognised in the West by either economists or business leaders (Birkin & Polesie 2011). Some authors in the West have recognised the significance of the complexity. For example, Polanyi (1957) argued that economies are embedded in society and culture and also that the Western market society is fundamentally unsustainable because it ignores this embedded complexity and is hence destructive to the human and natural systems. In response to this complexity, Birkin (2000) created a new sustainable development business model as shown in Figure 8. The model aims to "integrate the information flows within a concept of an organic whole and it also emphasises the significance of uncertainty" (*ibid*., p 303). The Cloverleaf model illustrates the internal and external relationships among business activities, social systems, ecological systems, which are represented in three groups (Birkin 2000, p 303-304) as follows:

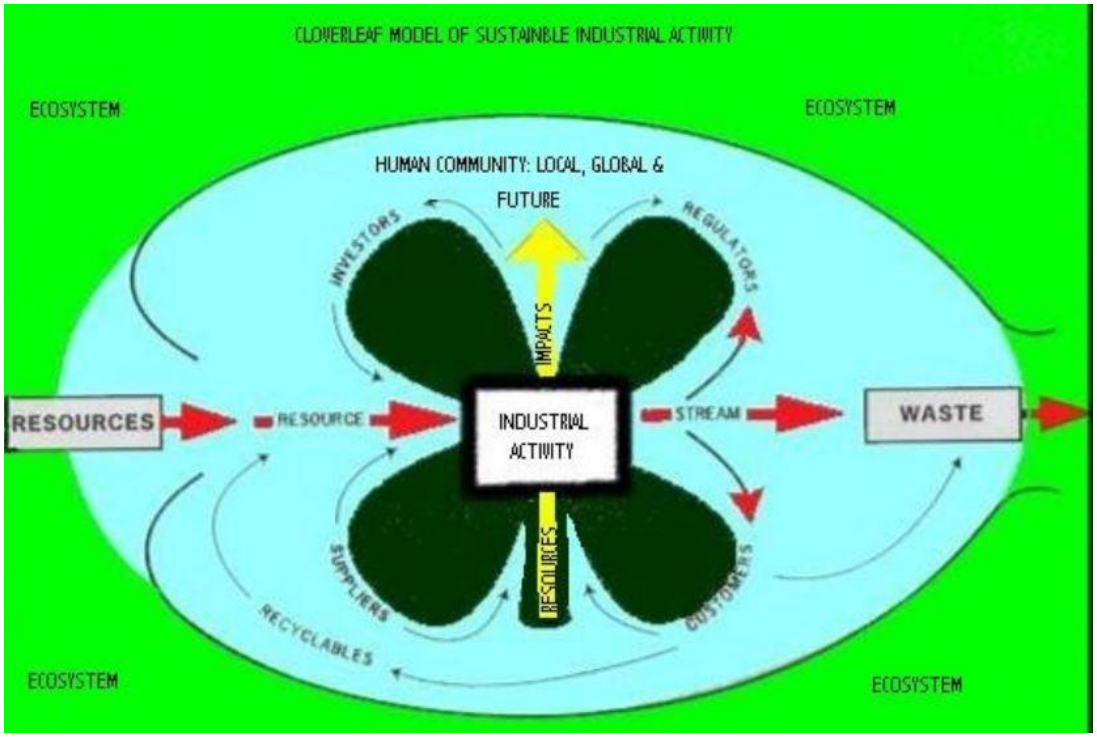


Figure 8: Cloverleaf Sustainable Business Model

> "'Resource Flow': the strong line going from left to right through middle of the diagram;
> 'Stakeholder Analysis': the leaves of the Cloverleaf as information flows; and
> 'Carrying Capacity Assessment': the thick black between the outer ecosystem information pool and the inner human community information pool."

The model also captures the interactions between these three groups in an additional fourth group called "Resource Flow Impact" which is represented by the strong line going from bottom to top in the diagram (Birkin 2000, p 303).

A company is located in the middle of the information flows: "At the centre of this diagram is the company, where relevant information is managed and used in accordance with the specifications of standardised environmental management system." (Birkin (2000, p 303). Hence, all key relationships for a sustainable business model are represented as information flows and that effectively defines an industrial unit which has access to and reports its own internal information flows. Knowledge of external relationships in the model is strengthened and focused in communications with informed stakeholders. The fourth group "Resource Flow Impact" relates to the economic, social and ecological interactions inside and outside the company. In this way a business entity is represented in a measurable way within social and ecological systems.

Moreover, a *Sustainable Development Matrix* derived from the four groups above provides

industry sector benchmark has been developed by Birkin to be “suitable for appraising and reporting on the performance of industrial entities within ontology of interconnected events.” (Birkin 2000, p 307). More importantly the Cloverleaf model is inclusive for it comprises the methods, relative accuracy and objectivity of science with the scope, judgement and values of art to provide a holistic understanding of all the relationships that are now known to constitute a business.

Only when all business relationships are captured and described can eco-efficiency be truly implemented; partial eco-efficiency makes no sense. Eco-efficiency has been discussed widely by both economists and social scientists. The former emphasise the three dimensions of sustainable development in terms of environmental, social concern and economic development whilst trying to balance these three dimensions in practise. The latter focus more on developing an “organic” economy or business system which is embedded in the whole ecosystem. However, the importance of eco-efficiency is nonetheless accepted by both groups and it involves issues of saving physical and social resources, improving management abilities and reducing the impact on the natural environment.

To establish and implement the Cloverleaf tool will hence need to deal with dynamic and on-going changes over time which cannot be isolated from their context. For instance, as new values are creating during EMA implementation they will in turn influence the consequences of any improvements. In this way, changes will be effect employee, customer and the general public’s understanding and perception, and then new expectations and routines will be established.

In summary, there are important issues of understanding the factors that affect people, organisations and routines when implementing EMA in addition to technical accounting factors. This once again implies that the small steps taken within companies will trigger bigger changes in people and then society which is likely to cause more progress for moving towards to sustainable development. All these aspects are represented and promoted by the understanding and modelling of an intrinsically sustainable business.

Part Five: Research Design

"A research design is the logical structure of a study" (De Vaus 2001, pp 8-9); hence it is based on the aim of the study. The aims of this study are to: 1) improve sustainable business in Chinese companies with EMA; 2) observe, understand, assess and explain the changes that occur in and around the companies when implementing EMA. Furthermore, the research design used in this study has all "three important layers of the 'onion'" (Saunders *et al*. 2003, p 82) which are a philosophical perspective as discussed above and the research approaches or strategy and the data collection which are discussed in this section.

5.1 Research Approach and Strategy

This study uses the deductive approach to develop a hypothesis through data collection. It will then to test the hypothesis. According to Pawson and Tilley (1997), theory testing is the attempt to validate, refute, elaborate, or refine an abstract explanation of phenomena by assessing the scope of a theory's explanatory power or empirical generality through a research process. The research of this study is hence designed to generate explanation and interpretation of phenomena. ST will be used as the overriding, principal theoretical framework to explore and interpret complex relations and hence this study is intended to test ST in practice and the to assess the need to "generate" new theory.

5.1.1 Qualitative Research and Case Studies

Following from this study's research aim and questions, EMA implementation is used to improve sustainable business and as a medium to explore relations between people and structure. ST consequently is employed to explain and interpret this process.

There are four research questions directing this study. To answer those questions, a sensitising analysis has revealed an important issue within regard to the broader research context. It revealed that business actions taken in small steps may eventually lead to big changes with regard to individuals and then to significant impacts on Chinese organisations and even the society of China. Therefore, there is a strong need to observe, understand and assess the changes in technical detail and broader context that may occur when implementing EMA, and to seek explanations for these changes as part of the sustainable development of China.

Consequently, a research strategy is required for examining changes of the process and the role of individual actors in the process (Harre 1979). Sayer (1992, p 243) developed this further by classifying appropriate, typical methods as a "study of individual agents in their causal contexts, interactive interviews, ethnography, as well as qualitative analysis". According to the diverse needs of this study, a multi-method approach will be employed for the different purposes in each phase of the study.

First of all, qualitative data will be used in the content analysis phase of this study. As Patton (2002, p 453) stated, this involves "any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings." The study of contingent mechanisms and context during EMA implementation uses qualitative data which is then subjected to content analysis.

Secondly, quantitative data will be obtained from questionnaires and company accounts and reports and will be used during the scoping and context studies mainly as a complementary method providing supporting data. This will enable the researcher to better identify and describe variability in different phenomena and to examine and explain the relations between variables.

Although the scale of this quantitative data used is relatively small, it will still further core research purposes (Saunders *et al*. 2003). Furthermore, case study research is defined by Saunders *et al*. (2003, p 93) as "a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence." Hence, this study uses various methods for collecting data including interviews, questionnaires, observations and secondary documentation. This approach is well suited to understanding complex social phenomena in their real-life contexts and for seeking to answer questions of the kind "how" and "why" (Scholz *et al.* 2005; and Yin 2003).

Hence, the main characters of each of the cases used in this study are: 1) well focused to provide rich understanding within the real-life context of the subjects rather than being replicable; 2) allows for the researcher to continually check their understanding and to ask questions until she in time obtains satisfactory answers; 3) allows for gathering information on phenomenon from a variety of viewpoints that cross the boundaries between different factors (Ghauri 2004). Some scientists argue that a case study gives a narrow view and lacks the potential for generalisation; however it is also argued that it is the best means to achieve the research purpose of acquiring a better understanding of human agency and behaviour, and for revealing changes in social structure.

Additionally, a case study researcher has an important role to play. Johnson (2006) says that a qualitative researcher has a desire to explore and evaluate subjective interpretations and to understand actors being deployed in their everyday lives which nonetheless leads to social constructions of meaningful behaviours or actions. Therefore, it is essential to pay attention to the researcher's own position during this study.

5.1.2 Research Design

To further describe the research approach and strategy used in this study, there are three issues that need to be summarised. It would provide a better understanding on the background of data collection, as well as data's limitation. This also implies a close relation of ontological status and human being's ability of receiving ontological status. In fact, no study could escape from this limitation. However, it does not distort the fact of what the company has been experiencing in my case. The thing actually would be focused on what we could interpret and understand.

A qualitative research might not be good for generalisation, but is meaningful for understanding and interpreting a phenomenon. It is useful in examining theoretical frameworks and contributing to the replenishment of theories.

- ***Targeting***

First, in terms of the selection of study objects, it was affected by personal links "Guanxi". At the beginning of field study, it was aimed at scoping objects through primary and secondary documents of a study population of no less than 18 companies. However it failed due to difficulties of getting access.

The key to selection was heavily influenced by not only the purpose of this study, but also by the personal links of "Guanxi". A doctoral study in itself is not a good reason for gaining access to a Chinese company; it has to be supported by "Guanxi" due to characteristics of Chinese social culture. Therefore, where and who as the objects of case studies are first of all influenced by the "Guanxi" of the researcher and key persons in the relevant companies.

Second, the two companies finally selected as the objects were positioned based on secondary documents study. It should be very important step for positing effective objects, especially as "an access" required "Guanxi", which is hard to use very often from my instinct and experience

in Chinese social society. However there is a big block due to the problem of "data disclosure", which will also be discussed in the section on data weakness.

In fact, the secondary documents study was not very successful. There was very little data to be found through public information, as well as academic gateways. Then the accuracy of this data is more likely to be easily questioned. What I have to state is that I am truly favoured since two companies accessed have provided useful data in the end.

Two tourism companies eventually offered field visits through my personal links. Longmen Ancient Town was selected as the first case. It is a typical humanistic and historical tourism destination, whilst Ocean Spring Resort (OSR) as the second case is an artificial and natural tourism destination. They were both expected to provide sufficient information through different angles and surroundings.

However, the first case was almost abandoned since there wasn't any evidence showing their environmental improvement and no EMA adoption at all. Fortunately, the second case has supplied effective and interesting data. The first case still contributes to the conclusions about specific Chinese culture and thinking.

- ***Designing***

In term of data collection design, this qualitative research is constructed by qualitative data obtained through observation, semi-structured or in-depth interviews; as well as combining questionnaires as quantitative data.

Observation is the first step. As an observer, I stayed at each destination at least one week, first to observe the surroundings including their products, customers, local residents, buildings. My role was to be as neutral as possible. As the interviews and questionnaires were carried out, my role had been divided into two aspects according to real demands: one was to observe people and their reflections; another was to elucidate basic concepts relating to "EMA", "Sustainable Development", "Stakeholders" in a real life situation.

The second step comprises semi-structured and depth-in interviews and questionnaires to members of ESER, managers, junior staff in the key departments, customers, and local governments' representatives. The purpose of this step is for 1) the assessment of environmental performance through EMA tools based on company information systems; 2) the assessment of environmental management through the key company personnel or key

departments.

As a result, the picture of the cases environmental performance and EMA adoption was drawn. The outline of internal and part of external stakeholder background was highlighted. The facility and barriers of EMA implementation became visible.

The third step was ongoing after leaving the scene. There were some depth-in interviews with key people for better and further understanding of the changes that the company made; as well as documentary sorting out and reviews. However this step was not carried on for Longmen Ancient Town due to quite bare output from the second step.

In general, the first and second steps would mainly answer the first research question and part of second research question as well. The second and third steps would explore further for better understanding and interpreting of second and third research questions.

- ***Sorting***

Data collected was organised for three purposes according to research questions.

Firstly, the data collected through documents, interviews, and observations and directly related with EMA performance was identified for revealing the level of EMA adoption and implementation. It included figures, records, relevant norms and reports, and descriptions.

Then this relevant data was sorted according to EMA principles for appraisal of environmental performance. Since relevant staff lacked of knowledge of EMA, the data had to be classified or remedied again into the findings and data analysis. This was not only for displaying the level of environmental performance, but also for locating the facilitators and barriers to EMA adoption and implementation.

Secondly, a great deal of data from interviews, questionnaires, observations, documents, as well as the sorted data from the assessment of EMA information above was used to examine relevant theories based on the literature view. This provided a better understanding of behavioural change in the organisation and was useful in the discussion about future research.

Additionally, relevant information relating to culture, philosophical thinking, and general psychology was introduced and employed for a synthetically comprehensive analysis. It was based on 1) understanding of the macro circumstance of the Chinese environment and of the

company's environment; 2) interpretation of the micro circumstances of individuals impacted by Chinese culture and traditional thinking.

In other words, it reveals how the Chinese context influences individual and the company learning with regard to the use of EMA in practice.

Finally, the data and previous analysis provides a conclusion for the company for better EMA performance and adoption in the future.

However, the first case of Longmen Ancient Town was not discussed in terms of EMA implementation and behavioural changes, since it had provided very little data relating to EMA identified through data. Although some of data was still employed as an example of Chinese culture living in society, the analysis was not used to directly refer to the research questions.

- ***Weakness of data***

The weaknesses of the data had been noticed from the early stage to the end of the project. These weaknesses related to incompleteness and inaccuracy which are unlikely to be solved through better design of collection methods. Hence, it is necessary to highlight them for the foundation of information.

Although the problem of incomplete and inaccurate data often happened in the research; these two problems relate to some interesting issues that could reflect on part of the circumstances of this study and study's objects.

First, incomplete data is caused by informal visits through "Guanxi". As mentioned previously, access to the companies mainly relies on my personal links. Although the "key person" who led me into "spots" might be personally interested in the topic of this study, it is still the fact that they fairly put "trust" on me. It means that they needed to use their personal links, and informal contacts to introduce me to the objects of interviews and questionnaires.

Whether or not the effective data was available was partly decided by the "key person". For instance, "first key person" in LMT was moderately influential in the local society, however, it is possible not to so influential in the company. The data collected was much more limited than the data in OSR. In contrast, "second key person" in OSR was moderately influential, and it directly helped to break through some boundaries into various departments and individuals. The data from OSR hence is more sufficient than in LMT.

However, the problem still existed even in OSR where the collection required more detailed and depth-in information. This relates again to the issue of "trust". How much "trust" would people be prepared to invest in the researcher, who it is often regarded as possibly risky?

However it does not mean that a formal visits or study would entirely solve the problems. It might help to open the door to the checking of more official documents and departments, but it might encounter another issue when dealing with depth-in interviews since formal or official trust could be a constraint for them to tell the truth.

Second, the purpose leads to inaccuracy. The problem of inaccuracy was soon found after the first stage of data sorting until the end. It did not surprised me due to the "reality" I perceived during the study.

Those data related environmental costs are mainly for persuading further investment on the projects or summarising achievements to their top leaders. It was not for continual appraisal of environmental performance. Therefore the data or figures displayed discrepancies. In occasion, adjusted data was provided in OSR, and I believe that it could occur in various domains in China as well.

In addition, information collected could be subjective. People tended to only show positive attitudes which required me to set more security during the conversations, not only an observer. Also, there was a need to educate on the concepts of certain words especially when the interviews were carried on, for example, EMA, Sustainability, and Corporate Responsibility. This might have distorted their subjective cognitions or beliefs, which an observer needs to avoid.

Finally, lack of professional guidelines and norms is not beneficial for better data disclosure. Wu and Tang (2012) concluded that poor data disclosure could be caused by lack of professional guideline and norms, as well as lack of effective third party supervision. This issue will be discussed later in more detail.

5.2 Cases Setting

5.2.1 Brief Introduction to Ocean Spring Resort (OSR)

The Ocean Spring Resort (OSR) was founded in 2002, as a resort destination opening in 2006. It belongs to one of the biggest tourism group "China Travel Service (Holidays) Hong Kong

Limited (CTSHK)". The whole Resort covers an area of 5.1 Square kilometres, with an initial investment of 2.5 billion RMB. The second investment collaborating with EVERGRANDE GROUP started in 2014. Currently there are about 1,900 employees.

OSR is located on the West seashore of Zhuhai city, Guangdong Province, and wasteland and some sugarcane land was altered for the use of OSR from 2002 when the construction project of OSR was embarked on. Apart from the rare ocean spring as the core product, customers who come to OSR can be entertained with different activities in theatre, playground, health club, and sports club; in future there will be a golf club and camping site in its second investment construction. OSR provides accommodation and catering, by running two five-star hotels, one hostel, and several restaurants and bars. As a different use, OSR is also a MICE destination (Meetings, Incentives, Conventions and Exhibitions) with the most comprehensive facilities in China. It is well-known in MICE markets today (CTSHK 2013).

The company divides its business into five centres as subordinate departments:

1. Hotel Centre: Main hotel 57,028M ², Meeting Hotel 49,642M ²
2. Spring Centre: 15,104M ²
3. Entertainment Centre: Restaurants and bars 4,000M ², theatre, health club, sports club.
4. Park (play ground)
5. Corporate Headquarter (Administration building, living apartments and house, hostel etc.)

Since Opening, OSR has been rewarded by different authorities according to its outstanding performance. For instance, the first "National Demonstration Base of Vocational Tourism" in China by China National Tourism Administration (CNTA) in 2007 (CTS management 2013), which is the only national reward to a resort destination so far by CNTA. In 2011, it was rewarded as "Zhuhai City Harmonious Corporation of Good Relations of Labour" by Zhuhai City that is to praise humanistic concern, the improvement of working environments, and so on (CTS-2 2016,). In fact, rewards have covered various aspects, showing its good reputation among governments, associations, customers and employees.

Moreover, another outstanding feature of the company is its good environmental performance. It is often regarded as an example to be shared with the peers. The total investment on this performance improvement has been more than 20 Million RMB, and it has received in total more than 4 Million RMB in awards, and more than 1 Million RMB reduction and exemption of relevant taxes or charges (evidenced from internal documents).

Additionally, a team for Energy Saving and Emission Reduction (ESER) was set up in 2007

under the engineering department. As one of several special groups including a team of Service Quality Management, a team of Marketing and Sales, ESER also directly reports to top management as well as its own department leaders.

5.2.2 Brief Introduction to Longmen Ancient Town Tourism Development Ltd. (LATTD)

Longmen Ancient Town (LAT) as a unique tourism destination is managed by Longmen Ancient Town Tourism Development Ltd. (LATTD). The company was funded and controlled by the Tourist Administration of Zhejiang province at the beginning. However, it was later transferred to the local government of Fuyang city, which belongs to Zhuhai, the second biggest city of Zhejiang province. Some private investment has also been involved in the company. The governor of the company is actually one of leaders of local government. It means that the company is not only a state-owned company, but also directly managed by officials.

As the main product is the destination, Longmen Ancient Town itself is unique. The ancient architectural complex covers 2 square kilometres; and the whole town with Longmen Mountain is in total about 18 Square kilometres. The ancient buildings are regarded as the best persevered ancient architecture of the Ming and Qing Dynasties South of the Yangtze River in China. The ancient buildings are also located behind the Mountain of Longmen. All have constructed a unique combination of antique and natural landscape. Additionally, this ancient town is not an empty building complex, with up to 7,000 local residents living therein.

Local residence is unique in modern China. 90% of the total residents have the same family name, SUN. Children are told by their parents that they all are descendants of a historical person called “SUN Quan”, who was a famous local leader and sovereign of a large area around AD 200, 2 thousands years ago. The whole “families” and “buildings” are well preserved. It’s all very attractive for visitors to experience this living humanistic and historical culture, together with ancient architecture.

However, because the strong character as sampled is very unique and attractive it also maintains strong self-regulation that becomes a constraint to new things including EMA implementation. Without this strong self-regulation, this current structure would have collapsed many years ago.

As it was mentioned in Data Targeting, this is the first case where I carried out a field study; however, data was too weak to support the research question for revealing intrinsic sustainable development by employing EMA as tool. Both the company of LATTD and the town of LAT

showed little environmental concern. It was not surprising especially when ST was explained to interpret its failure. Therefore, this case will not be used to examine EMA implementation, but to supply its unique context contributing to the analysis of EMA implementation in OSR.

5.3 Discussion of Data Collection and Analysis

Case studies require various methods of data collection. Pettigrew (1990, p 277) presented data collection as an iterative process in which "… one observes, follows themes and trails, identifies patterns, have those patterns disconfirmed or verified by further data, and the process moves on." Yin (2003), following Pettigrew (1990) and Patton (2002), suggests six sources of evidence for case study research which are classified into the four broad categories of documents, interviews, observations, and questionnaires. The data collection undertaken in this study is described below in accordance with these four broad categories.

- ***Documents***

Collecting secondary documents from other researchers, journals and subject companies was the first step taken to acquire data. This provided a general view of the companies and their operating contexts. It identified the types of organisations and helped to select the case study companies.

Such documents "represent a particularly valuable data source in organisation research because they provide a glimpse of activities and moments in time not immediately accessible to the researcher." (Patton 2002, p 293). Yin (2003) points out that the documents could be have been selectively deposited and saved since the author of the documents may have had own agendas and interests. Nonetheless, Yin (2003, p 86) also argues that "the advantage of this type of data are that they are stable, unobtrusive, exact, and can include coverage of many events, many settings, and a long time span."

Documents collected help to piece together the descriptive, chronological picture of a business or a process. This provided an essential context for directing subsequent interviews and observations.

- ***Interviews***

Interviews as a technique tool provided a level of depth and subtlety not available from other data sources. They can also yield new knowledge that transcends the experience of any one individual (Pettigrew 1990). Semi-structured interviews with a specific focus provided insights into

perceived causal interventions (Yin 2003).

However as Easterby-Smith *et al*. (1991, p 79) argued, there is a need to develop "a topic guide" that lists important areas and allows significant latitude "to follow interesting lines of inquiry and facilitate an unbroken discussion". In this study, "this topic guide" is effectively another output of the scoping phase.

Additionally, semi-structured interviews were used for learning how events are interpreted by their participants and especially for describing processes of change (Weiss 1994). They helped to study the changes relating to EMA implementation within the companies and to reveal the changes in relationships between the human agents and existing structures. They also helped to explain and interpret the stakeholder questionnaires and to provide a degree of consistency in the study.

Participants to the interviews were be mainly inside users in functional management such as finance manager, production manager, marketing or sales manager; in technical use level such as relevant engineering, accountant; and in general management level such as strategy development manager, general manager or director and so on. The broader participants of outside companies will be temporarily set as a flexible option relying on the needs identified from first round of interviews.

To improve the quality of the interviews, this study paid careful attention to account for factors that would affect the reliability of interviewing. These factors include questions design, communication skills, time and place of interviews, approach to the interviewees, ways of recording interviews and ways of preparing transcripts.

- ***Observations***

Observations made during the study were informal and served primarily to supplement the main data sources of documents and interviews (Robson 2002). Participant observation with its roots in social anthropology is encouraged by the Chicago School of Social Research for observing the constantly changing social phenomena (Saunders *et al*. 2003).

Furthermore, Delbridge and Kirkpatrick (1994, p 39) state that "in the social sciences we cannot hope to adequately explain the behaviour of social actors unless we at least try to understand their meanings." Therefore, the role of a "participant observer" was used in this research to "discover those delicate nuances of meaning" (Saunders *et al.* 2003, p222). This stance contributes to the quest for understanding and, more importantly, with regard to participants to "try to get to the

bottom of the process by which the individual constantly constructs and reconstruct his or her identity." (Delbridge & Kirkpatrick 1994, p 37).

Gill and Johnson (1997) develop four types of roles for "participant observations" which are fixed by the extent a researcher is involved in such as including complete participant, complete observer, observer as participant and participant as observer. Saunders *et al.* (2003) also illustrates five factors that will determine the choice of these roles which involves in the purpose of research, the timing of the study, the degree to which a researcher feels suited to participant observation, access issues and ethical considerations. Hence in this study, the researcher was revealed to the participants and took an advisory role part in some aspects of EMA implementation. This role did not set up a "real" life situation comparable to those that the participants experience in everyday working, and also the researcher was not able to be involved in all relevant activities in order to discover attitudes and approaches to the activities. But this role did have an advantage in that it improved participant's understanding and contributions (Saunders *et al.* 2003) as well as helping to elucidate key information since that they "are likely to adopt a perspective of analytic reflection on the processes in which they are involved." (Robson 2002, p 317).

However, there were some potential problems unforeseen for this research observation process. For example, it consumes much time; the validation of information partly relies on the researcher's personal skills; and its reliability can be limited by personal perspectives. (Saunders *et al*. 2003).

- ***Questionnaires***

The questionnaire was linked with the other methods in a multi-method approach in this study for improved descriptive and explanatory research (Saunders *et al.* 2003). In this study, the questionnaire as a supplementary method will only be used in the scoping stage for 1) a wide view on general background, attitude and relevant knowledge; 2) selecting the more suitable companies as samples; 3) context study on external EMA users.

Although the small size of questionnaires in 18 companies is not enough for higher reliability and validity, it could still be maximised by questionnaire techniques such as the careful design of individual questions, clear layout of the form, and lucid explanation of the purpose of the questionnaire, etc., according to Saunders et al (2003).

- ***Data Analysis***

Qualitative data is the main source of data in this study. Saunders *et al.* (2003, p 378) concluded

that: “qualitative data is based on meanings expressed through words, this collection results in non-standardised data requiring classification into categories, and analysis conducted through the use of conceptualisation.” The data categories used in this study follow Tesch (1990) and these are:

- ✓ Understanding the characteristics of language;
- ✓ Discovering regularities;
- ✓ Comprehending the meaning of text of action; and
- ✓ Reflection.

For this study, the second two above categories contain the main strategies. Furthermore following Saunders *et al.* (2003, p 380), this study’s analytic strategies were guided to “commence inductively, without predetermined, or a priori, categories and codes to direct your analysis”. In other words, this study’s analysis is more “interpretive” than “procedural”, “less structured” than “structured”. This is the most appropriate approach for uncovering the changes incurred in the companies by the EMA implementation process as well as its impacts in wider contexts.

Saunders *et al.* (2003, p 378) emphasised that “the non-standardised and complex nature of the data collected will need to be classified into categories before they can be meaningfully analysed, otherwise the most that may result may be an impressionistic view of what they mean”. Yin (2003) also argued that “the analysis of qualitative data involves a demanding process and should not be seen as an easy option, which especially refers to those who leave the data that they have collected unanalysed of periods of time because of their uncertainty about the analytical process required.” (in Saunders *et al.* 2003, p 379). Hence to ensure quality in data analysis, this study took four steps during the process of transforming the data into information (Saunders *et al.* 2003, p 380):

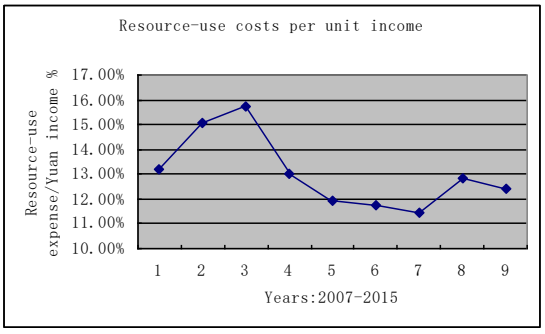
- ✓ Categorisation;
- ✓ Unitising data;
- ✓ Recognising relationships and developing analytical categories; and
- ✓ Developing and testing hypotheses to reach conclusions.

Part Six: Findings, analysis and discussion of EMA implementation

The tourism industry does not usually produce much waste and pollution when compared with manufacturing industries. In OSR, the cost of resource (energy and water) consumption is one of three main costs of the company, which the company tries to cut down. The average cost of that is roughly 13% of total income according to internal documents.

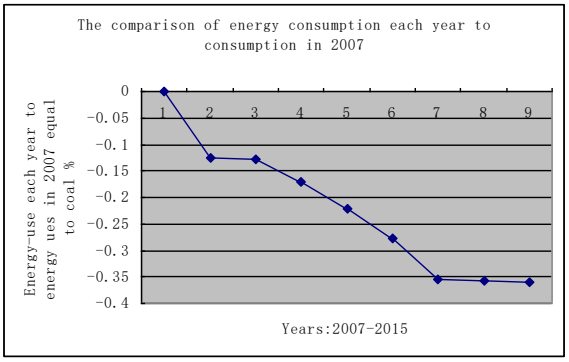
The company hence set up a team of Energy Saving and Emission Reduction (ESER) in 2006 for saving resource costs. It consists of two full-time staff and other managers from different departments all over the company, and a series of technological innovation and reconstruction projects were carried afterwards. The accumulative total investment of these projects has been more than 23 Million RMB, including 16 Million RMB on Heating exchange project, 5.62 Million RMB on air-conditional system innovation project, and 1.86 RMB on Gas station project (Tan 2011; Zeng 2014; internal documents), etc.

Chart 1: Efficiency of Resource-use Expenditure per Unit Income (the figures are calculated from chart 17 and 18)



Data collected from OSR has showed that the main purpose of ESER is to save energy costs rather than to reduce energy uses. However ESER efforts are significant. Water and energy costs per unit income was lowered from 16% in 2009 to 11% in 2013 (Chart 1), and subsequently the consumption of energy (excluding water) compared with 2007 was reduced by 14% in 2009 and by 35% in 2013 (Chart 2).

Chart 2: The Comparison of Energy Consumption (the figures are calculated from chart12)



As we could seen both from Chart 1 and 2, there is a steep drop at the period of 2010-2012, which I call it as “change time”. During the time, ESER kicks off the solution with intensive reconstruction and innovative projects for energy saving; it dramatically makes changes to environmental impacts

and costs. This three-year period in fact made OSR become a well-known environmental friendly company in the locality and even in Guangdong province as a whole.

What and why the change of better environmental performance happened that then become a core question for examine EMA adoption and implementation. Therefore, this part mainly focuses on environmental performance by utilising EMA as a tool to expose the "changes".

Two groups' detailed information will be displayed for the "changes" at this certain period and trends separately based on EMA principle. The data will be analysed ⅰ) to compare the changes in environmental performance ⅱ) to discover the trends in environmental impacts and costs through environmental management accounting.

Since the key issue of this thesis is around the change, the change time has been explored in first this part. EMA is then employed to reveal environmental improvements in each five innovative project and the trends of environmental performance over time. By doing so, the reality of EMA adoption and implementation within OSR would be exposed.

Therefore, this section below is divided into three parts: 1) environmental costs related information including physical flow and monetary flow, and then to discuss the trends of environmental performance over time from 2007 to 2015; 2) evaluating performance improvements by calculating eco-efficiency indicators based on data collecting and reporting; 3) discussing the key barrier of EMA implementing in terms of data disclosure.

Next, the study will focus on why and how the change happened in order to understand the reasons underlying this "Change" for achieving continual growth and development. The aims of analysis will then look beyond eco-efficiency EMA, and try to interpret the "change" based on the Chinese context in OSR.

Subsequently the changes and trends will be discussed not only with a viewpoint of management accounting but also with some thinking on sustainability, and its motivation, as well as the complexity beyond the changes. In other words, the study not only aims at providing a picture of sustainability through EMA tools. It is also about intrinsic level of sustainable development, which is trying to deliver more value and meaning while using less resource.

6.1 Environmental costs related information during 2007-2015.

6.1.1 "Change time": five environmental projects during 2010-2012

During 2010-2012 "change time", there were five projects related environmental performance innovation was carried out by ESER, which were listed blow in Graph 1. Apart from Sewage Treatment Station, each project had a particular purpose for saving the use of energy including electricity, fossil gas, and diesel. This analysis will bring more details of 5 projects during "Change time" to go through their performance and effects consequently.

Graph 1: The five Main Projects of Environmental Performance 2010-2012

Projects	Objects of saving	Innovation Projects	Content	Period of construction process	Performance Starting
A	**Diesel& Electricity**	**2#Heat-exchange Station**	Furnace innovation: Water source heat pump + Heat reclamation device(2 patents) improvement of energy efficiency	May to September 2010	October, 2010
		1#Heat-exchange Station	Changed diesel use to electricity use for Water source heat pump and Heat reclamation device	March-June 2011	June, 2011
		Air-controller System Innovation	Centralised to localised for reducing loss of heat from long distance pipe	October 2011 to May 2012	June, 2012
		Dynamic Control System	Connection of 2 heat-exchange stations and Air-controller system for mutual transformation	August 2011 to Oct 2012	June, 2012
B	**Gas& Electricity**	**Change to Tank gas**	Construction of Tank gas station :bottled gas to Tank gas for reducing waste and improving	March-June 2012	July, 2012
		Kitchen Utensils Upgrade	Diesel consumed to Gas (more effectiveness);energy-conserving Utensils	May-June 2010	
C	**Waste Water& Emission**	**Sewage treatment Station**	Reclamation water to watering and road clean	May-Dec 2005	2010 Re-evaluated
D	**Electricity**	**Dormitory Building Solar Heating**	10# Solar heating Other 9 buildings partly innovated	February 2010 2012	March 2010 November 2012
E	**Electricity**	**Streetlight and Lighting System**	Upgrade Lighting to LED; Redesign Lighting system for landscape sight	Feb 2011 to Dec 2014	

6.1.1.1 Project A: for diesel and electricity

This project comprised technological innovation of heating exchange, air-conditioner system upgrading, and dynamic control system. It was the largest investment of more than 20 Million RMB since OSR opened in 2006. It has entirely altered the efficiency of the use of diesel and electricity.

As a tourism company, it supplies various services for customers. One of the main materials for providing service was the source of "Heat" for hot water, heating in rooms, laundry, kitchen, etc. another was the source of "Cold" for cooling down. This project therefore was designed for three things: 1) Changing the way to producing "heat" from furnace burning by using diesel to reclaim

heat from sea water by the device that has been granted two patents; 2) connecting heating pump and air-conditioner system to exchange their "hot" and "cold" by a dynamic control system, their by-output would be interdependently used after the heating pump produces "heat" and air-conditioner produces "cold"; 3) localising the air-conditioning system for avoiding loss of heat or cold through piping.

The innovative transformation of Heat Exchange was to abandon the use of diesel as furnace's power. Instead, a heating pump powered by electricity extracting "Heat" from sea water drives running of the furnace since the company is located at the seashore. Water could be heated up for living use in OSR (excluding Laundry Room and dormitory). Later it was connected with air-conditioner system to reclaim the by-output of "heat" and "cold" as inter-supplement of energy sources.

This solution was not only to interdependently use the source of "heat" and "cold", but also to improve heat utilisation efficiency since the heat efficiency of diesel is relatively lower than electricity. As a result of innovation, the use of diesel and electricity had been dramatically improved in the terms of the efficiency and effectiveness.

Chart 3: the Comparisons of Consumption and Expenditure of Diesel and Electricity in the 4th Quarter between 2009 and 2010.

Physical Information	**In a quarter**	**2009**	**2010**	**Comparisons**	
Consumption		**4th quarter**	**4th quarter**	**amount**	**percentage**
Diesel	For furnace (Ton)	646	397	-249	-39%
	Equal to coal(Ton)	**941**	**578**	**-363**	**-39%**
Electricity	For furnace (Kwh)	60,000	31,100	-28,900	**-48%**
	For air-conditioner system (Kwh)	1,020,000	835,100	-184,900	-18%
	Total electricity (Kwh)	1,080,000	866,200	-213,800	-20%
	Electricity in total equal to coal(Ton)	**378**	**303**	**-75**	**-20%**
Total	**Equal to coal (Ton)**	**1,319**	**882**	**-438**	**-33%**
Monetary Information		**2009**	**2010**	**Comparisons**	
Expenditure	**(Yuan)**	**4th quarter**	**4th quarter**	**amount**	**percentage**
Diesel	For furnace	6,153,191	3,781,450	-2,371,741	-39%
Electricity	For furnace	58,800	30,478	-28,322	-48%
	For Air-conditioner	999,600	818,398	-181,202	-18%
Total	**(Yuan)**	**7,211,591**	**4,630,326**	**-2,581,265**	**-36%**

As the first project of the serials on 2# heat exchange station starts to run from October 2010, the consumption and expenditure of diesel and electricity in the last quarter in 2010 turned down by 33% and 36% respectively comparing to the last quarter in 2009. The information categorised

has been calculated and listed in chart 3. The total consumption of energy was converted to amount of coal for calculated convenience according to "The coefficient of energy resources equalled to coal" available in Annex 8.

The drop of energy consumption for furnace was 39% of diesel use and 48% of electricity use respectively, greater than 33% of total decreasing, as similar as the figure in the category of energy expenditure in Chart 3.

Besides, it is important to evaluate its efficiency since energy use would be influenced by quantity of customers and services according to ESCAP 2009. The Chart 4 below, hence, is made for showing the efficiency indicators of energy use.

Regarding with the amount of customers and incomes in the 4th quarter between 2009 and 2010, the income of one Yuan RMB expense on energy use of 2# heat exchange in the 4th quarter of 2010 increases 80% comparing to 2009, in the meanwhile, the consumption of energy of 2# heat exchange (equal to coal) for providing service to one person/time decreases 35% as showed in Chart 4.

Chart 4: the Comparisons of Efficiency of the Use of Diesel and Electricity in the 4th Quarter between 2009 and 2010.

Efficiency Indicators		**2009**	**2010**	**Comparisons**	
Efficiency		**4th quarter**	**4th quarter**	**amount**	**percentage**
Customers	(Person-time)	187,800	192,768	4,968	3%
Average income	(Yuan/quarter)	69,582,500	80,388,500	10,806,000	16%
Income/ energy expenditure	**(Yuan/yuan)**	**10**	**17**	**8**	**80%**
Consumption/ person-time	**(Kg coal /person-time)**	**7**	**5**	**-2**	**-35%**

As a result of technological innovation in 2010, the cost of hot water used to be produced by furnace burning that has cut down from 42.8 to 13.5 Yuan/ton as below in Chart 5.

Chart 5: The Comparison of the Use of Diesel and Electricity for Heating Water from 15-55℃/ton

Efficiency of Furnace Producing of Hot water					
	(Hot water from 15-55℃/ton)	**2009**	**2010**	**Comparisons**	
		4th quarter	**4th quarter**	**amount**	**percentage**
Diesel	Diesel/hot water (kg/per ton)	5.12			
	Unite price (Yuan/kg Diesel)	8.35			
	Unit price of hot water (Yuan/ ton)	**42.75**			
Electricity	Electricity/hot water (Kwh/ton)		13.80		
	Unit price(Yuan/Kwh Electricity)		0.98		
	Unit price of hot water (Yuan /ton)		**13.52**		
Comparison	**Unit price of hot water (Yuan/ton)**			**-29.23**	**-68%**

To sum up, as the most important innovation project, it efficiently reduced its environmental impact and effectively improved the value of energy use. The notable success in saving energy and costs brought further action on 1 # heat exchange and the whole dynamic control system; as well as positively influencing the top management and encouraging the ESER team according to the interviews during the field study.

6.1.1.2 Project B: for fossil gas and electricity

Project B aimed to change bottled gas to tank gas so as to for reduce energy consumption, as well as avoiding gas waste. Each unit gas consisting in twenty bottled-gases required heat to evaporating for kitchen, and the electricity used to be the source of heat for bottled-gas for daily operation. By contrast, the use of tank-gas did not require any electricity but demanding only free air temperature. On the other hand, bottled-gas easily remains after usage, and the gas in each bottle would be wasted, that is unavoidable.

In the early stage of project B mainly focused on upgrading kitchen utensils around 2010. Later the solution plan of tank-gas was approved and kicked off in 2012. This was the second largest project with the investment of 1.86 Million RMB. A tank-gas station therefore was set up during March to June 2012 for tank trucks loading. The purpose of tank-gas station for saving the use of fossil gas and electricity was achieved. The follow chart 6 demonstrated improving as we could see.

Chart 6: Gas Station Comparison: Innovation before and after in 2012

Physical Information		**2007-2011**	**2012**	**2013**	**2012-2013**	**Comparisons**	
Consumption		**average**	**3rd-4th quarter**	**1st-2nd quarter**	**4 quarters in total**	**amount**	**percentage**
Electricity	(Kwh)	**46,000**	4,700	2,900	7,600	**-38,400**	**-83%**
	Equal to coal(Ton)	**16.10**	1.65	1.02	2.66	**-13.44**	
Fossil Gas	(Ton)	**393**	156	132	288	**-105**	**-27%**
	Equal to coal(Ton)	**674**	267	226	494	**-180**	
Total	**Equal to coal (Ton)**	**690**	**269**	**227**	**496**	**-193**	**-28%**
Monetary Information		**2007-2011**	**2012**	**2013**	**2012-2013**	**Comparisons**	
Expenditure	**(Thousand Yuan)**	**average**	**3rd-4th quarter**	**1st-2nd quarter**	**4 quarters in total**	**amount**	**percentage**
Unit Price	Bottled (Yuan/Ton)	**6,558**	7,680	7,782			
	Tank(Yuan/Ton)	**none**	7,205	6,797			
Fossil Gas		**2,577**	1,124	897	2,021	**-556**	**-22%**
Electricity		**45.08**	4.61	2.84	7.45	**-37.63**	**-83%**
Total	**(Thousand Yuan)**	**2,622**	**1,129**	**900**	**2,029**	**-594**	**-23%**

The figures are categorised to compare the performances between the first twelve months and the

average of 2007-2011. As expected, the consumption of electricity dramatically turned down. Total energy consumption (equal to coal) was reduced 28% comparing with average consumption of bottled gas used during 2007-2011, and total expense of energy was reduced by 23% compared with the average.

Furthermore, although the kitchen utensils were changed to be more energy friendly in 2010, it is difficult to tell the result of effects since there is not a record of their physical flow afterwards for examining the "change". The decision of investment on Gas station was mainly encouraged by the positive result of project A according to the interview of field study.

6.1.1.3 Project C: for water waste

Project C does not seem to involve in any change in terms of reforming, but it influences relevant environmental cost in the way of changing appraisal method.

A sewage treatment station with four full sets equipment was set up since OSR started in 2006. It could deal with sewage 3770 ton per day according to internal documents. However it was not accounted for by OSR or the Local authority.

In 2010, the performance of Waste water and air Emission (W&E) was re-evaluated by the local authority. The charge for sewage treatment by water supplier is exempted, and the charge for sewage disposal and air emission is remissive granted by local environmental agency as the result. It reduced the W&E cost by 91% in 2010 comparing with the average even without any change of performance as showed in Chart 7. In terms of Air emission which declined by 20%, however it was mainly caused by the way of appraisal according to monthly records.

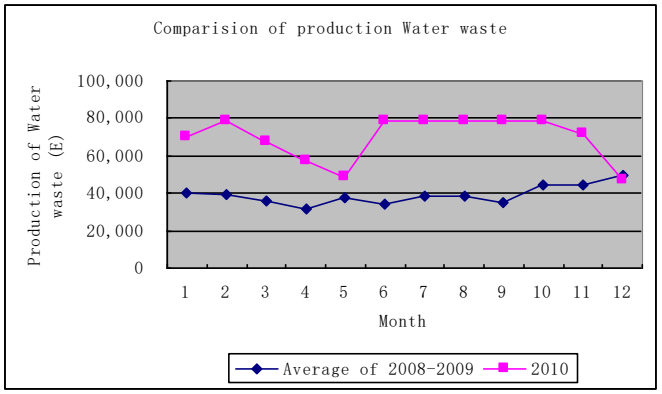
Chart 7: Water waste and Air emission- Physical and Monetary Information during 2008-2010

	Item	2008	2009	2008-2009 Average	2010	Comparison
Water Waste	Charge of sewage disposal (Yuan)	683,574	636,977	660,276	50,774	**-92.31%**
	Output of sewage (E)	488,268	454,984	471,626	834,835	**77.01%**
Air Emission	Charge (Yuan)	8,532	8,532	8,532	6,799	**-20.31%**
	Output of emission(M^3)	41,988,384	41,988,384	41,988,384	39,435,792	**-6.08%**
Noise		0	0		0	
Solid Waste						
Hazard Waste						
Total	**Charge (Yuan)**	**692,106**	**645,509**	**668,808**	**57,573**	**-91.39%**

However, what is interesting in Chart 7 is that there was a dramatic rise of 77% in term of output

sewage in 2010, whilst the charge of water waste had a fall of 92%. Seeking the detailed data in each month during 2008-2010, the comparison of water waste output between 2010 and average of 2008-2009 is illustrated in Chart 7.1. It can be seen that there was a general rise in 2010 compared with the past. Relevant staff interviewed was asked for the reason but could offer no likely explanation, except for the change in the method of appraisal.

Chart 7.1: The Comparison of Output of Water Waste between 2010 and Average of 2008-2009



The similar result can be found through efficiency indicators of water waste in Chart 8 below. The red figure has made it clear. The cost of water waste went down from 2.29 to 0.16 Yuan per every Thousand Yuan income; on the contrary, the output of water waste went up from 1.63 to 2.6 equivalents per every Thousand Yuan income.

Chart 8: Water Waste and Air Emission-Efficiency Indicators

Item	Month	2008	2009	2010
Water Waste	Expense/income (Yuan/Thousand Yuan)	2.15	2.29	**0.16**
	Output amount /income (E/Thousand Yuan)	1.54	1.63	**2.60**
Air Emission	Expense/income (Yuan/Thousand Yuan)	0.027	0.031	0.021
	Output amount/income (M ?Thousand Yuan)	7.57	6.63	8.15
Total Income	**Thousand Yuan**	**318,007**	**278,330**	**321,554**

The improvement in environmental performance appears to be more because of cost reduction rather than environmental impact reduction; or the reduced cost attracted management attentions, so hiding the fact that the amount of water waste had been going up. However more detailed data is lacking.

Furthermore, the sewage disposal purified by the sewage treatment station is reused to watering and road clean. The daily treatment of 2000 ton is still far less than the capacity of 3500 ton. However, there is not a record for tracing the use of reclaimed water.

6.1.1.4 Project D: for electricity

Project D aims at utilising solar power instead of mains electricity for hot water in the dormitory. With the large number of 3000 employee and long distance from city centre, OSR sets up seventy buildings as dormitory, each of which contains up to 500 people. All employees except those local residents are arranged into dormitory as part of welfare provided by the company.

The demand for energy for seventeen dormitory buildings' therefore is massive. According to the design of ESER, one of dormitories numbered 10# was transformed to solar power from March 2010. The remainders were partly modified by the end of 2012. After reconstruction of building 10# , it could use only solar power when the weather was good, otherwise it could transfer to heating pump or solar power plus heating pump in a total of three choices; whilst, the others still only use heating pump.

The following analysis is two comparisons of 10# with one of the other buildings 13# that only uses heating pump. These two buildings have similar capacity of receiving guests, 10# with 465 people in 100 rooms and 13# with 500 people in 97 rooms.

Chart 9: The Comparison of Electricity Use in June 2010 and 2011 between 10# and 13#

Buildings		**10#**		**13#**		**Comparisons in June**	
Operating Powers (Days)	Solar power+ heating pump	9		0			
	Solar power	**14**		0			
	Heating Pump	7		31			
Rooms & guests		100	465 people	97	500 people		
						10#&13#	**10#&13#**
Physical Information	**Consumption**	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
Hot water	Ton	240	392	274	407	-12%	-4%
	Ton/person	0.52	0.84	0.55	0.81	**-6%**	**4%**
Electricity	Kwh	2160	1736	4714	4650	-54%	-63%
	Kwh/person	4.65	3.73	9.43	9.30	-51%	-60%
Monetary Information	**Expenditure**						
Water	Yuan	600	980	685	1,018	-12%	**-4%**
Electricity	Yuan	2,117	1,701	4,620	4,557	-54%	-63%
Efficiency Indicator							
Hot water	Yuan/person	5.84	5.77	10.61	11.15	-45%	-48%
	Yuan/Ton	11.32	6.84	19.36	13.70	**-42%**	**-50%**
Electricity	Kwh/Ton	9.00	4.43	17.20	11.43	-48%	-61%

As we could see from chart 9 and chart 10, the building 10# reduced 54% and 63% of electricity by using solar power in two years summer and reduced 17% and 20% in two years winter respectively. Chart 9 for June and Chart10 for December of 2010 and 2011 have illustrated the

comparisons of 10# and 13# in terms of electricity use for hot water in detailed. It would help to understand the improvement under different circumstances since solar power is usually impacted by the weather.

Chart10: The Comparison of Electricity Use in December 2010 and 2011 between 10# and 13#

Buildings		**10#**		**13#**		**Comparison in December**	
Operating Powers (Days)	Solar power+ heating pump	13		0			
	Solar power	**11**		0			
	Heating Pump	7		31			
Rooms & guests		100	465 people	97	500 people		
						10#&13#	**10#&13#**
Physical Information	**Consumption**	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
Hot water	Ton	385	432	448	424	-14%	2%
	Ton/person	0.83	0.93	0.90	0.85	**-8%**	**10%**
Electricity	Kwh	9600	8760	11540	10916	-17%	-20%
	Kwh/person	20.65	18.84	23.08	21.83	-11%	-14%
Monetary Information	**Expenditure**						
Hot Water	Yuan	963	1,080	1,120	1,060	-14%	**2%**
Electricity	Yuan	9,408	8,585	11,309	10,698	-17%	-20%
Efficiency Indicator							
Hot water	Yuan/person	22.30	20.78	24.86	23.52	-10%	-12%
	Yuan/Ton	26.94	22.37	27.74	27.73	**-3%**	**-19%**
Electricity	Kwh/Ton	24.94	20.28	25.76	25.75	-3%	-21%

In summer time of 2010 and 2011, although there was a slight rise of 4% for consumption per person in 2011, the consumption of hot water in 10# both modestly decreased at 12% and 4% comparing with 13#. The costs of hot water per ton comparing with 13# dramatically decreased at 42% in 2010 and 50% in 2011. The efficiency indicators of use of electricity per one ton hot water could present the positive environmental impact that decreased significantly in summer at 48% in 2010 and 61% in 2011 showed in chart 9.

In winter time of 2010 and 2011 in chart 10, the consumption of hot water compared with 13# went down at 8% in 2010, oppositely went up at 10% in 2011. However the cost of hot water per ton turned down at 3% in 2010 and 19% in 2011. It is interesting that the cost of hot water continually fell even though the consumption rose in 2011. Consumed electricity for producing hot water both reduced at 3% in 2010 and 21% in 2011. It also proves that utilising of solar power significantly saves the electricity use, and reduces environmental impact in winter as well.

Moreover, three more things are worth saying. First, the efficiency differences between summer and winter could be seen through two charts. The efficiency of this project is more significant in summer than winter, in terms of both energy saving and environmental cost through the figures.

It can be seen that the efficiency of solar power can be influenced greatly by the local weather.

Second, there was a similar evaluation by ESER in 2012 for preparing the further projects for the rest of the sixteen dormitory buildings. The company later on changed its plan, deciding not to set up solar power for the rest, but instead modifying the system of heating pumps for relatively better performance. It was explained during the interview to a member of ESER that there was an economic difficulty due to loss of profit at that time as well as the relatively better performance that seemingly could be received through upgrading the heating pump system. However continuing records could not be seen through data collection.

Third, there are two rare increasing figures of 10# in 2011 both on the hot water consumption per person at 4% in June and 10% in December. The statistics showed that cost of hot water significantly reduced in 2011, in the contrast, the hot water consumption per person increased. It is questioned again that the purpose of ESER mainly focuses on saving the cost of energy rather than consumption; and also, without a strong, systematic record system and useful environmental management accounting tools, the real situation of increasing consumption could be easily hidden from the figures.

6.1.1.5 Project E: for electricity

The streetlight and lighting system is another project focusing on the electricity use. OSR with 5.1 Square kilometres is full of lamplight and streetlight, which was designed by a French artist when OSR was set up. However it consumed a great deal of electricity for keeping the resort well lit.

The company hence decided to redesign the layout of whole Park in 2011 in order to save electricity use, as well as changing the fluorescent bulbs to LED (light emitting diode) lamps batch by batch. It was finished by 2014. The benefit of this upgraded lighting system is more and more since the price of LED has gone down rapidly. However, there is not any record for the amount of use on lighting. It is difficult to trace the improvement of its performance.

In conclusion, the five projects above has achieved the purpose during the comparison period that saved energy of electricity, diesel and fossil gas, as well as reducing the cost of water waste and emission as summarised in Graph1.1. The reductions in consumption and expense for each were significant, except output of water waste which was increasing and has been discussed in the section about project C. The use of electricity had been reduced enormously in project A, B and D. The use of diesel was cut 39% in project A, and the cost of fossil gas was reduced by

22% through project B. Also the cost of water waste disposal turned down 92% after re-evaluation of project C by cooperating with the local Environmental Protection Agency.

Graph1.1: The Comparison on Reduction of Environmental Performance on Five Main Projects during 2010-2012

	Five Projects	Comparison Periods	Items	Reduction of Objects Electricity	Diesel	Gas	Water waste	Efficiency Unit price
A	**2#Heat-exchange Station** **1#Heat-exchange Station** **Air-controller System** **Control System**	The 4th 2010 and 2009	Consumption Expense	20% 19.80%	39% 39%		(Chart 3)	Cost of hot water/ Ton: **45to 11** (Chart 5)
B	**Change to Tank gas** **Kitchen Utensils Upgrade**	July 2012 to June of 2013 and average 2007- of 2011	Consumption Expense	83% 83%		27% 22%	(Chart 6)	
C	**Sewage treatment Station**	2010 and average of 2008-2009	Output Expense				**-77.01%** 92.31% (Chart 7)	Cost of water waste/1000 Yuan income: **2.29 to 0.16** Output of water waste/1000 Yuan income: **1.63 to 2.6**
D	**Dormitory Building Solar Heating**	10# in 2011and 13# in 2011	Consumption and Expense	63% in June 20% in December			(Chart 9 &10)	Cost of hot water/ton: **50%** (June) **19%** (Dec). Output of electricity **61%** (June) **21%** (Dec).
E	**Streetlight and Lighting System**			None record				Increasing benefit as reducing price of LED

The analysis on the five projects in this section focuses on the period when ESER tried to estimate the result from each projects. The basic data was collected from their reports at that time and from other departments. It had to be organised and sorted according to EMA principles that has been explained in the section of theoretical framework and data collection. However it is not enough to look on the performance only at a point time but also to assess it over time. Therefore the next part will present further details about the trends of their environmental performance.

6.1.2 The trends of environmental performance during 2007-2015.

The definition of EMA contains two types of information according to UNDSD 2001:

> "physical information on the use, flows and destinies of energy, water and materials (including wastes) and, monetary information on environment-related costs, earnings and savings."

Since EMA particularly benefits decision making of internal management with a specific

environmental focus, including environmental purchasing, investment, management, and service design etc., it is indispensable to present simultaneous reductions of costs and environmental impacts via the efficient use of energy, water during operations.

The study for IFAC 2005 also concluded that resource-use could be judged effectively through EMA tools. It "optimizes value generation over the long run, with due regard to the externalities associated with an organisation's activities" (IFAC, p19). The information through EMA tools can bring a clear and long-term picture for decision making without any hidden figures, which is usually unavoidable with conventional accounting.

Full range data collected are the most important as it illustrates the consumption of natural resources. Environmental indicators, present the company's environmental performance in terms of size, output, number of visitors and employees, which is also significant since it allows the company to distinguish the source of changes. It's the foundation of assessment on environmental performance improvement.

However, according to Jasch 2006 both physical and monetary flow information could be on a corporation level or divided for particular purposes according to sites, processes, production and dealing with costs. In other words, without full range recording of material flows, EMA could still be used to display different angles for management decision making.

Therefore, the section below is divided into three parts, (1) physical flow and (2) monetary flow to discuss the trends and efficiency of energy and water usage over time; as well as (3) environmental performance indicators to link environmental performance and economic performance together. Also, the analysis will also discover the weaknesses in data collection in each part.

6.1.2.1 PEPI-Physical Environmental Performance Information

A conventional cost accounting system does not usually record data on material inputs to and from each cost centre. According to IFAC 2005, material inputs are any energy, water or other materials that are put into the company, and outputs are any wastes, emission, products or other materials that exit the company. Input and output of materials are monitored by material flow accounting or material balance as referred to in Annex 7.

In reality, neither the ESER nor the finance team without cognition about EMA was found to be able to collect full range data as a system, including a balance of input and output. Only one

output that could be found from ESER is about waste and emissions shown in Chart 7 of project C. It in fact came out of the record of the fee receipt for water waste and emission for three years. It is unlikely to draw a material balance as input and output aspects. Also all data is not tracked in the same information systems in OSR, it is far more difficult to collect it all since it is regarded as confidential in the company. Hence, the physical information here only refers to input material flow, without a full range with details being shown in Chart 11.

The input data was collected in terms of three types of energy: including electricity, fossil gas, and diesel, as well as usage of water. As a tourism company that is mainly service orientated, there is not any material input for concrete products, rather, only physical materials for operational processes. Energy and water are the most essential resources for daily running in OSR.

There are three types of data in Chart 11. First, the data was collected from the accounting department concerning total usage rather than being detailed for each of item. Second, the data was collected from ESER deals with some details in certain periods of time but without continuing tracing. Third, with regard to the convenience of comparison, the consumptions of each category were calculated into equivalent coal according to "the coefficient of energy equal to coal" in Annex 8.

However there is a great deal of detailed physical information hidden because of the way it is recorded according to Jasch 2006. First, it lacks sub-classification in each category, for example in terms of water usage it lacks a record from the laundry and the seventeen dormitory buildings; in terms of electricity usage it lacks data from the gas station, and so on. It keeps no track of these important resource usages during operating processes based on field study on OSR. This might be caused by different job purposes and tasks from various departments. What is needed is a comprehensively integral and systematic organised whole.

Second, there is a lack of information about loss of resource-use. It seems to be unavoidable in OSR since there is not any the record of output on materials usage as mentioned above. However the losses of resource-use are very often during daily running, for example the bottled gas remnants, the loss of "heat" and "cold" in the heating exchange process, and air conditioner. It is a great pity since it would be a good way to estimate inefficiency or unreasonable design of the production process.

Although project A and B concerned the issue of energy loss and partly solved the relevant problem in terms of the loss of "heat" and "cold", it is not possible to continually trace the record

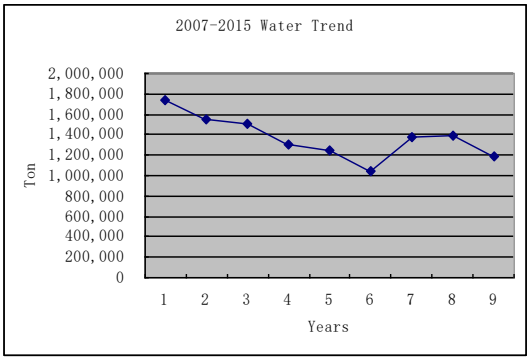
of these two projects both before and after.

Chart 11: PEPI (Physical Environmental Performance Information) of consumption from 2007-2015

PEPI	Inputs **Consumption**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Water (Ton)	Hotels								16,361	27,167
	Hotels Air Conditioner's Cooling Tower							6,605	24,028	26,822
	Heat-exchange							131,022	89,636	111,195
	Total	1,732,400	1,555,100	1,502,885	1,306,426	1,243,700	1,039,636	1,376,547	1,395,800	1,184,500
Electricity (Kwh)	Hotels Air Conditioner					5,141,900	4,771,700	2,994,300	2,976,200	2,969,800
	Hotels Air Conditioner's Cooling Tower							182,630	434,765	433,000
	Heat-exchange							1,756,302	1,441,078	1,374,230
	Furnace					99,000	79,700	75,800	81,300	85,800
	Total	33,575,200	28,273,800	27,758,077	27,266,984	26,753,000	25,579,577	23,510,399	23,442,900	23,597,900
	Equal to coal(T)	**11,751**	**9,896**	**9,715**	**9,543**	**9,364**	**8,953**	**8,229**	**8,205**	**8,259**
Fossil Gas (Ton)	total（M^3）	174,600	150,400	152,220	153,111	172,100	172,774	147,015	143,000	130,100
	Total(Ton)	407	350	355	357	401	403	343	333	303
	Equal to coal(T)	**697**	**601**	**608**	**612**	**687**	**690**	**587**	**571**	**520**
Diesel (Ton)	Furnace			1,922	1,615	1,166	850	621	629	601
	Total	1,800	1,830	1,922	1,615	1,166	850	621	629	601
	Equal to coal(T)	**2,623**	**2,666**	**2,801**	**2,353**	**1,699**	**1,238**	**905**	**917**	**876**
Energy in total	**Equal to coal(T)**	**15,072**	**13,163**	**13,124**	**12,508**	**11,750**	**10,881**	**9,721**	**9,693**	**9,655**

During field study, it has been found that physical flow information could be used to not only show the use of nature resources, but more importantly to effectively illustrate the trends of environmental impact improvement over time. The trends of usage of water, electricity, fossil gas and diesel during 2007-2015 are showed respectively in Chart 12, 13 and 14.

Chart 12: PEPI-the Trend of Water Usage 2007-2015

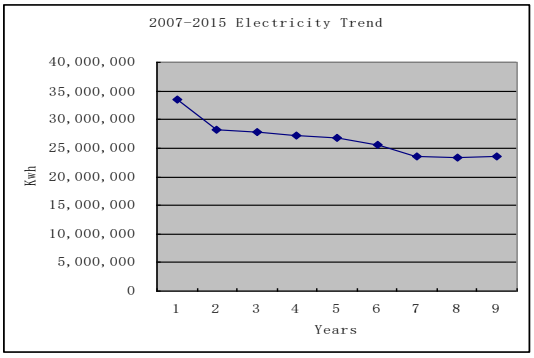


In terms of water usage, there was a trend towards reducing usage in general. The least water usage happened in 2012 at the 6th year of x axis. Combining previous analysis for project C, the output of sewage in 2010 rose by 77% compared with the average for 2008-2009 in Chart 7, whereas the total usage of water gradually fall during "change time" of 2010 to 2012 in Chart 12. There was an apparent discrepancy because water usage and sewage output is more likely to have a strong positive causal relationship due to the simply living use of water in a tourism company.

There is a lack of information about how much water would go with how much output of sewage. What we could probably infer is that: the part of water usage without sewage reduced and with sewage rose dramatically around 2010 to 2012, alternatively, increasing sewage was probably

just caused by hanging the method of appraisal according to an interview as “a recording game” (adjusted data). The interview and data both have made no visible and reasonable explanation on this discrepancy and it is worth exploring more. Overall there could be room to improve performance in terms of water usage.

Chart 13: PEPI-the Trend of Electricity Consumption 2007-2015



Regarding the decreasing line of Chart 13, the use of electricity gradually and continually reduced. It was one of important objects on saving energy-use that had a significant achievement. Four out of five main projects during “Change time” as in the previous discussion aimed at reducing usage of electricity. The trend line also proved this improvement during 2010-2012. After 2013, the decreasing line of electricity went into constant and low level.

It could be concluded that the most efficient use has already been achieved. This is more likely to be supported through field study. Staff interviewed: whether from top management to common workers, from regular staff or part-time have shown strong awareness of saving electricity and how to implement this. Even, it made me feel a bit overloaded since I experienced quite a gloomy environment in the lobby of two five-star hotels that I visited during field study. The was explained by staff for reducing the use of indoor light in order to save electricity, because electricity use was one of the important performance items in competition among different departments in OSR.

However, saving energy is not encouraged where it does not achieve better customer experience. It could break down service values that result in a halt to buy-in continually. It would be better to maintain equilibrium between environmental and economic performance, and to engage in further innovative reforms in terms of electricity use in the company.

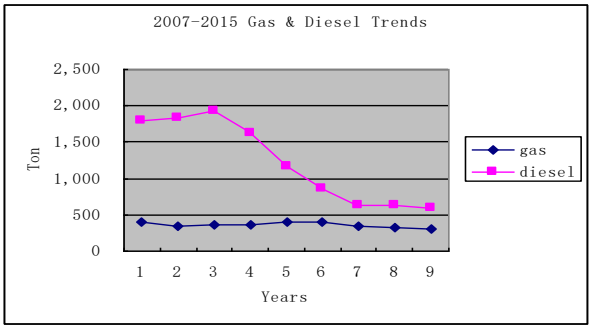


Chart 14: PEPI-the Trends of Fossil Gas and Diesel Consumptions 2007-2015

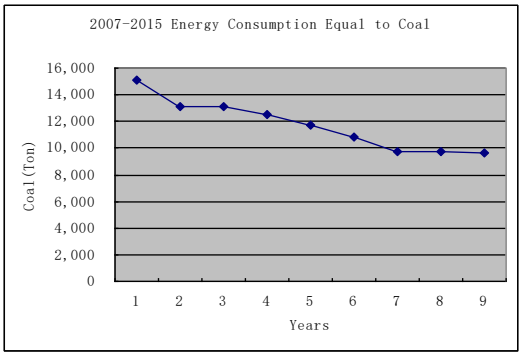
There were two lines in Chart 14. There was a sharp fall of diesel use, and gas use remained at constant level.

In term of fossil gas, project B aimed at

saving energy consumption of both in electricity and fossil gas. The comparison between the average for 2007 to 2010 and July of 2011 to June of 2012 showed the reduction of 27% in gas in Chart 6. However, the reduction of 27% around 2011 to 2012 in fossil gas is not backed up by the PEPI Chart 14 which showed a slight growth around 2011 to 2012. The reason for this discrepancy needs to be explored further and that might initiate further innovation either in the way of recording data or better use of technology.

In terms of diesel use, there was a sharp drop during 2010 to 2012 as shown in Chart 14. This is another major improvement in environmental performance through project A. This two year project during 2010-2012 combining fours steps eventually had a notable success in diesel and electricity saving as shown in Graph 1.1 (see page71). Chart 14 appears to support this finding in terms of diesel usage. It appeared to bottom out afterwards in 2013-15 as can be seen in this chart.

Chart 15: PEPI-the Trend of Energy Consumption in total from 2007-2015



In conclusion, the intended target of OSR to save the cost of energy use can be assessed by the physical accounting above. It included saving electricity use, transferring bottled gas to tank gas, as well as replacing the power from diesel to electricity. These three energy sources are converted into the coal according to "the coefficient of energy sources equal to coal" in Annex 8.

The figure in total clearly illustrates the reduction of energy use (Chart 15). The reduction during "Change time" of 2010-2012 in 4th to 6th years significantly contributed to the positive result. The company successfully made progress in reducing energy-use over nine years. As the result of these five projects, the energy consumption steadily decreased until 2015.

Moreover, another purpose of ESER was to reduce the cost of waste water treatment. It was analysed with project C in the previous section and is listed in the next section with monetary information. The intention was focused on saving treatment costs rather than waste water output. However, there was lack of continual recording of sewage output so that results cannot be assessed. This problem was mentioned in the interviews during the field study. This is another issue that would be worthwhile to be studied by the company for better environmental performance and cost saving.

Furthermore materials purchase costs are one of major cost drivers for OSR as mentioned in the previous section. According to IFAC 2005, collecting accurate physical accounting information underpins EMA and is the foundation of developing environment-related costing. Therefore, the following monetary accounting can be only based on the data collected in this section.

6.1.2.2 MEPI-Monetary Environmental Performance Information

IFAC 2005 makes it clear that environment-related costs are indentified differently depending on the purpose for using the information. As has been discussed, OSR focuses on saving the cost of energy usage and the cost of water waste treatment. The implementation could be assessed through monetary flow to see if it has achieved the target.

Based on EMA in practice studied by the United Nations Division for Sustainable Development, Jasch 2006 set up an EMA cost (Annex 6). The following monetary flow information of OSR was sorted accordingly in Chart 16. However only three out of five categories according to Annex 6 could be identified, and the detailed items are comparatively uncompleted.

A great deal of monetary flow information was impossible to collect. This was due to this information being sensitive in line with OSR's own confidentiality policy. Also, it showed the fact that the ESER team did not incorporate this work into their job tasks. As a result there is less information than there was on physical flows. Monetary flow information requires greater collaboration between departments with certain purposes of decision making.

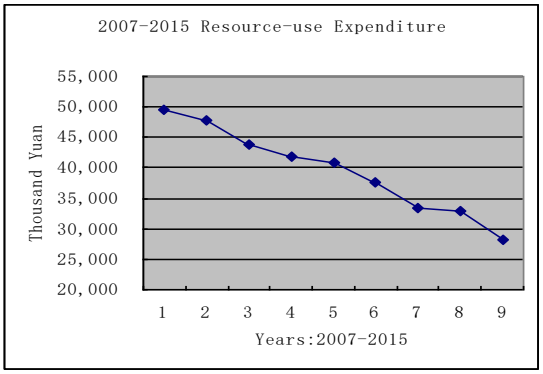
Chart 16: MEPI (Monetary Environmental Performance Information) from 2007-2015

MEPI	**Expense (Thousand Yuan)**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Material Costs of NPO	Water	4,584	4,104	3,943	3,220	2,969	2,494	3,323	3,337	2,825
	Electricity	32,245	28,430	27,138	25,240	24,784	24,862	22,629	22,251	20,628
	Fossil Gas	2,534	2,694	1,783	2,338	3,069	2,926	2,302	2,382	1,365
	Diesel	10,248	12,673	10,970	10,986	10,059	7,236	5,083	4,885	3,439
Materials	Total	49,611	47,901	43,834	41,784	40,881	37,518	33,337	32,855	28,257
The Fee for waste and Emission	Charge of sewage disposal	740	684	637	51					
	Expense of Sewage treatment	416	371	395						
	Charge of Air Emission		8,532	8,532	6,799					
Costs	**In total**	**50,767**	**57,488**	**53,398**	**48,634**	**40,881**	**37,518**	**33,337**	**32,855**	**28,257**
Earnings	**Government awards**					**2,534,100**		**180,000**		

It is impossible to calculate an accurate environmental cost with the incomplete and limited

information in Chart 16. However the available information still can to be used to assess their material purchase costs.

Chart 17: MEPI-The Trend of Materials Expenditure from 2007-2015



The trend of materials expenditure from 2007 to 2015 is demonstrated in Chart 17. It fell persistently from 2007 onwards. In comparison, the reduction in energy consumption (excluding water usage) kept to a constant level without a decline after 2013 as shown in Chart 15.

It would be interesting to explore the possibility of inconsistency between physical consumption and expenditure after 2013. Looking at the trend in consumption (excluding water usage), compared with the trend in expense, this might hint at the possibility of waste from water usage as mentioned before. Also it might give a clue that there could be significant change on unit price of resource. Moreover, it could probably lead to next step of innovation dealing with any inefficient and costly resource use. However there was a lack of enough data to support further exploration in this field study.

Finally, it is not enough to only look at the picture of trends in expenditure and consumption, since it is important and very useful to examine the efficiency and effectiveness related to the quantity of service and income. Environmental Performance Indicators next will be analysed in order to link environmental and economic performance.

6.2 Evaluating performance through Environmental Performance Indicators

EPIs are used to assess and report the materials-related part of an organisation's environmental performance. An organisation could benefit from the estimation of key EPIs without expertise once it was set up. It effectively represents a corporation's environmental performance in terms of its size, output, employees or customers, income. Also, physical and monetary accounting is tied together (IFAC 2005).

In addition, the concept of eco-efficiency is defined by the United Nations: "Eco-efficiency indicator is designed to capture the ecological efficiency of growth by measuring the efficiency of economic activity both in terms of consumption and production (resource-use) and its corresponding environmental impacts" (ESCAP 2009, p3). It provides the following measure of

eco-efficiency:

"Eco-efficiency: $\frac{\text{Environmental cost}}{\text{Economic output}}$ "

Environmental costs above comprises many aspects according to corporation's motivation, such as resource-use, pollution emissions etc. Economic output above contains value added of benefit (income per capital), unit of service and so on. (ESCAP 2009, p3)

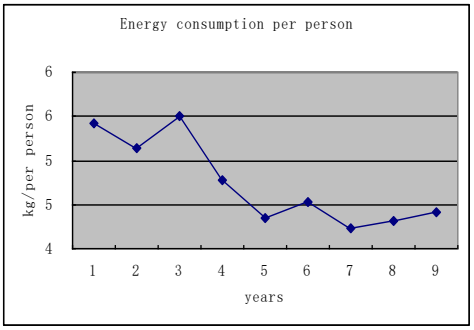
As a business, therefore, OSR has been trying to save resource-use costs by reducing the use of resource. In other words, it places emphasis on creating more income and service using lessresources. Since ESER was set up in 2007, it paid more attention to saving environmental costs and consequently resource consumption decreased as well.

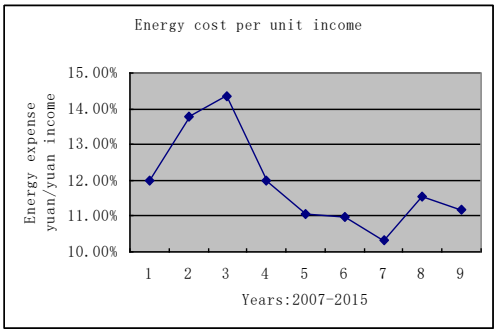
Three groups of EPIs hence are figured out for presenting their environment based on statistic from the previous charts and Chart 18 below, including energy consumption per customer intensity and energy cost as a proportion of income shown in Chart 19, water consumption per customer intensity and water cost as a proportion of income listed in Chart 21, and resource-use cost as a proportion of income calculated in Chart 22.

Chart 18: General Information of OSR from 2007-2015

GENERAL		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Income	Thousand Yuan	375,700	318,007	278,313	321,554	342,800	318,700	291,050	255,700	227,100
Customers	thousand people/time	2,780	2,560	2,382	2,615	2,700	2,400	2,300	2,250	2,190
income per capita	**Yuan /person**	**135**	**124**	**117**	**123**	**127**	**133**	**127**	**114**	**104**

Chart 19.1 EPI: energy consumption per customer during 2007-2015
Chart 19.2 EPI: energy cost per unit income during 2007-2015



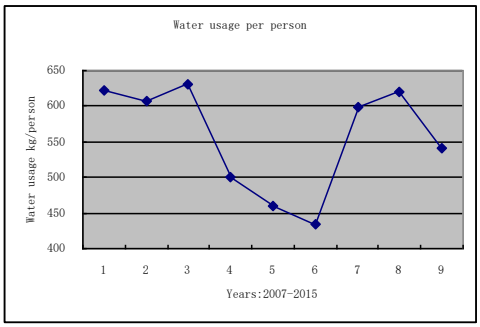


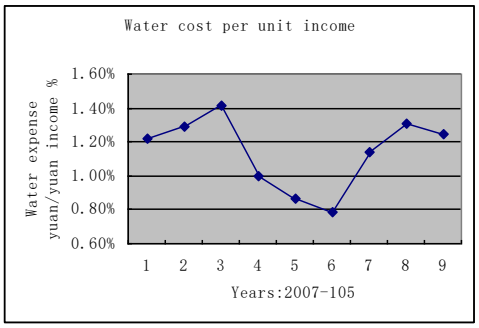
In terms of energy consumption, Chart 19.1 shows the high level of energy use intensity of per

customer from 2007 to 2009, while the percentage of energy cost to income suddenly went up from low level to the highest point in 2009 in Chart 19.2. The decreased income per customer during the same period that can be found in Chart 18 could be the main reason for increased energy cost as a proportion of income. Conversely, during "change time" of 2010-2012, both energy use intensity and energy cost showed sharp falls. In 2013, both of them reached the lowest point at 4.23 kg per customer in consumption and 10.31% in cost percentage respectively in Chart 19. The company achieved its target of saving energy cost and using less energy.

However there was a growth trend in both indicators' groups after 2013 as can be seen in Chart 19. Especially in terms of energy cost in proportion to income, it went up much faster than the consumption growth after 2013 to 2015. This trend could be explained by the decline in income and amount of visitors, as well as the reducing trend of expensing per visitor during the period shown in Chart 18. The showed that there is a high likelihood of having been losing their market share since competitors have emerged rapidly in recent years. The competitors' threat was mentioned several times during interviews especially from top management.

Chart 20.1: EPI: water consumption per person during 2007-2015
Chart 20.2 EPI: water cost per unit income during 2007-2015





In analysing the indicators in terms of water-use, data in Chart 20 shows that both water usage per person and the percentage of water cost relative to income experienced very similar fluctuations. However a project to tackle water usage was not found during the field study, a sharp drop and sudden increase in water intensity and cost proportion during 2010 to 2012 would be questioned. The drop could have resulted from the five innovative projects during "change time", but this was very unlikely. The average low level of water use was not kept from 2013 which meant after "change time" it increased rapidly. It would be interesting to explore further this significant change.

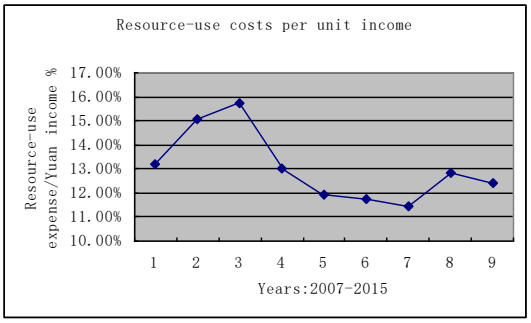
The most inefficiency of 631 kg water usage per person and the highest cost proportion of 1.42% both happened in 2009. This could be explained by the reduction in income and visitors in 2009 that caused more inefficiency and cost. However they were both higher than the worst year in

terms of economic performance in 2015 as shown in Chart 18.

On the contrary, the most efficient year with 433 kg water usage per person and the smallest cost proportion of 0.78% was in 2012 that witnessed similar economic performance to 2008. It certainly would contribute much higher profit fore the company with doing more and using less; however gross profit data was not collected to prove the inference.

Although his study can only give a vague picture of water usage performance based on available data, it is a fact that water usage is not taken account of in any reformed plan on improvement of its performance. Though project C focused on water waste, it was concerned with the decreased costs of water waste treatment rather than recording data to trace physical performance in practice.

Chart 21: EPI: Resource-use Costs (including energy and water) per Unit Income during 2007-2015



Resource-use costs proportion in Chart 21 comprising use of energy and water shows similar fluctuation in energy cost in Chart 19. "Change time" of 2010-2012 cut down cost of resource-use proportion from the average increased level during 2007-2010, and remained at constant low level till 2013, with a gradual rise after 2013.

Generally speaking, the five projects during "change time" significantly influenced the company's environmental performance in terms of saving energy use, and reduced the cost of resource-use proportion. However the gradual increase in intensity of all measures after 2013 might have been caused by factors other than declining economic performance. This needs to be explored further in order to guide the company's performance both in economic and environment aspects. Moreover, it is worth questioning the reasons for the fall and rise of water usage in Chart 20, although it did demonstrate an improvement during 2010-2012.

EMA tools in this case were employed through their data collection. Although it requires more professional skills to sort out data according to EMA principles, their data collected was be able to support the company setting up two flow charts: Monetary information flow and Physical information flow. These flowcharts could reveal more potential improvement areas and contribute to further innovation. However this needs professional accountants and interdepartmental managers involved and trying to set up detailed environmental related cost

accurately.

In addition, EMA performance works in progress because it is in essence a dynamic rather than a statics process. It is important to continually and systemically record and collect data in order to discover the relationship between economic and environmental performance. During the field study, the company with its five projects took the first step towards becoming more environmentally friendly, with the continuing trends of environmental performance analysed in each category that has also illustrated the benefits to economic performance. There is still a big gap to fill by setting up systematic data collection and the comprehensive use of EMA tools.

The following section will discuss the barriers to EMA implementation itself in OSR since EMA is still an undergoing and developing programme in practice. The theoretical review has already shown that EMA implementation in China is generally little in evidence and rarely the subject of research.

Furthermore, from the viewpoint of management, it has been found that EMA is questioned in terms of the top-down benefits of being well controlled and implemented or the basis of new plans. However it could also be seen to be a cause of passivity, lack of creativity, and inefficiency. With regard to competitors increasing, there has seemed to be some waggling around staffs in reality. It could be a barrier for further reformation or implementing action plans during daily life, even for being more sustainable.

6.3 Data disclosure is one of key problems of EMA implementation

In spite of context impacts on EMA implementation, EMA itself is heavily affected by data disclosure that impacts EMA implementation on several issues. These issues are highlighted in this section to identify barriers and challenges of EMA implementation in China because they are the core of EMA problems itself.

Jonall's (2008) work illustrated in Figure 2 (see page 19) show how EMA works as a tool to support decision making. It emphasises information consistency and cost visibility. Jasch (2003, 2006), Envirowise (2004), Jasch and Lavicka (2006) and Gale (2006a) were spontaneously concerned about one of the main problems of EMA costing being inaccuracy. Scholars have pointed out that "cost" is such an important element impacting on EMA implementation.

6.3.1 Data visible

Data visibility was the first challenge during the field study. There are two difficulties with the term of “invisible”. First, this is an “informal collection” access to the company through “a personal link”. Although this case study would be useful for the company, and “key person” who has helped to get access is also quite effective. It could be sensed that data collected was regarded as being somewhat delicate, especially with “figures”; also it was hard to directly get through to the Finance Department to ask for details. This is also a “weakness of data collection” that will be analysed later as well.

Second, data is hidden by the accounting system itself. UNDSD (2001) discovered that system boundaries can be on the corporation level as a starting point and then further spilt up into sites, processes and product levels. EMA related information is firstly based on input-output analysis showed in Annex 6 and 7. EMA related costs in OSR can hardly be calculated due to hidden figures through conventional accounting system as well as hidden processes.

Without knowing EMA as a system, the way of collecting data becomes barriers in practice. The change of environmental improvement was engaged by the special group - ESER. However ESER was set up within the Engineering Department of OSR and the key members are all engineers. As the result, the changes that happened did so through technological innovation rather than accounting innovation. Technology innovation was significantly achieved in projects A, B and D. Projects A, B, D and E also involved important reforms in their processes. They all contributed to saving energy and resource use as a result.

Although ESER directly reported to the chairman as one of special groups in the company, no changes in accounting system were detected. It still lacked an expert who knew how EMA could make a contribution or at least it needed an accounting professional working with ESER. However, the effective and efficient work of ESER not only played a role in providing basic “figures” but also in framing a new data recording and calculating system based on EMA principles. In other words, an innovative reform in the accounting system crucially requires collaboration between departments.

On the other hand, it is difficult for the accountants without EMA knowledge and without perceiving its importance. However, EMA and it development in China is currently very limited. Zhou and Tao’s (2012) study was published in the Journal of Accounting Research, which is the most influential Chinese journal in accounting in China. Their comparison of EMA in practice between China and overseas concluded that 1), EMA in China had been left far more

behind in general; 2), the study in China remained at the theoretical research level rather than in practice where EMA had no impact; 3), sustainability accounting was not defined yet, and it was empty in terms of individual behavioural impacts on environmental accounting. The latest studies of EMA in China have also concluded that it is an urgent matter to encourage EMA research in China and to set up norms and guidelines both from governments and accounting systems. In practice, relevant knowledge is needed for business and the innovation of accounting systems towards EMA is also required (Zhang et al 2015; Xiao and Xiong 2015; Meng et al 2015; Yao 2016; Wu and Tang 2012). In reality, this lack of relevant information and knowledge was observed throughout the field visit in OSR.

Moreover, EMA can be used for different purposes as a whole or for particular sites according to IFAC 2005. Environmental related information in OSR is in fact used for improving efficiency of energy and resources usage in particular sites, as has been mentioned in previous sections about projects ABDE, rather than at an organisational level. Five projects have been separately analysed in detail at a particular time based on the recording of data by ESER, whilst there was not any data for a full physical and monetary flows over time. This data would not be able to really support management decisions.

From a financial point of view, relevant environmental accounting information in the company was more likely to be clarified into Financial Accounting (FA) rather than Management Accounting (MA) (Figure 1); and the information about the organisation's environmental performance, rather than focusing on the managing of environmental and economic performance together via management accounting systems and practice (IFAC 2005). And yet, the purpose and process of accounting has not been altered into either MA or EMA, it still could be used to contribute to environmental improvements required by the management group in OSR.

However without having much knowledge about EMA, it can still can advance the company towards being more sustainable and improvements in both environmental and economic performance. It proves that a small step can trigger more than a small change. However it does not mean that FA with relevant information is enough to improve performance over time since much costs and data are hidden by the conventional accounting system. The use of EMA tools could provide a full set of data, both visible and auditable, which then becomes manageable for managers to make programmes and actions for saving costs or allocating process costs, and even increase efficiency through real-life process design.

Therefore it is crucial to improve awareness and professional knowledge, and it is urgent for Chinese scholars to further study EMA in practice in China through formal access. It requires a

strong power to push the conventional accounting system forwards to further innovation. Efforts have to be made both by technology and by accounting together to overcome the obstacle of "invisible data".

6.3.2 Cost accuracy

It is not enough to just set up a visible data system for EMA implementation. It is important to have accurate cost information. However there are some factors caused in inaccuracy.

First, cost accuracy is based on visible data. It could disclose the hidden costs in overhead accounts that it is not fully recorded in a conventional accounting system according to Gale (2006a). An obvious "hidden" in OSR for example was the "loss" of energy use. Different energy has its own portion of loss while it was transferred to "heat" or "cold". These losses then become part of output - waste. By identifying the loss, it would be possible to evaluate the waste whether caused by inefficient process or out of date equipment or other possibilities. However there was not any document record on waste or loss that was found in OSR. It in fact could be easily established through an input-output material flow.

However, there are also two good examples in OSR concerning "loss" of energy use. When Project A was initiated in 2007, loss of diesel for producing hot water that caused low efficiency was identified. Diesel hence was replaced by electricity for producing hot water. This cut down by 68% the cost of hot water within one quarter in 2010 (Chart 5). By allocating energy and redesigning its process, this cost was saved and it also obtained three patents. Beside, in project B, fossil gas was changed from bottled to tank storage. This was mainly resulting from evaluating the "loss", both in the loss of energy transferring and the loss caused by gas remaining in each bottle when fully "used up". When bottle storage was replaced by tank storage, the consumption of gas and electricity declined 28% and 83% respectively within one year (Chart 6).

In a conventional accounting system this loss is usually "Hidden" in the overhead or without being recognised in other items. It definitely brings environmental cost inaccuracy. Chart 11 illustrated that there were many missing costs in each category. There were only a few records for sub-categories which far more limited. For instance, the use of electricity was identified in four items as sub-categories; however some important electricity usage that I observed was unseen, such as laundry, dormitory apartment, gas station, hotel living use etc. Instead of monitoring streams of each usage of electricity, it was all drowned by total consumption and expense. It is hard to identify which is inefficient and which is efficiency

usage.

"Systematically identify the potential for material efficiency improvement is out of design of conventional cost accounting system" Jasch concluded (2006, p1204). It means that there is an urgent need for conventional accounting to be innovatively reformed.

Second, "missing cost" often results from inconsistent information or interdepartmental communication problems, revealed by some case studies in the west (Jasch and Laida 2006; Jasch 2006: Lodhia 2003). There are two sources of "missings" 1) the consistency of checking information systems is necessary since the figure is dynamic and reflectively exposes the problems or potential problems in reality (Jasch 2006); 2) "Environmental costs are part of an integrated system of materials, energy and money flow through a corporation, and not a separate type of cost altogether" (Jasch 2003, p670).

In OSR, however, it does not seem to have found an integrated system over time. It is more likely to be several types of cost for particular purposes in ESER reports. For example, although we could see a few sub-categories in Chart 11, no record over time could be found. Also, for those sub-categories that were concerned with the five projects in the "change time", it is difficult to make an illustration of the trend of changes over time in each project. Instead, project A could be compared a quarter between 2009 and 2010, project B was analysed over 4 quarters during 2012 to 2013 compared with the average from 2007 to 2011, the improvement in project D could be seen through the two months' comparisons between 2010 and 2011. It meant that there is no way to estimate improvement over time and monitoring it continually using EMA tools based on the current data collection.

Nevertheless, some "missing" was caused simply by being no concerned later on since the data collection was not set up systematically and required continual actions. Project E focused on saving electricity use by streetlights. The company has replaced traditional bulbs with LED bulbs, and also redesigned layout for good visibility. However there was no recording of data afterwards for evaluation and monitoring of their performance. It was neglected simply because there was no requirement or no needs from management level.

Furthermore, environmental cost inaccuracy was often questioned on the methodology by the managers, and it has shown to be at least twice as high according to EMA methodology compared to conventional accounting in Gale's (2006a) study. The suspicion from managers reveals the fact that people in charge are often not aware the inefficiency. Previous studies in practice have evidenced that producing waste and emissions is usually more expensive than

disposing of them. Jasch and Lavicka (2006) have concluded that material purchase cost of non-product output is one of the key cost drivers.

During the field study, the evidence also proved that there is a great deal of missing data in terms of waste and emissions. Project C was the only environmental project for dealing with waste water. However it only focused on saving expenditure by dealing with the local authority to change the way of estimating water waste, rather than reducing the amount. As a result, it has no record of water flow both input and output amount. Although it is not likely to produce an environmental cost currently in OSR, the company still needs to be aware that waste and emissions are such important items focused by EMA.

It is true that EMA has a root out of Management Accounting stretching back through the history of accounting development. One of the aims of EMA for business is to contribute to decision making. However, IFAC (2005, p29) states that "investment decisions are often made on the basis of incomplete information". Most companies have simply not regarded the full range of environmental related costs for their decision making especially in terms of investment. It is crucial to set up a data recording system being visible, and establish relevant knowledge to identify accurate costs.

In reality, the barriers do not only come out from the difficulties of EMS itself, but are involved with the impact both from internal and external aspects. Therefore, there is a strong need to reveal the surrounding environment, which gives us more explanation and understanding on EMA implementation in OSR.

6.3.3 Data disclosure

The issue of data disclosure was regarded one of obstacles for EMA implementation in practice as identified in the International Guidance Document Environmental Management Accounting (IFAC 2005).

A study of "Current Situation of Corporation's Environmental Accounting Information Disclosure" by Zhang (2016) split data into qualitative and quantitative information. This paper separately account for the level of EMA implementation based on three principles: importance, obligation, and consistency (ibid.).

The problem of data disclosure is firstly caused by the context. Studies on EMA data disclosure

(ibid.) have noted two barriers in practice 1) lack of legislation and rules set by governments. Without mandatory requirements, the power of accountants to make changes is weak. However the purpose and focus of traditional accounting itself needs to be innovatively changed towards to EMA adoption; with accountants being the key to contributing to this innovation in accounting; 2) lack of norms and guidelines in practice. If it is accepted that EMA tools are an effective means to link performance between economic and environmental aspects, it is important to set up the standard and norms and guidelines accordingly (Zhang 2016; Meng et al 2015).

Lack of data disclosure is a strong constraint in OSR. In spite of the consistency and invisibility problems of EMA data itself, the context significantly influences the lack of data. This was observed from field study in OSR.

There are not compulsory requirements on data disclosure from either local governments or associations. No evidence could be found on sustainability or environmental or corporate social responsibility reporting in OSR. In fact, this could become their core competitive ability when it is considered what OSR has achieved - as has been seen in the analysis above.

Additionally, relevant staff in the ESER group lack knowledge of EMA. Some reports were prepared in order to publicise achievements from certain projects. Most of the reports have been successfully utilised to persuade further investment and summarise to top leaders or the Mother Company. However, without EMA knowledge, there is an amount of missing data. Also the reports might lower or enlarge achievements leading an unsuitable decision making. This is one of the key problems in data disclosure practice in China (Meng et al 2015).

However the issue that has to be faced is the fact that research and study about EMA in practice in China has been very limited to date. Also, there is no supervisory and guaranteeing function provided by government or professional associations, without there are unlikely to be positive impacts on EMA improvement (Wu and Tang 2011).

Part Seven: Further discussion: seeking to explain the change in EMA implementation in terms of intrinsic sustainable development

Using qualitative research during case study, the process of transforming the data collected is important through categorisation, utilising data, as well as recognising relationships between data. Yin (2003) also argued that the analysis of qualitative data involves a demanding process, especially referring to the uncertainty about the analytical process required. Hence it is necessary to estimate the context of EMA implementation and its impact on management activities. This will offer a more organic perspective to help understand EMA implementation for sustainable development of China.

However, Saunders et al (2003) indicated that a more "interpretive" rather than "procedural", "less structured" rather than "structured" was more appropriate for uncovering meaning and for reflection in specific contexts. It is therefore essential not only to conclude results and understand the EMA implementation process in a particular Chinese context, but also to interpret behavioural patterns and to understand the reasons that might have influenced people to adopt and change their behaviours.

This part therefore aims to seek further explanation in a particular Chinese company from both a macro- and a micro-level so as to reveal intrinsic elements which might affect EMA adoption and implementation for greater sustainability. Therefore, this analysis has been divided into two parts: from a macro-level referring to management activities, as well as from a micro-level referring to people changes.

7.1 The view of change towards to sustainability through EMA implementation in the business

It is widely accepted by scholars that EMA is a useful tool for business to advance towards greater sustainability in practice. According to previous studies (ESCAP 2009) EPIs as efficient indicators of EMA to estimate the efficiency of environmental performance seems only to present the linkages between economic activity, resource usage and environmental impact. EMA is more likely to focus on "do less and gain more" between environmental impacts and economic performance accordingly. Jasch (2003) agrees that EMA does not deal with social costs and externalities.

However other scholars argue that these factors including social and externalities do have some impacts on EMA implementation in the business. One the one hand Corporate Responsibility (CR) requires and pushes business towards to SD. The company accordingly needs to fit its surroundings all over the world and interact with the environments to deal with globalisation, national goals and relevant legislations, social culture and customs, etc. On the other hand, both internal and external stakeholders have heavily impacted on EMA implementation in practice.

In China, people are significantly affected by particular Chinese culture and customs, awareness, knowledge, expectations and so on. Hence, it is crucial to understand these cultural influences and their interaction with management activities in terms of EMA adoption, implementation and estimation. This section therefore presents two important contexts both from a big picture as a whole, and from people as a core.

Moreover EMA in China might not be the full solution to address the needs of SD, but it is still a very useful tool for facing up to many aspects of the environmental crisis, and it can contribute to solve China's Environment-Economic Growth dilemma. Therefore it is necessary to evaluate EMA implementation and its adoption along with the complex Chinese context so as in order to seek out barriers and facilitators for business. Although this qualitative study might not be able to present a generalised picture of EMA implementation for all business in China, it is still useful for understanding better the implementation in practice. Also, it is impossible to generalise one conclusion from a single study, since China is such a big place and the context could be very different and complex from one province to another.

7.1.1 Sustainability and its context

7.1.1.1 Global level for sustainability

Global sustainable development concerns derive from the same environmental crises that China currently suffers. Humanity now recognises that global natural resources are extremely limited. This results in a global social system where change is manifested in such as external corporate pressure from governments, consumers, communities etc., and the on-going changes in institutions with respect to the issue of sustainability, and the internalisation of external costs.

Giddens considers the damage we are inflicting on Earth's ecosystems and comments on this ecological dimension: "Widespread changes in lifestyle, coupled with a de-emphasis on economic accumulation, will almost certainly be necessary if the ecological risks we now face are to be minimised. In a complicated interweaving of reflexivity, widespread reflexive

awareness of the reflexive nature of the systems currently transforming ecological patterns is both necessary and likely to emerge." (Giddens 1991, p222).

Hence there is a question of whether similar problems will produce similar pressures on Chinese companies and cause them to make similar changes, which is worth noting for identifying motivations, pressures, and so on.

Additionally as the global economic context changes, Ecological Economics grounds economic thinking and practice in physical reality, especially in biological systems. It accepts as a goal the improvement of human well-being through development, and seeks to ensure achievement of this through planning for the SD of ecosystems and societies. For an ecological economist, EMA is a form of micro-ecological economics.

7.1.1.2 Unique National context

At the nation level as we know from the background section that there are two unique elements: (1) the collective society and (2) the national plan "harmonious development." Both elements have roots in traditional philosophy and they may drive SD differently or produce different manifestations.

China has its own deep roots stretching back five thousand years. Its culture, values and ways of thinking carve a unique mark which might be difficult to understand in the West. China could however contribute more than what the West expects. For instance, an influential political party may be more effective in engaging in the improvement processes, as well in promoting EMA tools to a wide audience. It is crucial to be aware of this power of changing things possibly more effectively and efficiently in China.

For individuals, collective society underwrites the personal relationships network called "guanxi". It also helps to get a consensus from a balanced group. This balanced group constructs an informal but influential norm and routinised behaviours that can be accepted and agreed; it shapes people's perceptions and beliefs. The central person within this "guanxi" network is regarded as an authority that has more power to shake off the old structures and move to the new. Therefore, it is interesting to explore this impact and to be aware of the barriers and encouragements of EMA implementation in companies that could arise from this balanced group.

Moreover, the concept of "harmonious development" is a Chinese edition of sustainable development combined with traditional Chinese philosophy, which emphasises the balance between mankind and the physical environment. Consequently, it can be expected to bring a deep understanding of the relationship between people and the nature from old traditions in China that may advance the change of consciousness to being more sustainable. If so, there will be a good prospect for improving SD in China because a small step of EMA implementation may cause a big change through the of whole society and the nation.

Secondly, the pressing dilemma between economic development and environmental protection has become very harsh in China. This pressure is felt strongly from both global sources and from inside China, from both ethical and political, and from long term economic developing viewpoints. However since China is diverse across widely different areas and provinces, there may be different focuses within any national plan and set of environmental goals. Therefore it is necessary to identify and to be aware of those differences, which may provide some other information or effects or results when implementing EMA in companies located in different areas.

Additional, environment performance has been seriously criticizing in recent years and has the potential to threaten national and social stability. The report "Annual Report on International Politics and Security" in 2007 concluded that China became the largest emigration country as well as ranked the top one in terms of the number of elite persons lost. Seeking after healthy environments was regarded as one of the four main reasons for emigration (Tengxun News 2010).

However we need to bear in mind that it may be difficult to draw only one conclusion from such a diverse culture and geography.

Thirdly environmental issues relate to serious social problems in China. As we know, people argue that EMA is not for specifically improving social performance (as analysed in previous sections), but the origin of environmental concerns is from human agency, individuals, communities, and societies, who are aware of the environment change. Transformational process should show that adopting and implementing EMA is one way to respond to such social concerns. Companies being responsible are another part of the sustainable development issue as they proactively respond to social and public concerns. By doing so, environmental improvements will address social concerns in China today since there is a strong awareness of the damage done to the physical environment. This may give rise to an issue of social stability concerns in the Chinese Communist Party as well.

Since 1978 in China liberation and blooming is a positive result of reforms. Central government realises more and more the importance of being sustainable. Otherwise the reforms could be a disaster for the world, such is China's effect. The government therefore from the 11th FYP, 12th FYP to 13th FYP focuses on how to improve sustainability in the economic, environmental and social dimensions, using its own "language". In 2015, the 13th FYP engaged with implementing actions by launching relevant regulations. The tourism industry, for example, is identified as one of the advanced areas that will be supported by government because its own characterises are comparatively environmentally friendly.

As a result of this new national goal and target, the second capital investment project of OSR was kicked off last year after nine years of negotiation and layout. This is the second large investment and expansion after the first capital investment of 2 Billion RMB in 2002. Staff who were in charge of preparation of second project believed that local government would heavily impact on the negotiation and advance the result under the new national goal.

Fourthly, 13th FYP newly set last year focuses on five perspectives: creative, organic, greening, opening and sharing (Hexun News 2015). It was understood as a more doable national plan towards sustainability. It encourages corporations "going out" to the world, in other words, to achieve success in world markets.

7.1.1.3 Local society

Local society consists of two elements: location and local culture for OSR.

OSR is located at PingSha Town, which was an Intertidal Zone with two little villages before 1955; and 440 thousand square meters were reclaimed from the sea in 1955. The town was reallocated to the city of Zhuhai in 1988, by the time its population was 100 thousand (360 Baike 2). In the same year, PingSha was divided into GaoLanGang district in which it was set up as a "special economic area" of Zhuhai. Its unique location has been notable due to economic development. It is 40 kilometers away from City Zhuhai and 45 Kilometres away from Macro, as well as being located to the west of the Zhu River estuary with sufficient seashore and coastline.

Before OSR started in 2002, the town was uncultivated and waste land, local income mainly relied on planting sugar cane. Two years after OSR's opening, GaoLanGang district was approved as a "provincial special economic zone" in 2008. It is a fact that OSR significantly

advanced the process of GaoLanGang becoming a “special economic zone”. OSR has brought more confidence and learning experiences for the local society to achieve its growth and development goal.

In terms of local culture, first of all, PingSha is an immigrant town. The early immigrants came from all over China in 1955 to set up “a mechanical farm” when the land was reclaimed from the sea. Then second immigration was in 1978 when Vietnam delivered the policy of discrimination against Chinese residents. PingSha received about 6,000 refugees from Vietnam. The latest immigration has been from OSR since it was open in 2002. The company has attracted 3,000 employees, two thirds of employees were from different provinces throughout China, and one of third was from locals. Since OSR is away from the city 50 kilometres, most of outer had eventually settled in PingSha or Zhuhai. The culture of local society therefore is quite mixed and complex. However there is not a particular ethnic or local culture block, but being generally open and welcomed to outsiders.

Secondly PingSha and GaoLanGang areas comparatively fell behind the times because of inconvenient transportation from cities in the past. Although GanLanGang is located along the East Sea having a long coastline and PingSha has sufficient hot spring water from the sea, both of these are unique resources in China, it rarely had visitors in the past.

When OSR was opened in 2006 with 3,000 employees, it was the most famous and important event for both GanLanGang and PingSha at the time. In settling down three thousands employee living in the area, as well as more than 2 millions visitors every year, PingSha town has dramatically expanded. The position of the “Leisure and Relax Area” is a good use of local resources, and the large number of outsiders has been welcomed by this immigrant town according to the interviews.

Additionally, it is important to remember the general Chinese cultural context discussed in the previous section in “National Context”. Even without a particular culture block, the area could be still influenced by the strong and unique Chinese culture, collective society and traditional philosophythinking.

However, there is a need to embed the first case of Longmen Ancient Town in order to expose the influence of Chinese society (although the data collection was nearly abandoned due to no evidence of EMA implementation and adoption). However this humanistic and historical ancient town as a small society typifies the Chinese culture living in a society, which seems to be an opposite form of society from Pingsha town in the other case.

Very different from an immigrant and fairly new town, Longmen has a history going back two thousand years from 200AD. It has a strong and influential familial style with the same family name for over 95% its population. It is said that everyone is descended from a famous historical person “Sun Quan”. The society showed very strong and complex “guanxi” and its special power. This could be the strongest barrier for any new things- including EMA adoption.

During interviews and visits evidence was obtained about the conflicts between LAT and LATTD on many aspects including the way to develop LAT, and the way to communicate with local residents. The reality of the double use of the town, being a tourism destination and being a living society, could be one of reasons for conflicts; however the conflicts could be also accounted for by its influential and centralised power from “familial society”.

7.1.2 Stakeholders influence

7.1.2.1 Local residents

Moving back to Pingsha, generally speaking, local residents felt satisfied with the impact of OSR’s operation. This was established through interviews and questionnaires.

Unlike a typical town or village in China that has strong familial relationships around several big “families”, Pingsha is, in comparison, a new, immigrant town from the 1950s as was mentioned in the last section. There has been a tradition of not blocking outsiders or new things. In return, employees of OSR have become a part of “local”. The field study showed a positive relationship both from the point of view of locals and of outsiders.

Although the total employee of OSR was cut down from 3,000 to 1,900 recent years, the local employees have been increasing according to an interview with HR department. The cost of local employees is comparably lower than that for outsiders in terms of both salary and settling down. Providing services of catering, hotels, playground and so on requires low level staff rather than managers, and these are easier to recruit from local residents.

By contrast, some local employees seem to have much appreciated these job opportunities. On average they marked the highest point of a happiness indicator, mainly caused by steady and well paid employment. They were satisfied with living with parents and having their own small family in their hometown. Living condition has much improved such as: transportation

convenience, cleanness, infrastructure, and that there was less pressure compared with others who worked outside OSR.

The residents did not seem to be bothered by having many visitors coming over many years. Oppositely, they regarded them as presenting new economic opportunities for running restaurants, accommodation, shops etc. It is not surprised since the location of OSR is still away from Pingsha Town centre by about 10 kilometres, most of visitors would not disturb in the locals' daily life, which is very different from LAT; and yet local residents appear to be good at providing supplementary services.

Moreover, OSR as a state-owned company has a tradition of high benefits but not high salaries. In total 17 department buildings were built for all employees who needed a dormitory bed. Also, commercial houses were built in Pingsha Town centre, which offered special discount to employees. This was regarded as a win-win plan both for the company and local development. It led to employees settling down with the convenience, otherwise employees have been facing the pressure of living apart from families who live in Zhuhai city.

In other words, OSR has become part of the "local"; and the local residents have generally been positive about the impacts of OSR. It looks like to be symbiosis.

However, it seems that there has been limited pressure from local residents. Local residents are one of important stakeholders that are not so powerful in their influence on the business. This result has been found through questionnaires as well during the field study. Staff marked on average lower scores in terms of local resident pressure for the company to improve its sustainability.

OSR has its own culture as a small society that strongly influences the individual. Under the traditional collective society, there is a trend to lean towards the majority. Even if some of the employees are also local residents, they seemed to stand by the company rather than the locality. Considering that the rest of local resident who had been living out of the way are generally more appreciated OSR contribution rather than complaining. Although it is a pity that it difficultly set up an interview with a local resident who is not an employee, the conclusion could be quite similar. Majority locals are elders who have strong accent that it is difficult to communicate, and most of young people would find a job in the city after schools, the rest mainly work in OSR. Therefore, it is not surprised that local resident could not be so influential for OSR, which is very different from the local government's power.

Moreover, thinking about the special Chinese concept of “guanxi” would explain further the situation of power above. “Guanxi” is based on “family” culture. It could be understood through the concept of “Social Trust”. Lumann (1988) was the first person to clarify the concept of Social Trust and he pointed out that social trust is the outcome of social institutions and cultural norms. Comparisons of social trust between the west and China have been carried out by many scholars. They have concluded that Chinese people do not generally trust “strangers or outsiders” Whereas the West general does. Therefore, the trust of Chinese society is vulnerable and the trust of the west is tighter (Dong 2004). China has been lacking religion but experiencing turbulence during its history, the trust of relationships hit a low point during the Culture Revolution. It caused either no authority or no trustable authority. “Guanxi” from a certain blood “family” is the most visible and trustworthy relationship, and the “father” of the “family” is regarded as the trustworthy “authority” that has a strong root from patterned Chinese thinking. Weber (1995/1920) defined it as “non-generalised special trust”. In other words, this seems to be a less trustable social group since locals do not have strong blood relationships.

As the result, Pingsha town as an immigrant town is unlikely to establish one or several strong “family” influences. The demands or pressure from the locals would be less powerful to OSR. On the contrary, OSR as a state-owned company is led by the “authority” which is powerful and influential. Institutions and norms plus its explanation, thinking, and behaviours could more easily impact on each individual. Power leans towards OSR “society” more than Phingsha “society”.

7.1.2.2 Local governments

Local government has a dual role, (1) benefitting from corporation development and (2) being authority to guide or to pressure the company. The relationship between local governments and OSR has changed significantly in last decade, becoming more complex and loose.

Their relationship started with a honeymoon stage around 2002 when both local government and OSR provided strong support each to the other. The local government, GaoLanGang (belonging to Zhuhai city) was approved as a “special economic area” in 1988 by Zhuhai city (360 Baike 1). It was not developed smoothly at beginning. When CTS (Hongkong) decided to invest in the OCR project, it became the largest and most important investment (2 Billion RMB) since the first capital investment in 2002. Sufficient resources and support were offered by the GaolanGang government through land, tax, high priority infrastructure projectsand so on.

The city of Zhuhai also regarded OSR as the most important company, and the government

invested a particular road of 10 kilometres for transportation convenience between the town centre and OSR. OSR in return has contributed to the locality. It changed the area from saline and alkaline land to an attractive landscape, improved local living conditions, created more employment opportunities, and advanced local economic growth. It has been representative of the image of the "Leisure City of Zhuahai" promoted by the city. It seems to have successfully created an intimate relationship between government and OSR.

As we could see from Chart18, the highest income of 376 Million RMB was in 2007 when OSR was just open and in 2011 it hit the second highest income of 342 Million RMB. Meanwhile there have been more than 2 Million visitors every year. OSR has certainly brought dramatically increasing tax income through improving economic opportunities for the local, as well as importantly having contributed to GDP which was the most important estimating indicator for various levels of governments before 13th FYP. It can be concluded that during the "change time" of 2010-2012 OSR was engaged both by organisation's needs and government's support.

During the second stage, both OSR and government experienced a "break" from the previous intimate relationship.

On the one hand, GaolanGang was upgraded as a "provincial special economic zone" in 2008, and then a "national economic and technological development zone" in 2012 and became one of the most important ports and potential development area in Gongdong province（ZHDZ 2012）. Today it hasfully advanced its position. The latest announcement was in April 2016: "Zhuhai Gaolan Port Economic Zone has found a "3+1" port-vicinity industry pattern led by Marine engineering manufacture, petrochemical industry, green energy, as well as port logistics, and successfully introduced more than 20 of the world's top 500 companies." (ZNETDZ 2016)

The city of Zhuhai has also upgraded its city plan of development based on the National and the Gongdong Province Development plan. In 2008, China set up a several special Free Trade Zones, and divided Hengqin into China (Guangdong) Pilot Free Trade Zone Hengqin Area of Zhuhai, as a national pilot area led by Guangdong province directly. It has become one of the most important areas since then.

"Hengqin Island is the nearest place in Chinese Mainland to Macao. Covering an area of 106.46 square kilometers, it overlooks Macao across a river, with the shortest distance of less than 200 meters, and it is 34 sea miles away from Hong Kong. Upon completion of the Hong Kong-Zhuhai-Macao Bridge in 2016, Hengqin will become the only place in Chinese Mainland

directly connected to both Hong Kong and Macao" (Quoted from CPFTZ-HQ 2015). It aims at providing an international advanced service and focusing on technology, culture and education pilot, as well as being an international entertainment and resort area (CPFTZ-HQ 2016).

Since Henqin is also near Zhuhai city (10 kilometers away), the city of Zhuhai has taken advantage of its special development. For instance, one of the famous Tourism Giant, Chimelong Group set up its business in Henqin with the first capital investment of more than 20 Billion RMB in 2010, and aims to establish "Chimelong Tourism Eco-City" in Guangzhou's Chimelong plot (ChimeLong 2016). Chimelong Group Co. Ltd has collaborated with Zhuhai based on its special location to expand its international influence by setting up the theme of "World Circus Festival", "Chimelong Ocean Kingdom", and so on. It nowadays is well known throughout China. The city of Zhuhai therefore has improved its reputation through these international events in recent years.

From the point of view of government, both the GaolanGang and the Zhuhai governments have moved their focus and modified development goals over time. They are likely to be more independent and powerful due to greater opportunities than 10 years ago. Over time the governments have provided special offers in order to attract CTS's "large" investment being both Mother company and investor of OSR.

On the other hand, OSR was no longer the largest and important investment. It also experienced a decline in business from 2013 according to the previous analysis. Competitive ability has been questioned since then. As a state owned company and also a giant of the tourism industry, CTS has been trying to put up a second construction project in recent years. However the negotiation between OSR and the governments did not go well. It caused a postponement of upgrading for attracting customers' interest. The second capital investment was eventually kicked off in 2015 after nine years of negotiation.

In general, for several years before 2015, power weight has slightly shifted from the business to the governments due to the changing environment. Although the marketing lever is still significant for a rural area, especially for PingSha Town, the business influence has been decreasing among different levels of the government.

Evidence of this decreasing business influence was the postponement of the second capital investment. According to an interview with a manager, government put down several agreements and oral contracts. One reason was certainly due to the significant change in

various prices over the last decade; but also competitors have increased and governments' buy-in choices have grown in the "market". By contrast, local government has had more pressures in terms of social stability, environment protection, and GDP indicators in recent years. It looks forward the businesses having sustainable and bright future.

In reality, the postponed project was regarded as one of reasons that caused the decline of OSR's income, although the company tried to put on more activities in the playground, the life cycle of tourism products is limited. Adding new activities/elements or being more creative is indispensable as noted by staff in the interviews.

To the third stage, both the governments and OSR seems to have being taking a good account of a green future, but need to be more creative and to support each other.

The central government launched the 13th FYP national plan (2016 to 2020) published in 2015 that developed more ideas into actions than the12th FYP for. The13th FYP places emphasis on five perspectives: creation, collaboration, green, opening and sharing (Hexun News 2015). This is the first time that tourism industry development has been put into "Key programme of National FYP". The tourism industry apparently having lower resource consumption and less pollution would be greatly contributing to resolution of China's EEG dilemma (Lv. 2016).

Additionally, the tourism industry was intensively promoted by Premier Li in the opening ceremony of Boao Forum 2016. It is positioned as a synthesis of service industry and other industries. In 2015, domestic visitors to tourism destinations exceeded 4 billion persons-times and overseas visitors hit 120 million person-times. The tourism industry hence is expected to trigger up further economic development as one of the new drivers (Tech.huanqiu.com 2016).

The new position of the tourism industry in the National Plan should encourage the local government to take further actions to support local tourism development. Indeed, tourism is not simply a "service" industry; it advances the development of related industries and also encourages people in poor areas to become prosperous. That can be seen in Pingsha town's significant change from the past.

Also, Zhuhai was ranked as the top city by "2013 The Report of Chinese City Sustainable Development Indicator". The report analysed that its ranking was caused by continual environmental protection and social concern management (IFeng 2014). Although Chime Long Group has significantly improved Zhuahai's reputation more than OSR did, the city cannot ignore that OSR is of significant importance for Pingsha Town and the GaoLanGang area, as well as the

CTS (China Tourism Service) group. The mother Company of OSR is a real giant of tourism industry in China as a state-owned company. This probably means that there would be more support for the further development. In fact, it can be seen as a sign that the second capital investment of OSR eventually kicked off after nine years of negotiation in 2015.

On the other hand, the development of the tourism industry requires guidance, since it just maintains a basic "service" level in reality. The power of the governments, research from academics, and creative reform were all needed. How does the business upgrade its products, not only relying on new activities but meeting customers' needs and improving quality? How does a public service meet companies' needs? How would the cooperation between governments and companies create a better balance between economic, environment, and social triple bottom lines? Scholars in the Press Conference (TRC CASS 2015) discussed the issues. They indicated that government is of importance for advancing tourism development according the research published in the "Green Book of China's Tourism" (Chen 2016).

The local governments certainly will be strongly influenced by the 13th FYP, especially for Zhuhai that has established a better image of a tourism destination. OSR therefore could try to continually take advantage of the 13th FYP as a state-owned company and upgrade its business towards to better performance.

Although there is no direct evidence, the second investment is one possible result from the 13th FYP as it impacts on local tourism regulation and policy. It was speculated by a staff during interviews who was previously working in the many on-going negotiations. Camping site, golf centre, facilities upgrade are designed into the second investment, as well as departments and cottages for accommodation. It is to be expected that there will be more attractive activities and facilities for entertainment and leisure that will strengthen the economic performance of OSR in the future. However, it is not enough to be only concerned with its economic performance. Both local residents and governments as external stakeholders require that the company contributes to their goals as well.

Experts from the Tourism Research Centre of the Chinese Academy of Social Science suggested that it is necessary to use a tourism indicator as one of elements to estimate the performance of local government instead of only GDP indicators (TRC CASS 2016).

In conclusion, the attractive relationship between OSR and local government has been changed from the early stages. The changing surrounding eventually pushed them into a more complex link but having more demands from each other to achieve both parties' goals.

7.1.2.3 Customers

Customers ought to play an important role for any business. However it is in doubt to what extent customers are able to get involved in or affect the OSR's decisions.

There are two kinds of customer: tourist groups and individual travellers. Most of the tourist groups are coming for conferences, annual meetings, or incentive meetings since OSR is well-known in MICE markets today (CTSHK 2013). The brand of CTS has a good reputation in the market and attracts those who have sufficient budgets. However, OSR's income had declined in recent years because of the anti-corruption drive of government from 2011. Interviews in different departments all confirmed this sense that income had been decreasing, although these tourist groups used to be having high budget and expense.

Most of the individual travellers are coming for a leisure weekend from the cities around Guangdong province. They are comparatively price oriented with their first visit, concerned with participating in more activities rather than service quality. The rest of the individual travelers are mainly from Zhuhai for a half day Sea Spring. These visitors do not usually spend much but are only interested in the special spring hot water. These customers do not seem to consider or ask for better services or added value; however, a better visiting experience would influence customers' decision about a second visit.

7.1.2.4 CTS Group (Hongkong)

CTS Group as the mother of OSR and investor is certainly an internal stakeholder. OSR is governed by CTS Group under the organisational structure, and also relies on or benefits from CTS, a giant of the tourism industry in China.

CTS Group was converted from Hongkong China Travel which was set up in 1928. It is governed directly by central government, and is also one of three central government state-owned companies' headquartered in Hongkong. Its business has expanded into seven units including travel agency, hotels, scenic spots, landed estate, banking, logistics, and capital fund. It was successfully listed on the Shanghai stock market. Also CTS is continually ranked as the top one since 2009 among the top 20 tourism company groups (CTS-1 2016).

CTS has been following central government during its developing. For instance, it has adjusted its goals and key focus on three areas for 2015-2020: travel business, landed estate and capital fund - in response to the 13th FYP launch (CTS-1 2016). In 2015, CTS was ranked the 25th of

China's top 50 enterprises for globalisation (estimated by Centre for China and Globalisation) (Zhang 2015). In the same year, CTS successfully acquired British Kew Gardens Hotels as the only shareholder, making it the owner of 44 hotels and the governor of 11 hotels. This was the largest purchase by a Chinese company of British hotels up to 2015 (SINA.COM 2015). All fit in national calling for globalisation. The strong relationship between CTS and the central government was showed through these business activities.

It is very different from the West in terms of the potential driver of business. The government is very influential in a state-owned company. Meanwhile, the CEO/Chairman of the company could be involved in government's work through transferring job position, taking a role in associations, and so on. It means that the company could be one of participants in setting up relevant regulations or norms, and also be governed by these regulations and norms. For instance, one of top managers of OSR also plays a role in the China Leisure and Relaxation association.

In other words, they are both judgers and players. Both the company and government have tacitly agreed to give in to each other for a symbiosis. This special link could also contribute to OSR's further development by way of obtaining preferential regulations.

Moreover CTS aimed at further change by upgrading its strategy after the 13th FYP was launched. The group announced this in its CSR report for 2010. There were upgraded visions and action plans announced in the 2014 Report. One of core action plans relating to tourism was to upgrade itself from a tourism product's supplier to a synthetical service supplier of a tourism destination, and one of Key visions beyond the action plan is to being sustainable (CTS 2014). Since CTS is influential in the tourism industry, it could effectively advance OSR towards being more sustainable in the future.

7.1.2.5 Employees

There are three layers of staff according to their "belonging": Top Management, Middle Management and Junior Staff.

The leaders as the top management group are usually assigned every three years by CTS Group. The latest leader group came into being in 2015. It seems to be a practice position for these leaders who would usually be promoted after OSR experience. It can be said that they belong to CTS. This would benefit OSR by way of linking with the mother company tightly; however it

could be a barrier to further change.

Middle Management, however, was mainly recruited from all over China in 2006 when OSR opened. Most of them have settled in Zhuhai City and their children go to school in Zhuhai. The minority chose to buy houses in Pingsha, built by OSR, and become Pingsha residents. This group seems to be the core of the company, who not only work hard with competitive competence, but also have strong loyalty after working ten years in OSR.

This group has been significantly important in several ways. They are the "real" leader in each working group for every day running. Their attitude and understanding for implementing EMA directly impacts on junior staff in practice, as well as leading to whether or not the corporation's vision and action plans can be carried out successfully.

During the field study, I observed that people in this group were moderately satisfied with their current situation. The group consisted of the characters of young, creative, proactive, brave, well educated, dedicated and so on; when they are was recruited 10 years ago. At the time it meant a new life or career in a new land for them. After 10 years devoting themselves in the company the remaining staffs are well disciplined by the CTS culture and exhibiting OSR's characteristics. The strong "collective society" thinking of OSR's way has shaped their life pattern and thinking mode. It could contribute to EMA implementation when middle management could push action forwards and eventually set up a special culture "being environmental friendly" within the company. However it could be a block for new ideas due to being collectively the same.

Junior staffs as the grass-roots are mainly from Pingsha town or Zhuhai city. They are less powerful but kind and obedient. From interviews, they highly appreciated being able to work in OSR and showed opinions fitting with the culture of company. However the objectives of the interviews were selected by their managers, so there could be a possibility that they could not be able to present junior staff. And yet, their opinions and attitudes presented the main stream accepted by management.

In general, top management is certainly influential in OSR due to collective thinking. However, the top leaders partly belong to CTS, Mother Company, and their attitude and needs are affected by CTS including related EMA implementation and sustainable development. Middle management is the most important group for action plans, and has been well educated to fit in with OSR's collective culture. Junior staff however showed quite weak power, and kept fluidity for the time being.

Additionally, the intimate relationship among middle management has been specially developed due to the relatively isolated location. Those managers were recruited at the beginning, and lived together in the dormitory since then. It could be sensed during field study that there is a strong trust among the middle level managers that helps to set up the special OSR culture.

The power of effects among the groups could be influenced by "belief". Sztompka (1999) explained this "belief" as three dimensions: trust, confidence and faith. This belief would be sharply corroded by social change; the new relationship of trust would be established and strengthened through steady, transparent, and predictable norms.

It could effectively explain this "belief" relationship among OSR's, local society, employees and local residents with OSR. As a big state-owned company, it would bring comparably stable regulations and structures which are stable, visible and predictable for the public and individuals. Therefore "belief" was fairly quick to set up with trust, faith and confidence in OSR. How and what has happened during this process? This would be the question for the next part, which IT and ST are employed to intrinsically understand and interpret further the "Change".

7.2 The view of behavioural and philosophical change of people for EMA implementation

Zhou and Tao (2012) retrospectively layered Environmental Accounting's study in China into five aspects including sustainability, external context, data disclosure, Cost Management, and Behavioural science. The study on relationships between behavioural science and environmental management accounting is lacking in China. However, without better understanding of behavioural changes, it is difficult to reveal a whole picture of EMA implementation contribution to SD.

Therefore, this part will employ Institutional Theory (IT) and Structuration Theory (ST) to interpret the empirical situation of the OSR case, which is an ongoing process. It will also reveal the fact that a small step could lead to a big change, and a big change pressure could consist of small steps. Sustainability hence could be developed through this dialectical logic under a complex and dynamic context for a company, a society, a country, even the world.

7.2.1 Institution Theory (IT)

IT could explain OSR's phenomenon of improved environmental performance evaluated using EMA tools. Old institutionalisms state that institutions influence individuals' actions in order to maximise the benefits. The reform of environmental performance was carried out by OSR intensively during the 2010-2012 "Change time". It maximised the reduction in the cost of resource use. Chart 19.2 shows that energy cost per unit income was cut after 2009, hitting its lowest level in 2013. The benefits were derived from "changes" in terms of reforming actions by the ESER group that is regulating institutions.

Meanwhile, the corporate culture of being environmentally friendly has been established through individuals' behaviours. For instance, employees who were interviewed all had strong consciousness to save electricity; they proudly praised the company for being environmental friendly. Middle managers usually believed that this phenomenon was initiated by the results of "change time". The form of individuals' awareness towards OSR being environmental friendly was made up of normative institutions. These maintain that "institutions" are working along with OSR society. The new value has been successfully built up through managers' workloads. As the result, the effects of new "institutions" were manifested through employees' behaviours, thinking, and working process and so on (Peters 2000).

Moreover, New Institutionalism further explores that individuals comply with "institutional routines" simply because other types of behaviours are inconceivable (Scott 2001). It should not be ignored that Chinese society has a strong tradition of being collective. Employees of OSR, as mentioned in the previous analysis, are well educated about "authority" and the "society". In OSR, junior staff has less power to shift the change, and middle level managers general coordinate with the company's purpose due to the history of their career development linked with strong personal feeling. Obviously disturbing behaviours are not acceptable. These institutional routines greatly contributed to the establishment and maintenance of the pattern of carefully implementing action plans in OSR.

Peter (2000) also argued that "institutions" influenced each other and was impacted by external environments. However this does not seem to have been a typical case in OSR in the past. For many years of OSR's development before 2013, the company was likely to be powerful due to his background: large investment, benefits to local society and governments. This power provided a good opportunity for the company to set up its new rules and norms etc whilst the company decided to improve their environmental performance several years ago. However, in recent years there has been something changing that needs to be considered. For instance, the

power of influence on locals has been decreased due to increasing market competitive pressure; as well as new national plan has been engaging further innovation tourist industry, the "institutions" that had been set up in the company could be a powerful constraint to block further reform or creativity. The resistance or difficulty to further change and performance improvement in OSR could be encountered in many aspects, such as: the future economic development of OSR, EMA innovation and implementation. However it is apparently not enough to explain the "change time" of OSR, and about how and why people's awareness, thinking, and behaviours change. Therefore ST is significant in order to reveal deeper insights and to further this empirical case (Powell 1991).

7.2.2 Structuration Theory (ST)

Previous studies have noted the use of ST in three facets to examine the interplay between the agent and the structure: 1) an explanation of how subjective knowledge information impacts on determining individual behaviours in terms of better understanding and interpreting ongoing changes, as well as recognising the relationship between changes of institutional reality and knowledge or attitudes of human agency; 2) to improve the capacity for effective actions; 3) to reveal the process of change in the long-term ((Giddens' 1976, 1979, 1984; Rose 1998).

A simple definition of ST concludes that "the ongoing nature of society is a result of human action, as well as the ongoing nature of human action is a result of society" (Buhr 2002, p18). It shows that the structure has a duality. Human Agency (HA) presents a "transformative capacity". It is "intimately connected with "power", the power of understanding of the rules and capacity to use resource" (Giddens 1984, p14). Structure (S) is central to ST. It was defined by Giddens (1984, p377) as: "the rules and resources are recursively implicated in the reproduction of social system, and it is based on human's knowledgeability and as instantiated in action."

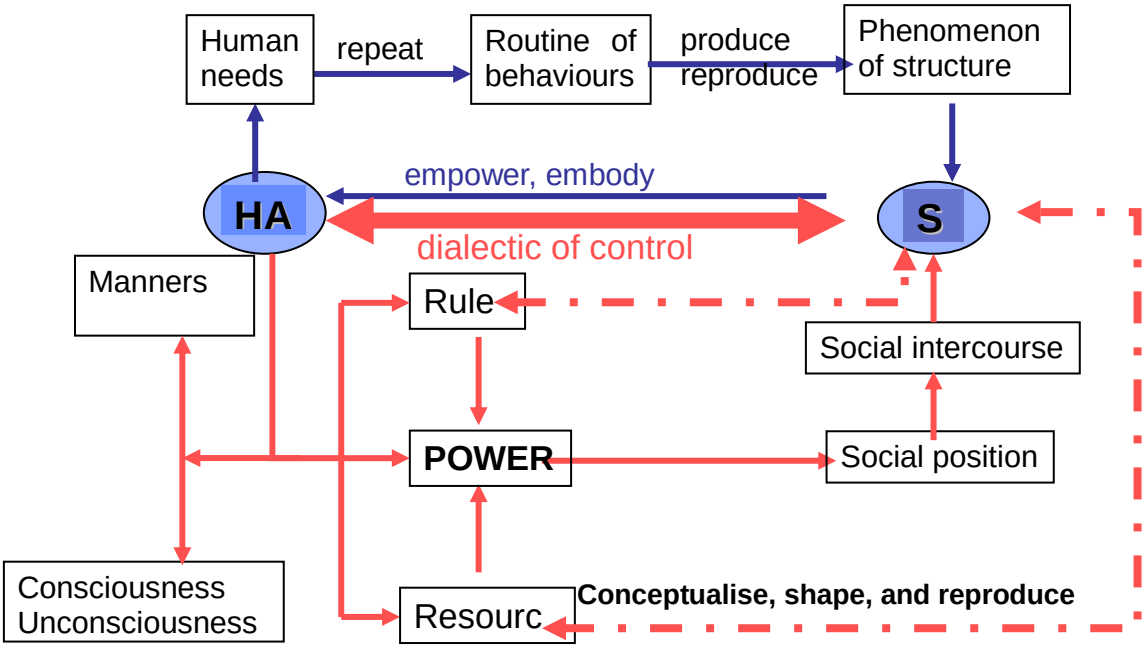
In this case, individuals or authorities (individuals or groups) represent Human Agency. Their understanding and interpretation of the reality has an impact on the structure. A series of environmental improvement actions initiated by a small group (ESER) is top-down stream management. It means that the decision and support is from top management to staff. To what extent the power of this capacity is, would make things differently. It would derive from the needs of the company, and interpretation of "the needs". As a result, the particular culture of environmental concerns was eventually set up through a series of actions; its resources were later expanded and strengthened to successfully advance further actions during "Change time",

meanwhile new values, ideas, and customs were built up.

"Three dimension of the duality of structure" (figure 7 in Part Four) has also been demonstrated by Giddens (1984) to link the relations among the rules, resources, as well as the power, the power of understanding of the rules and the power to use resource. ST is conceptualised by normative elements (legitimation) and codes of signification (signification). Both legitimation (providing morality) and signification (providing meaning) draws on the rules and resources. Domination provides influence over the power relations of rules and resources (Macintosh 1994). Therefore the structural properties of social systems are both the medium and the outcome of the practices they organise (Giddens 1984; Willmott 1987).

ST illustrates the process of how human agency both influences the structure and is influenced by the structure through the relations among rules, resources and power. Therefore, the model developed in this research, based on these studies is illustrated in the following Graph 2 to explain three uses of ST in the practice of OSR (Giddens 1976, 1979, 1984, 1991; Buhr 2002; Rose 1998; Rose and Hackney 2003; Rose and Scheepers 2001; Sewell 1992; Willmott 1987).

Graph 2: My model of Human Agency (HA) and Structure-(S) (Based on Buhr 2002; Giddens 1984, 1991; Rose and hackney 2003; Rose and Scheepers 2001; Sewell 1992; Willmott 1987)



In the upper half of Graph 2, the arrow loops from HA to S, and then back to HA, which shows the pattern of phenomena that are the influences between HA and S. HA, as a dynamic subject, raises needs that constitute the routine of behaviours. Individuals' behaviours consist of the phenomenon of social structure, which continually empower HA's refection.

Once ESER was set up in 2006, it made big efforts for later innovation projects, including: self study, learning from outside, visiting companies seen to be using best practise. Three years later, in 2010, it kicked off four innovative technological projects which significantly improved environmental performance. The benefits became a strong power to change people's recognition and behaviours accordingly. More and more staff and departments eventually were involved in the work with their behaviours changed, including recording daily or weekly data, changing the habit of electricity use, self-consciously saving energy. The common view of being environmental friendly was developed into corporate culture. EMA-related costs were also recorded through a series of collaborations. The benefits of better performance were manifested through EMA-related cost data. A positive loop was completed.

The interesting is that the benefits of improved environmental performance were clear before ESER implemented their projects in 2010. However it did not influence people's changing behaviours towards being environmental friendly. The question is how and why the power could be influential to kick off the change. The lower half of Graph 2 needs to be employed. It gives a deeper explanation of the first question used by ST, which is about the relationship between changes of institutional reality and knowledge or attitudes of human agency.

Underneath the relationship of HA and Structure is a transformation of power between HA and Structure. HA as an individual or top management group has the capacity to make a difference based on their "rules" and "resources," such as ideals, values, knowledge, desires, etc., as well as ability and activities of utilising knowledge, values, and its material conditions. Structure however also provides current morality including mutual rights, normative rules and so on, and meaning of this morality. "Power" of understanding the rules and the capacity to use resources has been transformed between HA and Structure to shape, produce, reshape, and reproduce each other. The structure is dialectic of control that keeps one side in a dynamic social position, and the other side as patterned individuals' manner and consciousness.

In other words, when the authorities realised the importance of energy saving, there was a process for them to re-evaluate their knowledge, ability to make changes, environmental conditions; needs, such as whether or not it would be supported by their parent company CTS; if was it possible to obtain investment; if it would be capable of implementing the policy. There was plenty of evidence of problems being tackled. ESER was set up in 2006; however there were not any real actions relating to energy saving improvements before 2010. One of key staff members mentioned that that was the time that they discussed, argued, simulated in lab, as well as seeking approval and trying to convince.

During this time, the need for change in authority was strengthened and that motivated the key members of ESER. They tried hard to improve their capacity to understand the issues and the capacity to use resources for achieving success. It caused the power to increase based on the rules and resources they had, eventually HA's "power" shifted the "Structure" that changed to adopt not only technological innovation, but also "EMA" tools, although this "EMA" was regarded as "basic".

Once these projects were initiated from 2010, the positive results from EMA tools continually convinced CTS and ensured further approval from the parent company. Meanwhile, EMA convinced managers and staff throughout OSR. As changed behaviours and thinking were routinised, it achieved a new social position. According to Graph 2, after social intercourse, it means the continual production and reproduction of these routinised behaviours and thinking, the phenomenon was structured. For individuals, their manners accordingly were the exposures of their conscious thinking, as well as unconscious instinct.

The phenomenon of OSR was very much fixed with what ST revealed above. Every department has its own working routines to fit in with the purpose of company to save energy use. As was observed, there were obviously routinised behaviours, such as, junior staff checked their energy meters every day, they also initiatively printed little tips "people turn lights off", sticking besides the electricity bottom. Education to be environmental friendly was also designed into "Orientation Training Course" for new staff. There were also different kinds of competitions between various departments, such as ranking the least usage, relevant knowledge, etc. This phenomenon drove HA including individuals and groups in OSR to carry on their needs and routines for fitting into the surroundings, although it might be not be in their consciousness. Therefore, the structure continually reshaped, reproduced and conceptualised HA's rules and resources by its power. It dynamically kept the balance between HA and Structure as a process.

The model in this thesis, based on previous studies, draws on both "the duality of structure" and "the three dimensions of the structuration process". This model helps one to gain a better understanding of the case, also a better view of the "interplay between the agent and structure". It explains how institutional reality and knowledge or attitudes about human agency influence each other, shape and reshape each other, as well as how the capacity for effective actions is improved. It could provide a better understanding of the process of adoption of EMA and relevant actions. In fact, these are substantially the three uses of ST according to the literature review.

It is a fact that structure is not a statics process, but dynamic over time. Rose and Scheepers in figure 6 have made it clear that "it starts with a simple model as mutually dependent structure and social interaction and then evolves as they are reproduced over time and space." (I did, P8).

In fact, for the time being, the work of ESER has been shifting in recent years to keep regularly evaluating that data that can be collected, rather than further innovation. Once the dynamic balance has been set up, the constraint is built over time. It is a fact that EMA adoption requires professional accountants to be deeply involved and continually innovating. How to go beyond the "comfort zone" is one of keys for further EMA implementation and improvement. It will also provide more suitable operational guidance for practitioners in the company.

Furthermore, in spite of the constraints, there is still a need for further improvement. Based on the literature, IT provides a good platform for understanding and establishing new institutional norms, and maintenance of the institutional structure. Also ST gives a good picture of the change between HA and Structure, and the changing process, to reveal further how and why the changes happened. The ontological status is recognised by humans through their own interpretation based on subjective knowledge and values. It then leads to relevant behaviours and manners with their conscious and unconscious. Therefore, it could be seen a thread that underpinned behaviours in the two layers: (1) consciousness/unconsciousness layer and (2) knowledge, value layer. A key issue is how do these elements eventually trigger changes in behaviours is?

For instance, the benefit of better environmental performance was not a new thing, however most individuals or groups in OSR were not convinced of the benefit until change time. For top managers, it might be an issue relating to complex conditions such as investment, ability and so on, but for most of people, it is probably just an issue relating to the change of thinking and behaviours. What is the key to make the lever move? It is significant not only for the starting point, but also for further EMA adoption by the company. There seems to be a vague area for ST to explore andclarify.

DiMaggio and Powell (1983) pointed out that established institutions have their own forms of self-regulation and maintenance. It can be a powerful constraint on other changes and a source of resistance to new internal systems, including the changes in the conventional management accounting system and EMA adoption.

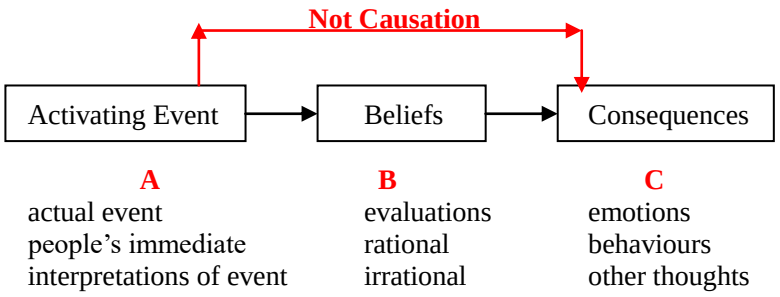
Therefore, a psychological thinking base in the Chinese context around OSR is employed below. The foundation of psychology principles relating to behaviour changes might be able to reveal

the particular context in OSR.

7.2.3 Further psychological and philosophical thinking base on Chinese context

In a psychology study, there are many issues relating to what makes behaviours' change including: antecedents experience, values, happiness, and beliefs, etc. Cognitive Behavioural Therapy is one of the methods even used to guide and modify people's behaviours in the practice. A model of Activating Event, Beliefs, and Consequences (ABC) is demonstrated to explain the consequences below. These consequences comprise behaviours, emotions, and other thoughts.

ABC model:



The key to the ABC model is that behaviours as Consequences (C) are not caused by an Activating event (A), which people usually think. The fact is that, a good/bad thing (referring to A) does not directly result in behavioural reaction (referring to C); but is caused by what people believe (referring to B). Briefly, C is not the result from A, but is the result from B. This relates to people's experience, values, and knowledge and so on, that belongs to general consciousness (BCS.com 2016). However, "beliefs" could also be something beyond these consciousnesses having a very personal trace as well. For example, a rope could be useful in daily life, but could be threatening for a person who had experienced a snake attack, which might be at a conscious or an unconscious level. This is also more likely to fit in with the arguments of ontological realism and epistemological subjectivism.

As a result, the beliefs that might be beyond experience, value, knowledge are very important. It directly leads to an influential power to shift and change human's thinking, emotions, and behaviours. The belief sometimes does not independently exist; also it could be strongly embedded into relationships with other people and with the environment.

The Longman dictionary of contemporary English (2003) explains the word "belief', by using "trust", "assurance", "believe", "confidence", "faith", and so on. It certainly contains different

levels and aspects. For a Chinese individual, there is a tradition of being collective and Taoist thinking of "Yin-Yang", which emphasises "balance" among people and with nature as discussed earlier in the thesis. Therefore, to discuss the meaning of "belief" it is important to explore it under a certain social environment for understanding of people's behavioural change in OSR.

Among complex social systems, "belief" could be understood as "trust". Luhmann (1979) conceptualised "trust" from a social perspective and identified it as a duality structure: "human trust" based on emotion link, and "regulation trust" based on norms link. Yamagishis (1994) later developed his own explanation as "general trust" and "special trust". The former was the trust on objects' characters, intentions. The latter was the trust on regulations or norms of motivating good deeds. Seligman (1997) proposed a triple structure to analyse "belief" in terms of "trust", "confidence", and "faith". It interplayed to construct the concept of "belief" from different facets that was likely to imply a more complex concept of "belief".

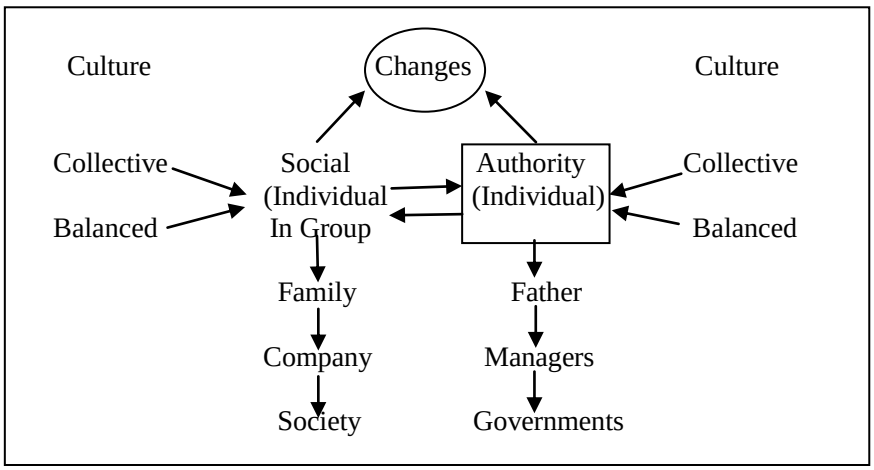
Max Weber's study on "Chinese Religion: Confucianism and Taoism" published in 1915, which concluded that in China there generally was not a trust among Chinese, and the so-called "trust" is founded on the community of blood, instead of the community of belief. Later, Fushan's conclusion in 1998 also showed that the relationship of Chinese society was built on the foundation of families with certain siblingship, and it lacked trust in outsiders; and it could be called a society that lacks general trust (Li and Liang 2002).

Li and Liang continued this study based on an investigation of 2,000 Chinese participants in Gongdong province in 2002. The output of the investigation has links with previous studies, however it proves the fact that there is a considerable difference between the west and China. First, Chinese do not show a general and extreme lack of trust in outsiders in the social system, however the community of blood is one of the key issues that impacts on whether or not trust exists. Second, both the trust of the community of blood and outsiders heavily rely upon "emotion connotation". This could be understood as that "Special Trust" that is generally existing, which is directed, first to blood, and second to strong emotional links (Li and Liang 2002).

In other words, this is where "guanxi" has been inflectionally affecting people among relationships. In fact, without "guanxi", this case study would have been impossible to produce. From the viewpoint of staff in the company, it is not the issue of whether or not "a case study" is useful or helpful for a company, it is about whether or not "the person" carrying out the case study is trusted to be open.

This “guanxi” has a strong root in the word of “belief” or “trust” in relationships. Therefore, it is necessary to illustrate the relations of Chinese society as previously discussed to examine how “belief” of individuals or “trust” in relations works in reality. Graph 3 is demonstrates how “trust” triggers the change of individuals including OSR’s. It shows the relations among people in a Chinese context with traditional thinking and culture, named as “Authority-Social Relations” below. The core of that is “trust on authorities makes up a social group”.

Graph 3 My Model of Authority-Social Relations



The relation between society and individuals has a strong and long tradition stretching back several thousand years. Authority always plays an important role in China that is constituted by collective society. Also Chinese culture and traditional philosophy have been influenced by Taoism which emphasise “Harmony” by the principle of “Yin-Yang” (figure 5). It could be regarded as a dialectical balanced relation.

To observe the Chinese social system, there are three layers of relations representing the whole from a management perspective. Family as the smallest unit of a society, individuals in family society tends to trust their father who is the authority. Then, the second layer of society is set as companies, authorities seem to be managers. The next layer is expanded to small or big societies, and then different levels of government would be the authorities. It all comes from the root of community of blood and the emotional connotations. The trust on authority seems to be natural.

These relations of layers could be understood in several aspects in reality. First, Chinese companies tend to set up a culture or intimacy acting as a “family”. People believe that it helps to manage and discipline all members. Although this family-based culture has changed when foreign companies impact strongly through management involvement, the tendency towards

"familialism" does not seem to fade away since both state-owned companies and private Chinese enterprises have increased their power due to well-developed family-based culture in recent years. It is interesting to note that this is where the power between HA and Structure has been shaped and reshaped within a bigger area, however this is not the concern of this field study.

OSR is a big and historical state-owned company and “family culture” is encouraged throughout the company not only by OSR, but by its parent company CTS. It could be found everywhere. For instance, seventeen dormitory buildings were designed at the start-up of the company. This investment showed in part the intention to bring employees close physically to work. It successfully contributed to the building up of a team-work spirit among these employees, who by now have mostly become managers in various departments with strong loyalty to the company.

There are two “authorities” presenting different relations based on this “family” orientation. Managers as key members of this “family” are closer with “authority”- top management leaders. Also managers in their working group are “authority” respectively. This “family” culture prefers intentionally to encourage the trust on “father”, which is represented by top management leaders and managers.

It can be analysed that once “authority” encourages an individual's “change of behaviours or values”, it could not necessarily accord with individuals knowledge, personal value, rules and so on. Since the consequence of behaviours is the result of “beliefs”, the trust on “authority” could be playing a significant role to shift individuals’ evaluation and interpretation, which changes individuals’ behaviours moving towards what “authority” encouraged.

“Trust” could be recognised as the key trigger pushing individuals towards change during the process of Structuration. This could explain the phenomenon that large number of employees in China often carries out innovative action plans smoothly in accordance with the plan. The corporate culture can be established effectively based on this “trust” in authorities. “Trust” strengthened the power of the impact on the structural rules and resources, which strongly shape the new Structure by influential HA. In other words, it is not the issue whether or not environmental improvement is good enough for individuals (which they might not be conscious of); it is the issue of trusting in authorities’ choice.

Second, in the third layer of the expanded social group in Graph 3, a company is also a small social group. Its authority then becomes the local government. It is possible to illustrate the phenomena and explain the reason for government’s influential power upon Chinese companies from the relations of social-authority perspective. Those “authorities” of companies are also an

individual in the bigger circumstance. An individual as a company's representative has also been influenced by "authorities" - the government. The power of decision-making is underpinned by how they interpret "authorities" encouragement, it would be impacted by their "belief", and "trust in governments" is something underneath.

For OSR's current situation, it could benefit from the 13th FYP that actively encourages tourism development. The authority, as both local government, and the authority of the parent company, CTS would spend more attention to this issue. It means that there would be more benefit from regulations, rules and preferential policies. These all could be regarded to increasing the power of rules and resources in terms of further development.

And yet, it is the fact that further innovation is indispensable. Since 2013, a challenge of losing customers has emerging that caused decreasing income and the amount of customers in Chart 18. Although the second investment project would bring OSR new activities that would attract customers, scholars have noticed that it is not a sustainable way to develop the tourism industry showed in "Tourism Green Paper: China's Tourism Development, Analysis and Forecast". The central government promotes "innovation on suppliers", in terms of tourism, it means to encourage the concern on upgrading industrial structure, meeting customers' needs, as well as investing in sufficient content and quality of each activity supplied rather than increasing projects (TRS CASS 2015).

It is a good opportunity to take advantage of that to engage further EMA implementing and adoption. In spite of those tourism products itself, OSR as a good example of environmental performance improvement for the governments. It does not only provide the benefits on cost saving, but also continually establish better reputation to governments and social side, as well as customers trust, which is very important for business too.

Third, the surrounding of this three-layered relation is cultural influence in Graph 3. Balanced and collective culture constitutes family culture from tradition thinking. It also could be an internal resistance in terms of EMA implementation and adoption. China is not a form individual power but is power in a balanced collective.

Therefore, the authorities as individuals, they unconsciously received the culture required, which also could be explained as the similar process as above through Structuration Theory.

This power could also present a difficulty for authority since they are the core people to initiate changes with their rules and resources. These authorities as individuals are also embedded

themselves into certain societies, which they need to consider “balance” seriously in this collective society. Whether or not the needs raised would meet the requirements of balanced society is not easy decision to make.

Three years’ hesitation before OSR kicked off a serial innovation projects in 2010 had exposed their complex thinking, it would be difficult to analyse exactly without the interview on “these people”. However it could be guessed through relevant staff and their working content, which is to persuade Mother Company, managers, relevant staff etc. to obtain “trust” on them. Therefore, it could assume that it would be an important internal barrier for further EMA adoption and implementation, especially, it lacks of professional guidance due to current situation of EMA study in China.

Finally, it might be also a good explanation on the comparison between LAT society and OSR society. LAT is a familial society in which majority resident “trust’ on their “father” (several elders as the leader group in a company). This trust or beliefs directly lead their behaviours or emotions and thoughts. However once “father” as powerful HA questions the rules, norms or new values and ideas, it would be a strong constraint on individuals changing their behaviours. It then would hinder the patterned behavioural changes in institution. The power of change tends not to occur from its old self-regulation. This could be an underneath reason deriving local resident to resist on any reforms or innovation. Again, the problem is not the issue of whether or not it obtains benefits, but the issue of trust, probably with consciousness as well.

Oppositely in OSR society, the power from local resident is fairly weak. It could be assumed that there is not much familial root as the immigrant and new town. Although people would tend to trust on “the authority” from familial relations, without complex relations and historical roots the power of “father” authority is more likely to be weak than authorities in the company and local government. In other words, the power from local governors or the company would be comparably to increase the break-apart potential constraints from local resident. Every individual could not escape from the culture and traditional thinking.

However, it would be argued that local residents as external stakeholders could be able to play a role of inspection in terms of better environmental performance.

In conclusion, a small step could trigger a big change that is possible in Chinese society. With regard to the discussion above, it seems to be important to change authorities’ thinking and beliefs. It would give an influential power to reshape the “Structure” by its special “be trusted” from single individual. Also it tends to be a top-down effect.

In addition, a small change of down-top stream leading to big step seems to be also a possibility from Chinese history. It is also the similar pattern to change the "key person" (authority) at the bottom of society. LAT might be a good example to show the power form the down-top stream, although this power is more likely to be a constraint rather than to be a driver of further reform.

Theoretical frameworks employed have effectively exposed the facts of EMA implementation and adoption in reality, as well as revealed the "reality" based on the understanding of macro-world including national and social context, and the "reality" based on the interpreting of micro-world regarding with individuals' beliefs, cognitions, values, knowledge leading to behaviours changes. All has demonstrated a whole picture of intrinsic sustainability.

It is true that the sustainability is not independent only relying on innovation in technology, skills these visible assets. It requires a big change for every nation, and every individual, since it is the issue about living things including human being. Therefore, the focus of "change" is indispensable, which is in fact relating to social, psychological, philosophical sciences for better understanding of the "Change". Indeed, it still has a big space to explore, especially under different and various context.

However there is still a need to encourage corporations to take responsibility moving towards sustainability. Relevant researches needs to consider the other enquiry from the corporations. Therefore the final part of my study would provide some conclusions and suggestions on EMA implementation and adoption from management perspective, based on previous analysis as the following.

Part Eight: Conclusions and suggestions to the company from a management perspective

With regard to EMA implementation and adoption for OSR in practice, there are three issues to be concluded for the future development from management perspectives. "Facilitating" helps making EMA implementation easier to happen. Then "Barriers" aims at discovering those rules or problems that prevents people from adopting or implementing of EMA, it focuses on the limitation. The last, "Challenge and opportunities" is to propose those issues that tests strength, skill, or ability for improvement of EMA; as well as to display the opportunities and suggestions accordingly.

8.1 Facilitating

First, the benefits obtained certainly facilitate EMA improvement for OSR. It comprises visible and invisible rewards and assets. They could be effective drivers of continual EMA implementation for the company.

OSR has accumulatively obtained more than 2.5 Million RMB awards and 1 Million RMB exemptions, as well as considerable funding for technology innovation. Three patents during technology upgrade projects benefit to both costs saving and being first mover.

The rewards of improved environmental performance are appreciated by local environmental agency and governments. OSR once for a while was a representative of Zhuhai City being leisure and recreational with its distinctive reputation.

Second, achieving competitive advantages drive the business to go forward as the first mover of EMA implementation in China. For several years, the improvements of environmental performance in terms of innovative technology, skills, knowledge, and awareness have reshaped the "structure" of OSR society. EMA adoption and implementation has seemed to be easy to get on with current corporate culture.

Conversely, EMA implementation also benefits to retaining employees when differentiating itself from many aspects. As a result, employees are generally proud of what the company has achieved. This intercourse has strengthened he engagement of EMA improvement. Also, it could be good

to motivating individuals to change their behaviours as well.

Third, the special background of OSR could contribute to further EMA implementation and adoption. The 13th FYP national plan highlights the importance of tourism industry being sustainable since last year. As one of the most important state-owned company, CTS, the mother company of OSR has shifted the vision and mission to meet national goals. This would not only lead OSR to further development economically, but also to obtain more supports for EMA improvement.

Fourth, Chinese traditional culture being harmonious and balanced are regarded complex and uncertain, however it fits in the characters of sustainability. This is an invisible driver to be mutually beneficial to improve sustainability for the business.

Traditional philosophical thinking from Taoism concerns Yin-Yang principle. It believes that the power of harmonious and balanced relations is extremely influential. It also displays this process of dynamic relations changing with balance. A famous idiom from Lao-Tzu (philosopher in the Spring and Autumn Period, about BC 500, founder of Taoism) "上善若水，水善利万物而不争" is saying that "the highest level of ethics is like water，which is beneficial for all things, without striving for fame and gain". It means that "The best good" is to give others opportunities and to absorb it as a whole.

It is true that Chinese culture and philosophical thinking tend to absorb new things to make it as fitting into the environments; as well as maximized benefit is not the core thing that is highly valued by majority traditionally. The societies around OSR have also showed the open attitude to accept new things and outsiders. It is such an important element for EMA implementing in practice as well.

Finally, Social-authority pattern on the trust is powerful. Key person can engage a change of EMA implementation, which could bring a small step from "authoritative-individual" to a big change of social reflection.

This "familial" trust with managerial tools could bring more effective and efficient changes towards EMA once the authorities agree. Since OSR is a typical stated-owned company, familial culture is highly encouraged. It does not only take effective actions with regard to EMA requirements, but also easily sets up particular culture towards to being sustainable.

As a large stated own company, although the top management needs to be strongly convinced in

term of investment on environmental improvement, which it could be seen for the way of sorting relevant environmental data of ESER that has implied a top down managerial style rooted from "familial trust" in the company. This has successfully helped to achieve the purpose of environmental improvement goals, and also it could be expected to benefit to further action plans and effective improvement of EMA implementation and adoption in the future.

8.2 Barriers and suggestions

Data disclosure is a strong constraint in OSR.

The data collection system of EMA is used to assess and disclosure of environmental-related financial and material information. The better collection could be achieved the better performance could be expected. Without accurate and visible information, it is hard to effectively and efficiently contribute to management decision.

However the issue has to faces to the fact that the research and study on EMA in practice in China has fairly left behind. As a result there is not supervisory and guaranteeing function under the governments or professional associations. Hence, these would not be positive impacts on EMA improvement (Wu and Tang 2011). The problems of data collection in OSR have been discussed as a key issue of EMA implementation in a previous section.

With regarding to the solution, there is a strong need for an integral team to identify each item, not only ESER staff over time to set up more accurate systemically recording mechanism. The core issue at the beginning could be focused on establishing material flow information based on "output equal to input", which has discussed in previous section in this paper. It is certainly required that accountants, engineers, and managers working together.

What could be significant is that there would be massive waste and inefficient found only relying on a chart of "material flow information", which could lead huge cost and resource saving even without more investment on it.

However it does not mean that investment is less important. Another key issue of data is "recording" that needs to be systemically collected from daily routines. For example, appropriate investment on the system of meters reading (to change mechanical record by labours every week to automatically electronic meters), might be not in turn immediately, however it would be contribute to the issue of being efficient and accurate.

Then, another kind of strong barriers could be internal consistence. The character of self-regulation within existing "structure" is powerful. People tend not to change that is exposed by literature reviews. Without systemically dynamic on-going process, EMA improvement is easy to still.

After 2013, it has seemed that ESER in OSR has shifted their core work to initiate relevant activities among employees, to maintain weekly report based on current recording system to top management. Although these works are of importance, it is in fact not enough for further improvement.

EMA as a managerial tool requires not only technique skills of EMA but also it is a process relating to strategy management process for both long and short terms. However several difficulties in reality need to be considered by OSR.

First, the leader groups would change every three years; which is one of rules in the most state-owned companies. It could be an obstacle for setting up a long-term goal to achieve continual EMA improvement.

Second, top-down management has its own advantages; however it is unlikely to effectively encourage employees' own initiative. The belief of "no fault is the best" is of the majority. The goal of work is not to make a mistake, rather than seeking to achieve personal goals or enjoying works.

Third, "familial culture" is highly appreciated; however "every white edge comes with black edge" as idiom. The negative of this culture is to be averaging in the quantity of works and rewards of achievements. It could be easily read out through interviews that make passive attitude on works and less motivation. Although it is a general problem of management in OSR, it could heavily impact on EMA implementation since it specially requires team-work with initiatives.

Therefore, it would also a challenge for EMA further development and improvement. Both management teams and Mother Company need to pay attention on the issue. However oppositely speaking, EMA as a special issue, it could be suggested to deal with as a special case in the company without challenging whole system of management style and strategy. A success in the special and beneficial case could probably bring more confidence to further reform on the management system as well. This possibility could be proved both in reality and in Saturation Theory as we discussed.

Finally, current modern China could be a barrier in a way of being capitalism.

Current social culture after 30 years being more capitalism obviously tends to focus on “Money”, which is more and more accepted by common people. However EMA in the whole concept of being sustainability is a tendency towards Chinese traditional thinking of being harmony (balance between nature and human being, and balance individual itself inside). To what extent do people realise and aware the value of “harmony” that could be directly a barrier or challenge for the company.

The reality of EMA without full development and even without starting in China does need more active involvement both from organisation and individual. Whether or not to address the issue that could lead it to be a constraint or challenge, however it could be an opportunity for OSR to differentiate itself from others.

8.3 Challenge and opportunities

Firstly, educating on “value” and “awareness” is time and money consuming. It is a big and general challenge for corporations to adopt EMA. EMA with its profession and systemically dynamic process is not only a simple and independent project, as well as its value could be difficult to receive by individuals.

However, based on the analysis of the company and its environments, there is an opportunity to face to this difficulties. Middle level managers could be a core role to trigger the change of balanced lever to junior and majority staff, and to adopt EMA implementing for better performance. However it is a key that how middle managers agree with new ideas since it is lack of research and basic field study in China in terms of EMA. It is not easy to establish its value important due to “unseen”. It could be a big challenge to educate the accountants first, and then to effective explain to middle level managers who is significant for implementation in practice later.

This challenge could create the opportunity for OSR to differentiate itself from competitors. OSR has a strong background being a state-owned company. The trust as a key of “structure” change is powerful within the company. In other words, it could be strongly reshaping “Human Agency” behaviours, beliefs through the “trust” on authority although it might still lack awareness, value or relevant knowledge so on. EMA adoption therefore could be expected to take place easier than those private competitors companies in reality.

Second, technology, accounting, and process innovations can be quite costly. EMA as a relative new stuff is not only relating to technology innovation in OSR, but it is the core of traditional accounting innovation. It requires substantial knowledge and technology, however the difficulty is that EMA in China is still relatively untried. It needs time and concrete study in reality. Although the centre government concerns practical skills for accurate estimating on sustainable developments, the first mover in the practise does have to bear the cost for uncertainty.

More importantly, EMA as an interdisciplinary subject, and its implementation requiring interdepartmental collaborating, it demands people with better understanding and open attitudes both for researchers, as well as executives and interdepartmental manipulators. Previous experience or background could become constraint to block interactions since people physiologically tend to be self-centred with their own known information. This could be seen through the work of ESER. Although ESER is consisted of interdepartmental managers, and leaders in top management, as well as technicians in their professions, it did not seem to work in accordance. Previous works were mainly focused on technological innovation by ESER.

However, OSR could take advantage of being experienced benefits of doing so as an opportunity to strengthen its core competitive competence. More space of EMA improvements is not only produced by technology projects, it could be easily found through EMA tools even after setting up a chart of "material flow information". It is a time that the accounting department could play an important role of leading on further innovation to data recording, and then to reveal those "hidden cost". It definitely requires relevant managers checking the teams' working process, and technicians checking with principles and process of mechanising, all work together. The Accountants could be the key person to look through the potential weakness and waste. It would become a serial of sufficient and valuable documents for decision-making; as well as to appeal to the public attentions. Although EMA implementation is still experiencing no professional guiding, no supervision, no relevant norms, both visible and invisible benefits still could be highly expected.

By doing so, it would be probably better to set up a communicating platform focus on sustainable development, but utilising EMA tools to estimate relevant performance with figures and recordings, not only "taking things". Then this would certainly help to reproduce benefits in terms of stakeholders'' appreciation and awareness, accurate and sufficient data of EMA, concrete cost saving, and so on. It all would pay back the "cost" of being first mover, not only financially but intangibly.

As the result, it would be a potential to look for further benefits, for instance, retaining and attracting customers or value creation of documenting would push society towards to be sustainable, vice versa, which makes a positive loop in a whole.

Furthermore, the cost on dealing with these challenges could be regarded as paying premiums for new markets; it could reshape and influence the mother company and its peers. And also, it would meet the request and pressure from national expectation on CTS.

Last but not least, the special context of OSR could be a challenge, but also could be an opportunity to engage further EMA implementation. It is true that OSR as a position could strongly initiate social structure changes among their relevant societies, as well as influence on the local governments in past.

However since new development goals and unique location of the Gaolangang area, this position has been fading away. It could be seen from the process of second projects negotiation with local governments. Losing interests by the local governments is a challenge and difficulty for further development. However EMA implementation could be a medium and a unique element to draw governments' attention. A vision and decision from top management is of importance for the next.

Additionally, OSR still keeps its impacts on local society due to those contributions to the local and employees' localisation for many years. It seems that external pressure from local society is weak. However it could be a challenge for further improvements.

External pressure could be a good driver to maintain companies efforts. Sustainability needs to be aware by the public, especially local society. It would help set up a link between the corporation and society not only by benefits but also by loyalty, which could be created by meaningful mission achieved together. Therefore, some actions such as "public platform on sustainability" would improve the level of EMA implementation, as well as it is a good channel to voluntarily show the mission and create public's demand on the issue. It could become a strong competitive advantage to the competitors.

In conclusion, this paper seeks and explores a general solution in practice for being sustainable from management perspective. Hence the research questions imply two meanings: what is the tool of that and how is utilised in real Chinese companies, as well as, how and why could affect the use of the tool to improve sustainability at the end.?

This study therefore mainly focuses on the detailed EMA performance data, which is not only used for later analysis of performance changes. But more importantly, it could be an example of dealing with data for the business in reality, since “related environmental cost data” is a key for EMA implementation. Furthermore, another part of this paper aims at revealing those things underneath of EMA performance, it comprises the processes of changes, philosophical thinking of individuals under Chinese culture. It is expected to be able to unearth those intrinsic elements of being sustainable.

My personal Chinese thinking believes that “Small step would trigger big changes”. It is not a talkative dream or a wish. A new world starts from individuals’ minds and that actually happens every day.

Appendices

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Figures, Charts, Graphs:

Annexes

Annex 1: Overview on Environmental Cost Scheme

(UNDSD 2001, p 16).

	Air/Climate	Waste Water	Waste	Soil/Ground water	Noise/ Vibration	Biodiversity/ Landscape	Radiation	Other	Total
1.Waste and emission treatment									
2.Prevention and Environmental management									
3.Material purchase value of non-product output									
4.Processing costs of non-product output									
Σ Environmental expenditure									
Environmental Revenues									

Annex 2: Structure of the Chart of Accounts

(UNDSD 2001, p 33)

Class of accounts	**content**	**Allocated to**
0	Fixed assets	Balance sheet
1	Stocks	
2	Other current assets and deferrals	
3	Provisions, accounts payable and deferrals	
4	Operating earnings	Profit and loss accounts
5	Material expenditure and services received	
6	Labour costs	
7	Depreciation and other operating expenses	
8	Financial earnings and expenses, taxes	
9	Equity capital, reserves, closing accounts	Balance Sheet

Annex 3: General Input/Output Chart of Accounts

(UNDSD 2001, p 43)

INPUTS in kg/kWh	**OUTPUTS in kg**
Raw materials	**Product**
Auxiliary materials	Main product
Packaging	By products
Operating materials	**Waste**
Merchandise	Municipal waste
Energy	Recycled waste
Gas	Hazardous waste
Coal	**Waste Water**
Fuel oil	Amount
Other fuels	Heavy metals
District heat	COD
Renewables (Biomass, Wood)	BOD
Solar, Wind, Water	**Air-Emissions**
Externally produced electricity	CO2
Internally produced electricity	CO
Water	NOx
Municipal water	SO2
Ground water	Dust
Spring water	FCKWs, NH4, VOCs
Rain/ Surface water	Ozone depleting substances

Annex 4: Tracking Matrix for Material Flow Balances

(UNDSD 2001, p 44)

	Amount in kg., KWh l	Purchase value	Account number	Stock-keeping	Production planning system	Direct costs	overhead	Assigned to cost centre	Other records/measurements	Calculation/estimates
Raw materials										
Auxiliary materials										
Packaging										
Operating materials										
Energy										
Water										
Product										
Waste										
Waste water										
Air emissions										

Annex 5: Table of Company Data

(Rovira et al. 2007)

Province/ Company	**Interview with**	**Industrial Sector**	**Ownership**	**Size - employees (empl/s)- Sales**	**Sales to**	**Sales to**	Com/ive Ad/age
Yunnan Province							
Chuxiong Ancient Tourism Co	Manager	Tourism	Private	200 empl/s	China	-	Quality
Kunming Iron & Steel Group co ltd	Manager	Steel	State owned	21000 empl/s 12.5 billion Yuan	China mainly Some Worldwide	B2C	Quality
Kunming Yunnei Power co ltd	Manager	Diesel Engines	State owned	1527 empl/s 140,111 engines	China	B2B	Quality Costs
China Electron-Power Co	Enviro Manager	Coal power	-	-	China	-	-
Yunnan Aluminium	Manager	Metallurgy	State	3,220 empl/s 8 billion Yuan	China Other Asian	-	Quality
Yunnan Furui Chemical co ltd	Manager	Chemicals	State owned	1,152 empl/s 1.2 million tonnes	China 50% Asian 50%	B2B	Quality Costs
Yunnan Salt & Chemical Industry co ltd	Manager	Salt	State owned	4,100 empl/s 0.6 billion Yuan	China	B2B 50% B2C 50%	Quality
Yunnan Sanhe Automobile	Director	Vehicle repairs	Joint venture with Japan	160 empl/s 3 million Yuan	China	-	Quality
Yunnan Yibiao Cement	Manager	Cement	Ltd Co with some government shares	280 empl/s 80 millionYuan	China Some Europe & Asia	B2B 80% B2C 20%	Cost Quality
Jiangsu Province							
Avery Dennison	Manager	Stationery	Ltd. American owned	400 empl/s $75 Million	China 80% Asia 20%	B2B	Cost Quality
Jiangsu Changyu Chemical Co ltd	Enviro Manager	Chemicals	Incorporated	360 empl/s 230 million	Europe 60% Asia 30% Other 10%	B2B 30%	Quality
Jiangsu Jiangjia Electronics Co ltd	Enviro Manager	Electronics	Incorporated	960 empl/s 120 million	Europe 10% Asian 90%	B2B	Quality
Jiangsu Suhang Electronics Co ltd	Manager	Electronics	Private	300 empl/s 100 million	International 70%	B2B 80%	Quality
Shanghai Chemicals	Vice Director Safety & Enviro	Gas	Listed with state owned majority	580 empl/s 780 mil. Yuan	China	B2B	Cost Quality
Shimano Kunshan Bicycle Component Ltd	Enviro Manager	Mechanicals	Japanese owners	1200 empl/s 800 million 400 million assets	Europe 40% Asia 40% Other 20%	B2B 30%	Quality
Shanghai Meishan Iron & Steel Co	Vice Director Safety & Enviro.	Stainless Steel	Listed with state owned majority	4-5k empl/s 10 billion Yuan	China 90% Korea & Japan 10%	B2B	Low cost
Taitien Electronics	Manager	Electronics	Private	700 empl/s $10 million	Taiwan Other Asian	B2B	Quality Cost
Zhangjiagang Jinling Textile co ltd	Manager	Textiles	Incorporated	1800 empl/s 350 million	Europe 70% Asia 20% Others 10%	B2B 70% B2C 30%	Quality

Annex 6: Total Corporate Environmental Costs

Environmental protection expenditures (emissions treatment and waste prevention)
+ Material Flow costs (Costs of unproductively utilised materials, energy, capital and personnel)
= **Total corporate environmental costs**

Environmental costs (quoted from Jasch 2006, p1202)

		Air+ Climate	Waste-Water	Waste	Soil+ Ground water	Others	Total
1	Waste and emission treatment						
2	Prevention and environmental management						
3	Material purchase value of non-product output						
4	Processing costs of non-product output						
	∑Environmental costs						
5	Environmental earnings						
	∑Environmental costs/earnings						

		Air+ Climate	Waste-Water	Waste	Soil+ Groundwater	Others	Total
1	Waste and emission treatment						
1.1	Equipment depreciation						
1.2	Operating materials						
1.3	Water						
1.4	Energy						
1.5	Internal personnel						
1.6	External services						
1.7	Fees, tax and fines						
1.8	Insurance						
1.9	Remediation and compensation						

		Air+ Climate	Waste-Water	Waste	Soil+ Groundwater	Others	Total
2	Prevention and environmental management						
2.1	Equipment depreciation						

2.2	Operating materials						
2.3	Water						
2.4	Energy						
2.5	Internal personnel for environmental protection						
2.6	External services for environmental mgt						
2.7	Others						
2.8							
2.9							

		Air+ Climate	Waste-Water	Waste	Soil+ Groundwater	Others	Total
3	Material purchase value of non-product output						
3.1	Raw and auxiliary materials						
3.2	Operating materials						
3.3	Water						
3.4	Energy						
3.5	Others						
3.6							
3.7							

		Air+ Climate	Waste-Water	Waste	Soil+ Groundwater	Others	Total
4	Processing costs of non-product output						
4.1							
4.2							

		Air+ Climate	Waste-Water	Waste	Soil+ Groundwater	Others	Total
6	Environmental Revenues						
6.1	Subsidies, Awards						
6.2	Savings						

Annex 7**:** Physical Material accounting: Input and output

(quoted from IFAC 2005, P33)

Materials Inputs	**Product Outputs**
Raw and Auxiliary Materials	Products (including packaging)
Packaging Materials	By-products (including packaging)
Merchandise	**Non-Product Outputs (Waste and Emissions)**
Operating Materials	Solid Waste
Water	Hazardous Waste
Energy	Wastewater
	Air Emissions

Annex 8: The Coefficient of Energy Resources Equal to Coal (Baidu 2012)

能源名称平均低位发热量折标准煤系数
原 煤 20908 千焦（5000 千卡）/千克 0．7143 千克标准煤/千克洗
精煤 26344 千焦（6300 千卡）/千克 0．9000 千克标准煤/千克
焦 炭 28435 千焦（6800 千卡）/千克 0．9714 千克标准煤/千克
原 油 41816 千焦（10000 千卡）/千克 1．4286 千克标准煤/千克
燃料油 41816 千焦（10000 千卡）/千克 1．4286 千克标准煤/千克
汽 油 43070 千焦（10300 千卡）/千克 1．4714 千克标准煤/千克
煤 油 43070 千焦（10300 千卡）/千克 1．4714 千克标准煤/千克
柴 油 42652 千焦（10200 千卡）/千克 1．4571 千克标准煤/千克
液化石油气 50179 千焦（12000 千卡）/千克 1．7143 千克标准煤/千克
天然气 32198-38931 千焦（7700-9310 千卡）/立方米 1.1-1．33 千克标准煤/立方米
焦炉煤气 16726-17981 千焦（4000-4300 千卡）/立方米 0．5714-0．6143 千克标准煤/立方米
高炉煤气 1.286 千克标准煤/立方米
电力(当量)3596 千焦（860 千卡）/千瓦小时 0．1229 千克标准煤/千瓦小时
主要能源品种折标准煤参考系数
注:1 千克标准煤的发热量为 7000 千卡;1 千克标准油的发热量为 10000 千卡。标准煤与标准油单位的转换:7/10 或 10/

Annex 9: Questionnaires and sorting

Sheet A: Sustainable Tourism Questionnaire（for business and staff）
表 A：可持续性发展旅游调研问卷（针对企业内部管理团队和员工）

1. Please fill in basic information as below: 请填写下列基本信息

1.1 Your name 您的名字
1.2 Job title and how long have you been working as this position 您的职务及现任时长
1.3 The name of company or organisation 您企业的名字
1.4 Established in (year) 哪年成立的企业
1.5 Address or location 地址
1.6 Contact details (email/phone)联系方式（邮件及电话）
1.7 Core activities 您企业的主要商业活动
1.8 What is your tourism product? 您的旅游产品是什么？
1.9 What is your business core value? 您企业的核心价值？
1.10 Number of Employees 企业员工的人数？
1.11 Your income level monthly 您的月收入水平在如下哪个范围？
0-3,000/ 3,000-8,000/8,000-15,000/15,000-25,000/25,000 above 以上
1.11 Average monthly income for local 当地的平均月收入在如下哪个范围？
0-2000/2000-4000/400-6000/6000-8000/ others (Please specific)其它（请具体列出）

Sheet A: Sustainable Tourism Questionnaire（for customers and local people）
表 A：可持续性发展旅游调研问卷（针对游客和居民）

1. Please fill in basic information as below: 请填写下列基本信息

1.1 Your name 您的名字
1.2 Which nation / province were you born? And where do you live now? 您的出生地和现居住地？
1.3 What is your job 您的工作是什么
1.4 Contact details (email/phone)您的联系方式（邮件及电话）
1.5 How long have you been visiting/staying this tourism site? 您在这里参观与居住多久？
1.6 Who have been staying/ visiting with you together?您跟谁一起来旅行？/哪些家人与您居住在此？
1.7 Your income level monthly 您的月收入水平在如下哪个范围？
0-3,000/ 3,000-8,000/8,000-15,000/15,000-25,000/25,000 above 以上
1.8 Average monthly income for your local 您所居住地的平均月收入在如下哪个范围？
0-2000/2000-4000/400-6000/6000-8000/ others (Please specific)其它（请具体列出）

2. **Please rank importance of these stakeholders to your tourism business? 请为以下利益相关者对您处旅游业务影响的重要性打分（相应数字下划勾）**

(1=no importance 一点不重要, 2=less importance 有一点重要, 3= importance 重要, 4=more importance 比较重要, 5= most importance 非常重要, 6=don't know 不知道)

Stakeholders 利益相关者		1	2	3	4	5	6	∑S	∑R	∑C	∑A
2.1Customers 顾客	Domestic 国内			1		2345678 90		4.6	5	5	4.8
	Overseas 国外			137	89	24560		4.2	4	4.3	4.2
2.2 Employees 雇员			1		6790	28		3.5	4	4.3	4(7)
2.3 Supply chain 供应链合作者	Hotels 酒店		1		346789	250		4	4	4.3	4.1
	Tour operators 旅游接待		1		79	2345680		4.4	4.5	4.7	4.5
	Transport 交通		1		37	2456890		4	4.5	5	4.6
	Restaurants 餐饮		1		379	245680		4	4.5	4.7	4.4
	Travel agencies 旅行社			13	789	24560		4.2	4.5	4.3	4.3
2.4 Investors 投资方	Private shareholders 私人股东		59	378	1246	0		3.8	3.5	3.3	3.4
	Government funds 政府资助			59	238	1460	7	4.2	5(1)	4	4.2(9)
	Retained earnings 回报再投资			689	1237	540		4.4	3.5	3.7	4.0
	Bank loan 银行贷款	9		678	1234	50		4.2	3	3	3.6
2.5 Government 政府	Regulations 相关法规			8	1679	45230		4.8	4	4	4.4
	Licenses 相关执照			8	1679	45230		4.8	4	4	4.4
	Help agencies 服务机构		16	7	389	2450		4.2	2.5	4.3	3.9
2.6 Environmental 环境	protection agency 环保机构		5		1389	24670		4	5	4.3	4.3
2.7 Environmentalists 环境保护主义者			5	9	67	12480	3	4.3	4	4.3	4.2(9)
2.8 Local communities 当地社区				19	78	24560	3	4.5	4.5	4	4.3(9)
2.9 Others（Specifics）其它利益相关者（请明确指出）				68	5	2	390				3.8(4)

3. What are the benefits your business could gain from sustainable development? 可持续性发展将为您企业带来什么益处？请评估以下各项可能的益处。

(0=not applicable 不适用，1=none 完全没有, 2=little 不多, 3=moderate amount 有一些, 4=a lot 很多, 5=highest amount 非常多, 6=don't know 不知道)

Potential benefits 可能的益处	0	1	2	3	4	5	6	∑S	∑R	∑C	∑A
3.1.Environmental protection 环境保护				1	3569	2480	7	4.2	4(1)	4.7	3.9(9)
3.2.Better economics of local community 改变当地经济				7	15689	2340		4.6	3.5	4.3	4.3
3.3.Better staff training 员工培训				35	189	240	67	4	-	4.3	4.1(8)
3.4.Improvement of employ satisfaction 提高员工满意			1	358	9	240	67	3.6	-	4	3.8(8)
3.5.Making people happier 让人感到更幸福			17		3589	2460		4	3.5	4.3	4
3.6.Company image 公司形象				8	3459	120	67	4.4	-	4	4.3(8)
3.7.New market opportunity 新市场机会				387	4569	20	1	4(4)	3.5	4	3.8(9)
3.8.Increasing market share 提升市场份额				8	34569	20	17	4.3(4)	4(1)	4	4.1(8)
3.9.Keep cost down 降低成本		1		38	5	24	6790	3.6	-	3(1)	3.5(6)
3.10. Short-term profit 短期利益			5	13678	4		90	3	3	3(1)	3(8)
3.11.Long-term profit 长期利益					568	12340	79	4.8	4(1)	4.5(2)	4.6(8)
3.12.Better Customer's experience 更好的顾客体验				7	569	123480		4.8	3.5	4.7	4.5
3.13.Shareholder satisfaction 股东满意				13	2589	4	670	3.8	-	4(2)	3.9(7)
3.14.Management satisfaction 管理层满意				13	2589	4	670	3.8	-	4(2)	3.9(7)
3.15.Contributes to national policy 对国家政策有帮助			59	1	238	40	67	3.6	-	3.7	3.6(8)
3.16.Fair way of distribution wealth 财富的公平分配		1	59		2348	0	67	3	-	3.7	3.2(8)
3.17.Other benefits (please specify)其它好处（请具体指明）				38	25		690				3.5(4)

4. What are the reasons you business has to improve the performance of being sustainable in your business? 什么原因促使您企业为了可持续发展改善措施？请评估以下各项是否为影响原因。

(0=not applicable 不适用, 1=no likely 没有, 2=small likely 有一点可能, 3=Likely 有可能, 4=more likely 很多可能, 5=Definitely 肯定的, 6=don't know 不知道)

Reasons 促进改善的原因	0	1	2	3	4	5	6	∑S	∑R	∑C	∑A
4.1 Government engagement 政府鼓励			7	3	159	24680		4.2	3.5	4.7	4.2
4.2. Customers' demand 顾客需求				178	359	2460		4.2	4	4	4.1
4.3.Suppliers' (tour operators/Hotels/Restaurants) pressures 来自合作供应商的压力（旅行社/酒店/餐饮）			157	360	89	24		3.4	2.5	3.7	3.3
4.4. Environmentalists' pressures 来自环境保护主义者压力		5	37	68	149	20		3.2	2.5	4	3.3
4.5. Local community pressures 当地社区的压力			5	17	89	2460	3	3.8(4)	4	4.3	4(9)
4.6. Social groups such as NGOs pressures 来自社会群体（例如非公益组织）的压力			35	140	689	2	7	3	4(1)	3.7	3.3(9)
4.7. Increasing sales 业绩增长				37	14589	20	6	4	3(1)	4.3	4(9)
4.8. Increasing productivity 产品多样性增长		7		38	1459	20	6	4	1(1)	4	3.7(9)
4.9. Technology innovation 技术创新			13	56	489	20	7	3.2	3(1)	4.3	3.6(9)
4.10. New products & new market opportunities 新产品或新市场机会			3		1589	420	67	4	-	4.3	4.1(8)
4.11. Employees' pressures 来自雇员的压力		790	1	38	4	2	56	3.5	1(1)	1.7	2.5(8)
4.12. Legal requirement 政策法规的需求		9		13	458	260	7	3.8	5(1)	3.3	3.8(9)
4.13.Other reasons (please specify)其它原因（请具体指明）				58		2	6390				3.7(3)

5. What barriers do you recognize preventing your business becoming more sustainable? 您认为企业向更可持续性发展的障碍是什么？请评估以下各项。

(0=not applicable 不适用, 1=No barrier 非障碍因素, 2=weak barrier 微弱障碍, 3=moderate barrier 一定程度的障碍, 4=powerful barrier 有相当的障碍, 5=very powerful barrier 非常大的障碍因素, 6=I don't know 不知)

Barriers 障碍	0	1	2	3	4	5	6	∑S	∑R	∑C	∑A
5.1.Lack training on skills (such as EMA) to staff 缺少对员工的相关培训（例如：环境管理会计相关知识）			5	23678	19		40	3	3	3.5	3.1(8)
5.2. Staff motivation 员工的动力			45	3870	129		6	3	3(1)	3.3	3.1(9)
5.3. CEO or owners attitude 股东或高层管理层的态度			3	457	1689	20		3.4	3.5	4.3	3.7
5.4. Resistance to change 抗拒改变			30	2548	9	17	6	3.2	5(1)	3	3.3(9)
5.5. Insufficient rewards 缺少奖励制度			45	36	12978	0		3	3.5	4.3	3.5
5.6. Current environmental policy 目前的环境政策		4	57	13	689	20		2.8	3	4.3	3.3
5.7. Lack guideline by government 缺少政府指南		4	57	36	1289	0		2.8	2.5	4.3	3.2
5.8. Lack information system on implementing EMA 缺少执行环境管理会计所需的相关信息收集系统			4	5	129	80	367	3.3(4)	-	4.7	3.9(7)
5.9. Sustainability does not bring immediate benefit 可持续性没有立时效益			47	12359		680		2.8	3.5	4.3	3.4
5.10. Lack public awareness of being sustainable 公众对可持续性发展缺少意识			45		39	680	127	2.7(3)	5(1)	4.7	3.9(7)
5.11. Lack budget 缺少预算			2	1456	389	0	7	3	3(1)	4.3	3.4(9)
5.12. Lack support from local community 缺少当地社区支持			23	145	689	0	7	2.6	4(1)	4.3	3.3(9)
5.13.Other barriers (please specify)其它障碍（请具体指明）			5	28			36790				2.7(3)

6. **Do you have any information about your environmental and social impacts? (You could choose more than one Please) 您是否有针对企业发展对环境和社会所产生影响的信息？（可选择任意一个或多个）**

Do you have the sector reports and statistics？ (Yes/ or, if yes, is it possible to have a copy of these?) 您是否有相关的报告或统计数字(是/否，如是，是否可以传阅复印)

Impacts 影响因素的信息		**Impacts yes/no 是/否有影响**	**Report or statistics yes/no 是/否有报告或统计数字**	**Have a copy yes/no 是/否可传阅复印件**	**Y:N**
6.1.Co2 emissions 二氧化碳排放		YYNYNYYYY	NNNN	NNN	**7:2**
6.2.Pollution 污染	Underground water 地下水	NYYYNYYYY	NNNN	NNN	**7:2**
	Land 土地	NYYYNYYNY	NNNN	NNN	**6:3**
	Lake 湖水	NYYYNYYYY	NNNN	NNN	**7:2**
	Air 空气	NYYYNYYYY	NNNN	NNN	**7:2**
6.3. Waste 浪费	Material 资料	NYYYNYNNY	NNNN	NNN	**5:4**
	Natural resource 自然资源	NYNYNYNYY	NNNN	NNN	**5:4**
6.4.Carbon offsets 碳排放补偿		NYYYNYNYY	NNNN	NNN	**6:3**
6.5.Damage 破坏	Natural resource 自然资源	YYYYNYNYY	NNNN	NNN	**7:2**
	Landscape 自然风景	YYYYNYNNY	NNNN	NNN	**6:3**
	Traditional customs 传统习俗	YYYYNYNYY	NNNN	NNN	**7:2**
6.6.Diminish 削弱	local culture 当地文化	YYYYNYNNY	NNNN	NNN	**6:3**
	Humanity 人文精神	YYYYNYNNY	NNNN	NNN	**6:3**
	Ethnic culture 少数民族文化	NYYYNYNNY	NNNN	NNN	**5:4**
	Species 物种	NYYYNYNNY	NNNN	NNN	**5:4**
Others (please specific) 其它信息（请具体指明）		NYN	N	N	

7. **What are the important improvements your business needs to make for being sustainable? 为了可持续性发展企业需要改善的重要方面是什么？请评估以下各项。**

(0=not applicable 不适用，1=no need 不需要, 2=little need 没有什么需要, 3=some need 一些需要, 4=strong need 很强的需要, 5= very strong need 非常强的需要, 6=don't know 不知道) Is it urgent? (Yes/no) 它们是否紧急需要？（是/否）

Improvements needed 需要	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**Y/N urgent**	∑S	∑R	∑C	∑A

的改善								**紧急否**				
7.1.Economics 经济				**7890**	**13**	**2456**		**NN**	**4.6**	**4**	**3**	**4.4**
7.2.Making environment/nature protection policy 制定环境/自然保护政策				**27**	**13589**	**460**		**Y Y**	**4**	**4**	**4.3**	**4.1**
7.3.Staff motivation 员工动机				**129**	**35678**	**40**		**Y Y**	**3.8**	**4**	**4**	**3.9**
7.4.More investment 更多的投资				**178**	**3259**	**460**		**Y Y**	**4**	**4**	**4**	**4**
7.5.Sustainable report 可持续性发展报告				**1**	**235789**	**460**		**Y Y**	**4**	**4.5**	**4.3**	**4.2**
7.6.Environmental report 环境报告				**17**	**2589**	**3460**		**Y Y**	**4.2**	**4**	**4.3**	**4.2**
7.7.Environmental data collection 相关环境信息收集				**12**	**345679**	**80**		**Y Y**	**3.6**	**4**	**4.7**	**4**
7.8.CSR report 企业公民责任报告			**1**	**5689**	**247**	**30**		**N Y**	**3.6**	**3.5**	**3.7**	**3.6**
7.9.Communication with local community 与当地社区沟通				**1279**	**468**	**50**	**3**	**Y Y**	**3.8（4）**	**3.5**	**4**	**3.8(9)**
7.10.Cooperating with government or professional experts 与政府或者专家合作				**2**	**134789**	**560**		**Y Y**	**4**	**4.5**	**4.3**	**4.2**
7.11.Customers' feedback 顾客的反馈				**37**	**1289**	**4560**		**Y Y**	**4.2**	**4**	**4.3**	**4.2**
7.12.Management transparency 管理透明度				**125**	**34789**	**60**		**Y Y**	**3.4**	**4.5**	**4.3**	**3.9**
7.13.Awareness of top management 高层管理者的意识觉醒				**17**	**2349**	**5680**		**Y Y**	**4**	**4**	**4.7**	**4.2**
7.14.Training on relevant skills 相关技能培训				**1357**	**89**	**2460**		**Y Y**	**3.8**	**4**	**4.3**	**4**
7.15.Technology innovation 技术革新			**1**	**357**	**269**	**480**		**Y Y**	**3.4**	**3.5**	**4.7**	**3.8**
7.16.Keep cost of daily operation down 保持营运成本降低				**125**	**6789**	**340**		**Y Y**	**3.8**	**4**	**4.3**	**4**
7.17.Improve internal controls 改善内部控制				**178**	**269**	**3450**		**Y Y**	**4.4**	**3.5**	**4**	**4.1**
7.18.Others (please specific) 其它影响（请明确指出）				**8**	**7**	**5**	**369**					**4(3)**

8. **Please rank the following for the added value that brings to your tourism business for customers. 什么因素可能帮助顾客体验到旅游附加值，请为以下各项打分。**

(0=not applicable 不适用，1=none 没有, 2= little 不多, 3= moderate amount 一定程度, 4= a lot 很多, 5=highest amount 非常多, 6=don't know 不知道)?

Customers experience on Added Value 为提升附加价值的顾客体验	**0**	**1**	**2**	**3**	**4**	**5**	**6**	∑S	∑R	∑C	∑A
8.1. Star-rating hotels 星级酒店		6	5	18	23479	0		3.8	2.5	4	3.4
8.2.Luxury 奢侈品	0	16	238	4579				2.2	2	2.5	2.2(9)
8.3.Cleanliness 干净				12	356789	40		3.8	4	4.3	4
8.4.No litter 没有垃圾			2	17	5689	340		3.8	3.5	4.3	3.9
8.5.No poverty 没有贫穷			135	249	678	0		2.4	4	4	3.2
8.6.Customer experience 顾客体验				1247	359	680		3.4	4	4.7	3.9
8.7.Wild nature 原生态自然环境			2	139	57	4680		3	4.5	4.3	3.9
8.8.Wild life 野生动物		1	235	79	6	480		2.4	3.5	4.3	3.2
8.9.Happy staff 心情愉悦的员工			1	257	369	480		3.4	3.5	4.7	3.8
8.10.Happy community 气氛详和的社区环境			123	5	6789	40		2.8	4	4.3	3.5
8.11.Good local travel facilities 当地便利的出行设施			2	17	5689	340		3.8	3.5	4.3	3.9
8.12.Good distance travel facilities 便利的长途设施				129	35678	40		3.8	4	4	3.9
8.13.Personal service 一对一服务			2570	13469		8		2.6	2.5	3.3	2.8
8.14.Customer feedback 顾客反馈				123579	46	80		3.2	3.5	4.3	3.6
8.15.Footprint offset 碳跟踪补偿			12357	689	4		0	2.4	2.5	3(2)	2.6(9)
8.16.Service facilities 其它服务设施			47	239	8	5	16	3.3(4)	2(1)	3.5	2.8(8)
8.17.Other important sources of added value（please specific）其它(请明确指出)			2	57			369				2.7(3)

9. **What factors would help you to manage your business to add more value? 您认为以下哪些是可以帮助产品提升附加值的？(0=not applicable 不适用，1=YES 是, 2=NO 否, 3=don't know 不知道)**

Factors needed for added value 提升产品附加值的因素		**0**	**1**	**2**	**3**	**Y:N**
9.1.Secure markets 安全的市场环境			**1245678 90**	**3**		**9:1**
9.2.Business reputation 好的业务声誉			**12345689 0**	**7**		**9:1**
9.3.Obtain better staff 拥有好的员工			**12345678 90**			**10:0**
9.4.Innovation 革新			**2457 8**	**3**	**169 0**	**5:1 (4)**
9.5.Campaigns 开展相关的竞赛活动或运动			**2456790**	**8**	**13**	**7:1 (2)**
9.6.Strategy of decision-making 决策策略			**1234568 0**	**7**	**9**	**8:1 (1)**
9.7.MFA (Material Flow Analysis)材料消耗流程分析		**0**	**247**	**1**	**3568 9**	**3:1 (5)**
9.8.GRI (Global Report Initiative)可持续性报告			**1234678**		**590**	**7:1 (3)**
9.9.Stakeholder management 利益相关者管理			**2469 0**	**137**	**58**	**5:3 (2)**
9.10.Balance score card 消耗平衡记录			**470**	**1**	**235689**	**3:1 (6)**
9.11.Differentiation on Critical Success Factors 决定性成功因素的特异性			**1234567 0**		**89**	**8:0 (2)**
9.12.Keep performance indicators 保留执行记录			**1256890**	**37**	**4**	**7:2 (1)**
9.13.Stakeholder analysis 相关利益者分析			**1356789 0**		**24**	**8:0 (2)**
9.14.Accounting skill 财务技能	environmental accounting 环境会计		**235670**	**1**	**489**	**6:1 (3)**
	sustainable accounting 可持续性会计		**235670**	**1**	**489**	**6:1 (3)**
	traditional accounting 传统会计		**2370**	**15**	**4689**	**4:2 (4)**
	management accounting 管理会计		**23570**	**1**	**4689**	**5:1 (4)**
9.15.Government engagement 政府鼓励			**1235468 90**	**7**		**9:1**
9.16.Public pressure 来自公众压力		**8**	**13457**	**2**	**690**	**5:1 (3)**
9.17.Others(please specific)其它因素（请明确指出）			**57**		**369**	**2:0**

10. **What importance of the following factors may engage your businesses long-term viability or survival becoming sustainable? 您企业的长远发展从勉强求生走向可持续性发展的重要影响因素是什么？请评估以下各项的重要程度。**

(0=not applicable 不适用，1=no importance 不重要, 2=low importance 不很重要, 3= moderate importance 相当重要, 4=high importance 很重要, 5= highest importance 非常重要, 6=don't know 不知道)

Important factors for SD 对可持续发展有影响的重要因素	**0**	**1**	**2**	**3**	**4**	**5**	**6**	∑S	∑R	∑C	∑总
10.1.Short-term perspective 近期规划		5		3789	14	260		3.4	4	3.7	3.5
10.2.Current Regulations 现存的法规			5	389	147	26	0	3.6	4.5	3(2)	3.7(9)
10.3.Climate change 气候变化		17	34	59	28	0	6	2.4	1(1)	4	2.8(9)
10.4.Social concerns 社会关注			1	357	2469	80		3.2	3.5	4.7	3.7
10.5.Environmental protection policy 环境保护保护政策				137	2459	680		3.6	4	4.7	4
10.6.Personal value changing 个人价值观改变			13	47	259	680		3	4	4.7	3.7
10.7.Decision makers 决策者				17	23594	680		3.8	4	4.7	4.1
10.8.Public attitude 公众态度			7	1	2345689	0		3.8	3	4.3	3.8
10.9.Environmental groups 环境保护社团			1	379	258	640		3.5	4	4	3.8
10.10.Local community pressures 当地社区压力			137	49	2568	0		3	3	4	3.3
10.11.Improve business reputation 改善企业有美誉度			7	9	12538	640		4.2	3.5	4	4
10.12.Improve productivity 提高产品多样性				79	12358	40	6	4.2	3(1)	4	4(9)
10.13.Customers' demands 顾客需求				79	125	34680		4.4	4	4.3	4.3
10.14.Government support 来自政府的支持				79	1235	4680		4.2	4	4.3	4.2
10.15.Others (specifics)其它（请明确指出）				7	5		639				3.5(2)

11. **What importance of the following factors would impact of implementation relating to EMA on management activities? 对企业运用相关环境管理会计为管理措施有重要影响的因素是什么，请评估其重要程度。**

(0=not applicable 不适用，1=no importance 不重要, 2=low importance 不很重要, 3= moderate importance 相当重要, 4=high importance 很重要, 5= highest importance 非常重要, 6=don't know 不知道)

Impact on implementing EMA 对执行 EMA 的影响因素	**0**	**1**	**2**	**3**	**4**	**5**	**6**	∑S	∑R	∑C	∑A
11.1.Management process 管理程序		**5**		**1379**	**468**	**20**		**3.2**	**3.5**	**4**	**3.5**
11.2.Decision making strategy 决策策略				**13579**	**4**	**2680**		**3.6**	**4**	**4.3**	**3.9**
11.3.Technology Innovation 技术革新			**137**	**59**	**68**	**240**		**3.4**	**3**	**4**	**3.5**
11.4.Information collection system 信息收集系统				**13597**	**68**	**240**		**3.8**	**3.5**	**4**	**3.8**
11.5.Stakeholders reporting 相关利益者报告			**3**	**1579**	**68**	**240**		**3.6**	**3.5**	**4**	**3.7**
11.6.Short-term revenue 近期收益			**5**	**1379**	**468**	**20**		**3.4**	**3.5**	**4**	**3.6**
11.7.Cost reductions 减少成本				**1579**	**3468**	**20**		**3.8**	**3.5**	**4**	**3.8**
11.8.Investment appraisal 投资评估				**1579**	**348**	**260**		**3.8**	**4**	**4**	**3.9**
11.9.Staff attitude 员工态度			**1790**	**35**	**68**	**42**		**3.6**	**3**	**2.7**	**3.2**
11.10.Staff skills 员工技能			**179**	**350**	**68**	**24**		**3.6**	**3**	**3**	**3.3**
11.11.Business core value 业务核心价值			**17**	**59**	**38**	**2460**		**3.8**	**3.5**	**4**	**3.8**
11.12.Compliance with regulations 配合相关政策			**17**	**589**	**36**	**240**		**3.8**	**3**	**3.7**	**3.6**
11.13.Guideline from government or professional experts 来自政府或专家的指导				**13597**	**8**	**6240**		**3.8**	**4**	**4**	**3.9**
11.14.Others (specific)其它（请明确指出）					**5**		**639**				**4(1)**

Sheet B: Semi-structural interviewed questions
(Please use open and leading questions to try and get the interview talking and saying things I did not expect).
1. Please identify the major changes in your business over the last five years.
Economic aspects/Social concerns/Environmental concerns/Stakeholders
2. Please describe your opinion on your business as the following
2.1 Environment aspects:
-Do you think that your business contribute to healthy environment?
-Do you think that your business face to any environment problems, such co2 emissions & climate change?
-What are important environment issues for your business /your community?
-What are the core management activities with regarding to EMA tools (Accounting skills/Internal/External/Intangible assets) in your business?
2.2 Society aspects
-Are you happy with the contribution your business makes to the development of your local community?
-To what extent does your business contribute financial benefit to local communities?
-What are the other major contributions your business makes to local communities?
-Social/ nation value
2.3 Economics aspects
-Economic growth of distribution of wealth to poor people to bring them into tourism market
-Are you satisfied with your personal income from working here?
2.4 Stakeholders
--Does your business enjoy good relations and support from local government? (to local government) why statistics?
-Do your staff well motivated, satisfied/-are you well-motivated, satisfied /what motivates you and your staff
- Why is it the most important refer to Sheet A Questionnaire 2?
2.5 Values
-What is your expectation of being happiness? Are you satisfied? Why?
-What are the most important things in your life?
-Are you happy with the time balance between work and your friends, family and leisure
-Are you guided by religions or other philosophy? Such as Taoism, Tian Xia, Confucianism, Buddhism, Christianity
-What kind of change would you like to adopt in terms of management being sustainable?
-What would engage you change your attitude or value?
-Does people's value would influence their attitude/behaviours?
3. Do you think that your business needs to change in terms of being sustainable? If yes, what do you think is the most important? And what extent would you like to change? Why?
4. How would you describe the management style in your business? (You could choose more than one Please)
Team driven/ Transparent, open /Hierarchical/ others (please specific)