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Master Thesis for the attainment of the academic degree of Master of Science

‘Protect the environment, build the homeland’

A study on the Sino-Singapore Tianjin Eco City’s measures for citizens to act in an environmentally sustainable fashion

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Abstract

In order to achieve objectives of sustainable development, the Sino-Singapore Tianjin Eco City has devised a set of Key Performance Indicators, which require the collaboration of regional government and industrial entities, but also residents to be accomplished. Through qualitative interviews with eco citizens, this study offers an insight into life in an eco city and how aware residents are of their new home's targets and incentives. The thesis investigates, how the eco city encourages residents, who have often never received adequate environmental education, to recycle and adapt their purchasing behaviour. The findings reveal the existence of several technical measures, practical incentive schemes and dissemination techniques that encourage residents to act according to environmental considerations. However, residents are often unaware of the numerical targets or do not make the connection between incentive and intended behaviour. The study highlights possibilities for improvement, in order to enhance residents' understanding of the eco city's objectives. After all, without resident participation and understanding, the Key Performance Indicators may be unattainable and the eco city's eventual economic, social and environmental success in jeopardy.

Key Words: *Sino-Singapore Tianjin Eco City, Key Performance Indicators, Green Purchasing Behaviour, Green Consumer Behaviour, Incentives, Qualitative Study*

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Abbreviations

CBC	Central Business Centre
COFC	China Organic Food Certification
Eco City JV	Tianjin Eco City Investment and Development Company
JCBC	Joint Council for Bilateral Cooperation
Km^2	Square Kilometres
Km/h	Kilometres per Hour
KPI(s)	Key Performance Indicator(s)
M^2	Square Meters
MEP	Ministry of Environmental Protection
MoF	Ministry of Finance
MoHURD	Ministry of Housing and Urban - Rural Development
NBC	Northern Business Centre
NDRC	National Development and Reform Commission
NOx	Nitrogen Oxide
$PM_{2.5}$	Particulate Matter 2.5 Microns and Below
R&D	Research and Development
SBC	Southern Business Centre
SO_2	Sulfur Dioxide
SSTEC	Sino-Singapore Tianjin Eco City
STEC	Singapore Consortium
TBNA	Tianjin Binhai New Area
TEC	Chinese Consortium
TEDA	Tianjin Economic Development Area

1. Introduction

Bus number 947 slowly pulled away from the Yujiapu high-speed rail terminal that connects the newly constructed finance district in the Tianjin Binhai New Area (TBNA) to the city centre of Tianjin and from there to Beijing South Railway Station. Cramped in the back of the bus, I was full of excitement at completing the final stretch of my journey. I had been confronted with my destination all the way from Beijing South Railway Station to my present location on the bus. Advertisements for apartments in this new utopia were everywhere, from billboards in the high-speed rail terminal to a little notice stuck to the back of the seat in front of me (for an example of such an advertisiment see Appendix 1, Figure 8). Outside the window, glossy high rises gave way to factories, as the bus left the finance district and entered the Tianjin Economic Development Area (TEDA). Established brand names such as Volkswagen, Continental, Nestlé, Motorola and Airbus fleeted by the window, one factory larger than the other. At the end of a very long road, the industrial landscape started to change, as the bus approached the Ji River area. Factories gave way to a brief stretch of wetland, before the large orange arches of the Rainbow Bridge came into view (for an image of the Rainbow Bridge, see Appendix 1, Figure 9). Just across this bridge was the green wonderland I had been reading of. The first structures to catch the eye were a series of white wind energy turbines, gyrating in the light breeze. Beyond the turbines, yellow cranes stretched their metal limbs in all directions, one after another, as far as the eye could see. An elongated park area bestrode the river and behind it were rows upon rows of American-style brick buildings. Their roofs, covered in solar panels, glinted in the sunshine (for an image of solar panels on top of buildings in the eco city, see Appendix 1, Figure 10). After having crossed the bridge, the bus dutifully stopped at a red light. From the back seat of the bus, I looked out of the window at a large stone rock. On the rock, the name of my destination was engraved in bold Chinese characters: 中新天津生态城 *(Sino-Singapore Tianjin Eco City) (for an image of the welcoming stone, see Appendix 1, Figure 11).*

Hannes Gohli, 19th March 2017

1.1. Relevance of Research Topic

The importance the Chinese government attaches to the bilateral eco city project being constructed in the TBNA is reflected in the vast sums of money invested (Belle, 2015) and the number of media reports published on the Sino-Singapore Tianjin Eco City (SSTEC) (Gaia, 2012; Kaiman, 2014). The increasingly obvious effects of climate change on the environment in China, have prompted the Chinese government to intensify its support for local governments pursuing environmentally friendly and financially lucrative business opportunities (World Bank, 2009). Representing the most high-profile eco city project

currently under construction in China, the SSTEC pursues goals of environmentally sustainable construction standards and innovation, by attracting high-tech, low emissions industries to the region (Belle, 2015). More interesting for this master thesis though, is that the eco city, also seeks to enhance environmental understanding among its citizens. This research seeks to establish what measures the eco city government has adopted to educate and develop its citizens into becoming paragons of environmental sustainability. The majority of the citizens that first moved to the eco city in the Spring of 2012 (Moore, 2012; Flynn, 2012; Vince, 2012) arrived from areas with no environmental development plans and had received little to no environmental education in the past (Liu et al., 2010). For the most part, these residents had never been required to recycle, separate trash or offered free green transportation (Belle, 2015). In order to achieve the goals laid out in the key performance indicators (KPIs), the eco city would require residents to adopt environmentally friendly behaviour almost upon arrival (World Bank, 2009). After all, the eco city government's confidence and efforts are meaningless, if the citizens are unaware of the city's objectives and requirements. In short, how does the eco city government intend to support its citizens in the adaptation process? How aware are citizens currently of the eco city's objectives? Has their lifestyle changed due to these objectives? How do they contribute to the city's continued positive development? By conducting qualitative interviews with nine residents in the eco city, this research attempts to shed light on the above considerations by answering the following research questions:

Research Question 1: *Consumer behaviour guidance in the Sino-Singapore Tianjin Eco City: What measures are adopted by the Eco City Municipal Government to encourage its citizens to act in an environmentally sustainable fashion in order to achieve the city's key performance indicators?*

Research Question 2: *What impact does a sustainable environment have on a consumer's purchasing behaviour with respect to environmental considerations?*

1.2. Paper Outline

This paper is divided into a theoretical section (chapters two, three and four) that lays the groundwork required for interpreting the empirical findings (chapter six). Following an overview of the existing literature on the topics of eco city development, the SSTEC and green consumer behaviour theory, the theoretical section of this paper commences with a discussion on what constitutes an eco city in practical terms. The case study on the SSTEC intends to provide an outline of the evolution of the eco city by introducing the various actors involved in the planning, design and construction phases. The case study also introduces,

compares and evaluates the SSTEC's KPIs with respect to KPI sets developed by national government ministries in China. Besides presenting an evolutionary protocol of urban development, the case study gives the reader a general impression of the SSTEC's living environment, which is essential to understanding the interviewees' responses in the empirical findings. The theoretical section concludes with an excursus into green consumer behaviour theory. The excursus offers an overview of previous literature on green consumer behaviour theory, both internationally and in China. The conclusions gleaned from both sets of literature are then compared to, on the one hand, analyse differences and on the other distinguish what constitutes a green consumer in the Chinese context. This section is necessary to analyse the changes in the respondents' green consumer behaviour prior to and after moving to the eco city.

Following a presentation of the methodology used to conduct this research, the empirical findings outline and analyse the views of the nine respondents included in this study. The objective is to find generic themes mentioned during the interviews that indicate commonalities, as well as differences in the respondents' evaluation of the eco city and their own green purchasing behaviour. The thesis concludes with recommendations on how the local government can encourage environmentally friendly consumer behaviour by providing adequate education programs and support structures. The final conclusion presents a summary of the key issues discussed in this paper, both in the theoretical sections and the empirical findings.

1.3. Literature Review

The preliminary desk research revealed a plethora of international literature on eco city development since the late 1980s, when sustainable development increasingly became the focus of discussion in international political and economic fora. Academic attention during the 1990s initially focused on defining the concept of an eco city (Roseland, 1997; Blassingame, 1998), before post-millennial literature was able to evaluate the initial efforts at city-scale urban development (Jabereen, 2006; Bullivant, 2007; Hart, 2007; Nader, 2009; White et al., 2009). Contemporary international publications on eco city developments continue to evaluate eco city projects based on case studies (Keeton, 2011), but also discuss whether a clear set of standards are beneficial for future projects (Rapoport et al., 2014; de Jong, 2015).

In terms of eco city development in China, de Jong and Sun et al. offer various publications concerning the current state of eco city development and government policy (Sun et al., 2011;

de Jong, 2013/2015). The World Bank's contributions were especially valuable to this thesis and other studies (Caprotti, 2013; Belle, 2015), as they shed light on eco city developments across China (Baeumler et al., 2012), as well as in the SSTEC (World Bank, 2009). Iris Belle's doctoral thesis (2015), a comparison of urban governance in the TEDA and the SSTEC, offers an excellent description of the administration of the SSTEC, its position in the TBNA, as well as an evaluation of the eco city's KPIs. The SSTEC has received much attention from scholars in recent years (Caprotti, 2015; Brauch et al., 2016; Geroe, 2017), due in part to its bilateral nature (Ng, 2011) and extensive media coverage (Gaia, 2012; Kaiman, 2014; Teo, 2016). Caprotti's (2013) walkthrough gives a good impression of the SSTEC as it stands today and is the most consumer based and practical description of an eco city in literature. Other authors primarily focus on descriptive or evolutionary contributions (Keeton, 2011; Ghiglione et al., 2015; Geroe, 2017). However, despite the proliferation of articles on the SSTEC in recent years, the literature pays insufficient attention to consumer needs and practices, which is the gap this master thesis seeks to fill. After all, the primary beneficiaries and contributors to the success or failure of the SSTEC are its residents. In order to evaluate a change in the residents' consumption habits since moving to the eco city, the literature on green consumer behaviour theory is invaluable. International literature on the topic is extensive, as authors vie to create frameworks that describe the archetypical green consumer, both in demographic (Antil, 1984; Samdahl et al., 1989; Ajzen, 1991; Zimmer et al., 1994; Roberts, 1996; Straughan et al., 1999) and in psychological terms (Rice et al., 1996; Chan et al., 2008; Young et al., 2010; Kaufman et al., 2012; Juvan et al., 2013). In contrast, research on green consumer behaviour in China is still in its infancy (Liu et al., 2010; Zhao et al., 2014), with the majority of publications only emerging since the turn of the century. Studies often focus on the adoption of green products (Chan, 2001; Xu, 2013; Chen, 2014b) or compare Chinese consumers to international frameworks (Chan et al., 2008; Awuni et al., 2015; Chen et al., 2016).

In summary, more research dedicated to the habits and conventions of consumers in eco cities is required. Eco cities provide fantastic opportunities to conduct research on green consumer behaviour, sustainable urban development and green innovations, because they offer a closed environment for experimentation and observation. Due to the menace of climate change and its effects on the global environment, the construction of ecologically friendly urban areas is imperative to maintain current standards of living in cities (World Bank 2009; Keeton, 2011, Baeumler et al., 2012). Therefore, further research on how to improve green building standards, environmental technology innovation, renewable energy, green transport, but also environmental education for residents is of tantamount importance for future generations to enjoy the benefits of urban life we cherish today.

2. Eco City Development

2.1. Definition and Evolution of Eco Cities

The British architect and environmental activist Richard Register was the first author to coin the term 'eco city' in his 1987 study on the future of urban development '*Eco City Berkeley: Building Cities for a healthy future*' (Register, 1987). Register defines an eco city as "an ecologically healthy city" but contends, that "no such city exists" (Register, 1987:3), as "eco cities are a direction, not a destination" (Register, 1987:135). Since then, there have been various derivations of the term, including 'sustainable city', 'free eco city' and 'zero-carbon eco city' that are often used interchangeably in the relevant literature (Hassan et al., 2014). Rapaport (2014) describes the term 'eco city' as an "umbrella concept" (Rapaport, 2014:138) that encompasses many different forms of urban development, from small-scale urban revitalisation projects to completely new urban areas. So far however, there has been no universally accepted agreement among authors on the definition of an eco city (Kolte et al., 2013; Joss, 2011; Roseland, 1997). Researchers tend to offer their own unique definition of what is included in the term 'eco city'. While some definitions are rather factual, such as an eco city being a "development of substantial scale, occurring across multiple sectors, which is supported by policy processes" (Joss, 2011:280), others describe glorious utopias (Bullivant, 2007; Hart, 2007; Nader, 2009). The lack of a unified definition is often seen as a barrier for the construction of environmentally friendly urban areas, as no universally recognised standards exist, upon which a project can be measured (Rapoport, 2014; Hassan et al., 2014; Keeton, 2011). Some authors propose, that no such definition should exist, due to differences in geography, economy and demographics from one site to another (White et al., 2009; Pow et al., 2013; Belle, 2015). These authors believe, that the generalisation of urban plans for eco cities and the adoption of common standards for sustainable development are both unwarranted and unrealistic (Stirling, 2009; White et al., 2009; Pow et al., 2013; Hassan et al., 2014). They argue, that a certain degree of flexibility is beneficial in order to be able to adapt to local conditions (Afiff, 2010; Rapoport, 2014; Belle, 2015). The danger of not having measurable standards is, that any project pursuing vaguely ecological targets is free to call itself an eco city (Rapaport, 2014). Despite this ambiguity, most definitions of eco cities in the relevant literature do include similar design patterns, such as the construction of parks, green buildings and recreational areas for residents, the avoidance of automobile-based transportation systems, the supply of convenient and environmentally friendly public transport facilities, walkability and high density residential areas (Roseland, 1997; Blassingame, 1998; Jabereen, 2006; Dujardin et al., 2014).

The definition and evolution of eco cities goes hand in hand with the discussion on sustainable development, which has become increasingly prevalent on various international political and economic platforms. The discussion on sustainable development was triggered by the realisation, that breakneck economic growth and relentless industrialisation have serious consequences for the natural environment (Hassan et al., 2014; Belle, 2015). United Nations publications, such as the Brundtland report in 1987 and the Agenda 21 in 1992, emphasised conscious resource allocation, environmental protection and social development as necessary conditions for future growth (Rapoport, 2014). The Habitat-II agreement meanwhile, was an attempt to apply the propositions from Agenda 21 to urbanisation (Hassan et al., 2014). The agreement describes a sustainable city as an urbanized zone that is able to balance the three pillars of sustainable development: the economy, the society and the environment (Belle, 2015). As a consequence, the United Nations Centre for Human Settlements defines a sustainable city as an urban area "where achievements in social, economic and physical development are made to last" (United Nations Human Settlements Programme, 2002:6). Recently however, there has been growing concern among researchers, that a number of eco city projects have focused primarily on the economic and have disregarded the environmental and social pillars of sustainable development (de Jong, 2013). Put differently, these projects are "entrepreneurial land development projects" (Rapoport, 2014:142), whose success is judged on their economic, rather than their environmental achievements (de Jong, 2013). The reason for this concentration on the economic pillar of sustainable development in China may be connected to the country's belief, that "the precondition for sustainable development is development" (Nielsen, 2003: 6).

Coinciding with the discussions on economic growth and its effects on the environment, the first ecologically friendly urban developments originated during the counterculture movements of the 1960s and 1970s (Rapoport 2014). Originally, eco cities were small-scale redevelopment projects instigated by residents and architects, who were concerned about ecological degradation and social inequality (Roseland, 1997). These eco villages adopted ecological design principles and encouraged conscious consumption and low impact lifestyles among residents (Rapoport, 2014). The publication of Agenda 21 in 1992 led to a proliferation of government sponsored local eco city initiatives during the 1990s, as governments across the world became eager to prove their dedication to Agenda 21 and sustainable development. Despite their environmental fervour and determination, many of these projects were not completed, as market realities caught up with overly idealistic local government plans (Barton, 1998). Notable exceptions were the frequently cited eco developments Hammarby in Stockholm, Sweden and Riesefeld in Freiburg, Germany (Rapoport, 2014). After the turn of the century and with the advancements made in

sustainable transportation, renewable energy and green architecture, plans started emerging, primarily in Asia, to build city-scale development projects. Today, governments around the globe see eco city projects as useful experimentation grounds for new technologies and urban management (Joss, 2011), as well as high profile demonstration projects of their determination to improve the local environment (Bulkeley et al., 2013). Currently there are projects proposed for eco city construction in the UK, South Korea, the US, Spain and Jordan among others, as well as developments currently under construction in Abu Dhabi and various locations in China (Joss, 2011). At present however, only a small number of eco city projects have managed to pass the design stage (Belle, 2015). Designed by the most renowned architects, masterminded by powerful government agencies and constructed by multinational cooperations, these city-scale projects bear little resemblance to the modest yet important efforts of local environmental activists in the eco villages of the 1970s (Rapoport, 2014). At the forefront of this race for sustainable urbanisation stands China, whose relentless speed of development since the 1980s has coincided with the advancements in sustainable development discussed in this section. China's speed of economic growth has lifted millions out of poverty and expanded the middle class, leading to increased consumption and investment possibilities across the country (Goodman, 2014). But growth has also put a lot of pressure on urban areas, which have had to contend with unprecedented urban sprawl, unbridled migration and pollution that endangers the livelihoods of millions on a daily basis (Cao, 2015). The following section will analyse the evolution and current climate in China's eco city development agenda, culminating in a case study dedicated to its most prominent example: the Sino-Singapore Tianjin Eco City.

2.2. Eco City Development in China

China's eleventh (2006 - 2011) and twelfth (2011 - 2016) Five Year Plans underlined the Chinese government's intention to deviate from the growth trajectory pursued since the reforms in 1979 and instead follow a development agenda focused on becoming a "resource conserving and environmentally friendly society" (Baeumler et al., 2012:34). However, China's pursuit of eco city development predates the Hu Jintao administration's scientific outlook on development (Sun et al., 2011). The first Chinese cities to adopt ecologically sound methods in their urbanisation plans were Yichun in Jiangxi province in 1986 (Sun et al., 2011; de Jong, 2015) and Leshan in Sichuan province in 1987 (Sun et al., 2011). But these cities' intentions were limited to the field of agriculture and in the case of Leshan were mainly promoted by scholars wishing to highlight the importance of environmental protection in China (Sun et al., 2011). During the 1990s, the Ministry of Housing and Urban-Rural Development (MoHURD) and the Ministry of Environmental Protection (MEP) started

devising indicator sets to help cities develop in a more sustainable manner (Baeumler et al., 2012). Over time, these indicator sets increased in complexity and number, which is why simplifications were necessary in 2004 (MoHURD) and 2007 (MEP) that laid more emphasis on environmental, rather than economic and social indicators for eco city development (de Jong, 2015). These two ministries were by no means the only Chinese national level entities devising indicator sets describing eco city standards. In 2009, for instance, the Chinese Society for Urban Studies and the United Technologies Corporation developed an indicator set for assessing eco cities, that consisted of 61 indicators, which incorporated both the MoHURD's and the MEP's indicator sets (Baeumler et al., 2012). However, the MoHURD's and the MEP's indicators remain the most cited in literature (World Bank, 2009; Belle, 2015) and for this reason are treated seperately in this study (for a detailed list of MoHURD's indicator set see Appendix 6, Table 3).

In the eco city indicator set designed by the MoHURD, a project seeking eco city status must first be certified as a 'Garden City', before being able to apply for certification as an 'Eco Garden City' (Baeumler et al., 2012). The difference to the eco city indicator set devised by the MEP is, that the MoHURD's indicators solely focus on urban areas, while the MEP's indicator set includes the entire jurisdiction of the eco city in question (World Bank, 2009). The MoHURD's set also places greater emphasis on energy efficiency, pollution control, as well as green building and transportation, while the MEP's indicator set concentrates on the provision of green spaces and landscape, as well as the quality and management of the environment. The standards of the MEP were last revised in 2007 and now include stricter regulations on energy and water consumption, along with more stringent emission standards. The MEP's indicator set encompasses 19 quantitative indicators, of which 15 are mandatory and four are indicative (for a detailed list of the MEP's indicator set see Appendix 6, Table 4).

Indicator sets are used in the approval of eco city projects in China, as they are considered more scientific, outcomes can be measured more easily and also because of the top-down nature of the Chinese political system (de Jong, 2015). Clearly defined indicator sets make it easier for the vast number of ministries that are involved in the planning, approval and construction of eco city projects to evaluate a local government's progress, as well as the eventual success or failure of an eco city project. For the sake of achieving sustainable urbanisation targets, the two indicator sets both highlight the need for certain physical infrastructure, such as the construction of waste treatment facilities or the provision of public green areas (Baeumler et al., 2012). Local governments need to be aware, that while complying with these indicators will undoubtedly help improve the local environment, they alone do not guarantee low-carbon development. In recent years Chinese leaders have

consistently emphasised the importance of reducing the country's energy and carbon intensity. Furthermore, local government officials are to be held more accountable for environmental transgressions during their time in office (Baeumler et al., 2012). This has resulted in local government officials exploring new ways of boosting their environmental performance as a means of enhancing their position in the nomenclature (Kostka, 2015). Eco city construction is both a high profile and ostentatious scheme for local government officials to boost their standing in the Party and can also attract national and international attention, as well as expand the local economy (Ghiglione et al., 2015).

China's change in growth trajectory to pursuing more sustainable economic growth has led to a wave of new eco city developments across the country (Sun et al., 2011). The map on the following page shows eco city projects that have received eco city status, according to the MoHURD and the MEP indicator sets. A notable exception on this map is this master thesis's case study, the SSTEC, which is not included here, because it is not formally recognised by the MoHURD or the MEP (Baeumler et al., 2012). Neither does the map below support the popular headline on urban development, that hundreds of eco city projects are being developed across China (Kaiman, 2014; Shepard, 2015; Caprotti, 2015). The actual number of eco cities currently under construction in China is difficult to assess, due to the ambiguous definition of the term 'eco city' and the different sets of standards adopted by Chinese authorities (Baeumler et al., 2012). The map on the following page does however prove, that several regions, municipalities and townships in China have successfully applied to the MoHURD and the MEP for recognition as eco cities or eco counties.

Figure 1: Map of Eco City Projects Approved by the MEP and the MoHURD (Source: Baeumler et al., 2012)

Data collected by the Chinese Society for Urban Studies in 2011 shows, that 259 of the surveyed 287 prefecture level cities in China expressed an intention to develop eco or low carbon cities (Sun et al., 2011). However, many of these projects either never pass the design stage or are abandoned during construction. Reasons for abandonment include specific economic and social conditions on site, local level ambition leading to overzealous adoption of unrealistic project designs and cost evaluations, as well as corruption or rotation resulting in local officials being removed from office. An example of a high profile project that was abandoned midway through construction, is the Sino-United Kingdom Dongtan Eco City, which was supposed to be completed on the Chongming Island at the mouth of the Yangtze river (Larson, 2009). Plans were devised and construction begun in 2005, but the project was abandoned, due to "financial constraints, a change in local government priorities and environmental concerns" (Baeumler et al., 2009:44). The Sino-United Kingdom Dongtan Eco City is one of a series of examples, where local governments seek cooperation with international partners to construct ecologically friendly suburbs or even new cities around the drafting of the 11th Five Year Plan in 2006 (Baeumler et al., 2012). Other examples of

cooperations between local governments in China and international construction companies or governments include the Sino-German Qingdao Eco Park, the Sino-Dutch Shenzhen International Low Carbon Town, the Sino-Finnish Mentougou Eco Valley, the Sino-Swedish Wuxi Low Carbon Eco City (Brauch et al., 2016), the Sino-Singapore Guangzhou Knowledge City, the Sino-Singapore Suzhou Industrial Park and the Sino-Singapore Tianjin Eco City (Baeumler et al., 2012).

The above analysis has shown, that the intent to develop urban areas in a more environmentally sustainable fashion in China exists between national ministries, local governments, as well as international government and private organisations. But some authors argue, that "relatively little policy guidance exists at the national level what this (sustainable urban development) means in practical and operational terms" (Baeumler et al., 2012:34). For this reason, local governments constructing eco cities often devise their own set of indicators in collaboration with their international partners (Caprotti, 2013). After all, the construction of eco cities depends not only on local and national government support, but also has to satisfy a large number of stakeholders with potentially significant capital contributions (de Jong, 2015). An eco city project pursuing solely environmental targets would not pass the development stage, as stakeholders investing vast sums of money will want to include indicators promising eventual economic gains (de Jong, 2015). An important lesson to be learnt from abandoned projects, such as the Sino-United Kingdom Dongtan Eco City (Larson, 2009), is, that in order to be successful, an eco city project needs strong support from national and local government entities (Baeumler et al., 2012), needs to satisfy investors (de Jong, 2015) and has to observe the interests and culture of the local community when devising its KPIs (Baeumler et al., 2012).

The previous chapter has shown, that China has adapted its growth and urbanisation strategy to include environmental considerations. The government has encouraged local governments to pursue eco city initiatives by designing indicator sets (Baeumler et al., 2012; de Jong, 2015;) and revising the cadre evaluation system to include environmental considerations (Kostka, 2015). Over the last decade especially, local governments have worked together with national and international governments to design and construct urban areas according to indicator sets designed by the MoHURD, the MEP or the project planners themselves (Baeumler et al., 2012). While many eco city projects fail at the design stage or are abandoned, some have been built and already house residents. The most prominent example in the media and the city closest to completion (Belle, 2015) is the subject of the following section: the Sino-Singapore Tianjin Eco City.

3. Case Study: The Sino-Singapore Tianjin Eco City

3.1. A History of Development

Unlike most settlements, that form their own identity, economy and society over the course of centuries, newly constructed cities do not evolve naturally over time (Belle, 2015). Instead, they are designed to achieve set targets within a certain period of time (World Bank, 2009). The process of construction, from the initial planning to completion, involves a large number of actors, including political leaders, government administrators, urban planners, technical assistants, investors, construction companies, other actors from the private sector and future residents. Figure 2 below shows a simplified version of the decision-making process involved in the construction of the SSTEC (Belle, 2015). This section is divided into the seven stages of development outlined in Figure 2: Project Preparation, Design of Framework for Project Execution, Comprehensive Urban Planning, Urban Design, Land Development, Real Estate Development and Operation and Maintanance.

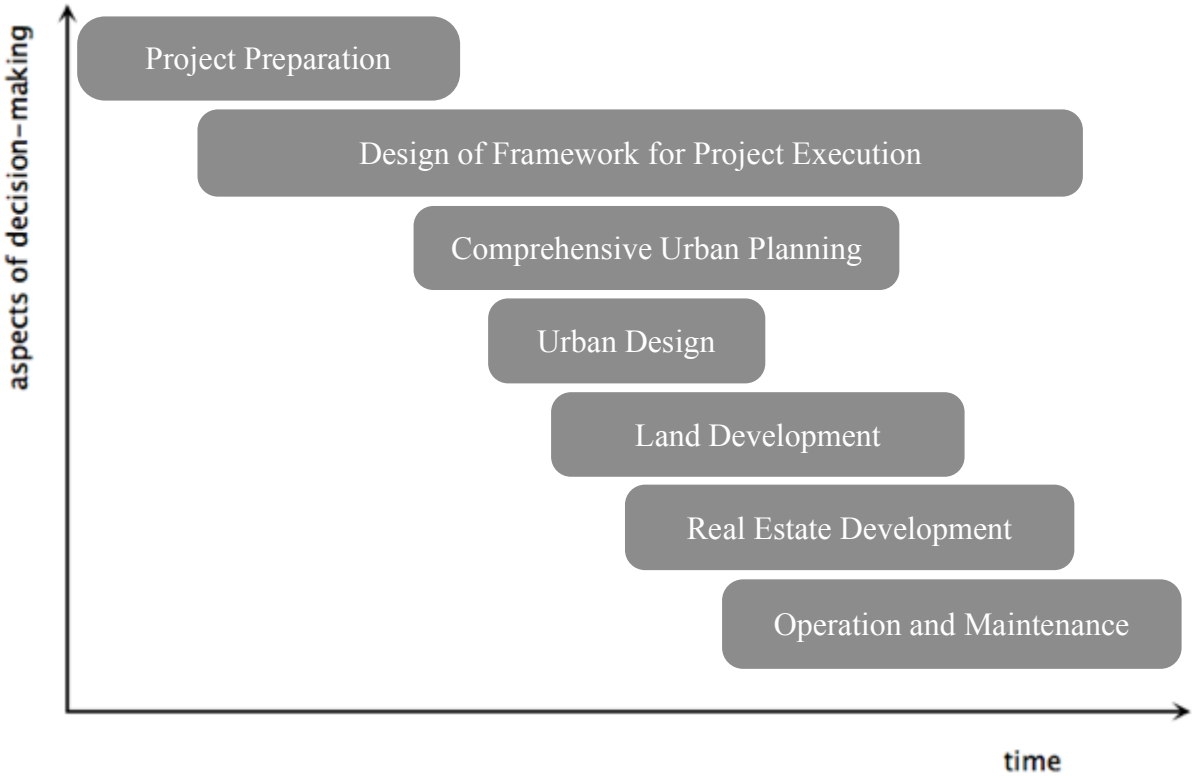

Figure 2: The Seven Development Stages of the SSTEC (Source: Author's work based on Belle, 2015)

Project Preparation

One of the most important aspects of building an eco city is its vision, which is composed during the first stage of preparation (Belle, 2015). A strong vision is required to convince

private investors, as well as government entities, to "set aside financial resources, administrative capacity, land and natural resources" (Belle, 2015:37). In the case of the SSTEC, the vision is encapsulated by its slogan 'Reduce, Reuse, Recycle' and its motto 'Live, Work, Play' (Ghiglione et al., 2015). The vision portrays the eco city's focus on providing housing and recreational facilities for a diverse group of residents (Live), job opportunities close to the eco city (Work) and entertainment, such as bars, restaurants, park areas and sports facilities (Play) (Belle, 2015). The eco city also promises to be "practical, replicable and scalable" (Belle, 2015:39), which entices both politicians and investors to be part of a futuristic sustainable urbanisation project in China. The possibility of the SSTEC's model being replicated elsewhere, lures enterprises in the clean energy, high technology and IT sectors into being part of the first eco city prototype of its kind.

Design of Framework and Project Execution

In the second stage, the principle actors involved in the design and construction of the eco city agree on a framework that defines the rules for executing the project (Belle, 2015). There are a vast number of actors involved in the execution of the SSTEC, but for the sake of simplification, they can be divided into national and local actors (Geroe, 2017). Because the SSTEC is a bilateral urban development project between the governments of China and Singapore, the roles each country play had to be clearly designed from the outset (World Bank, 2009). In the Framework Agreement for the development of the SSTEC project, which was signed by the Chinese Premier Wen Jiabao and the Singaporean Prime Minister Lee Hsien Loong in 2007, China retains the right to make legal decisions during the project's execution, while the role of the Singaporean government is described as consultative in nature (Belle, 2015). Figure 3 on the following page shows the different constellations of national actors in monitoring and supporting the execution of the SSTEC.

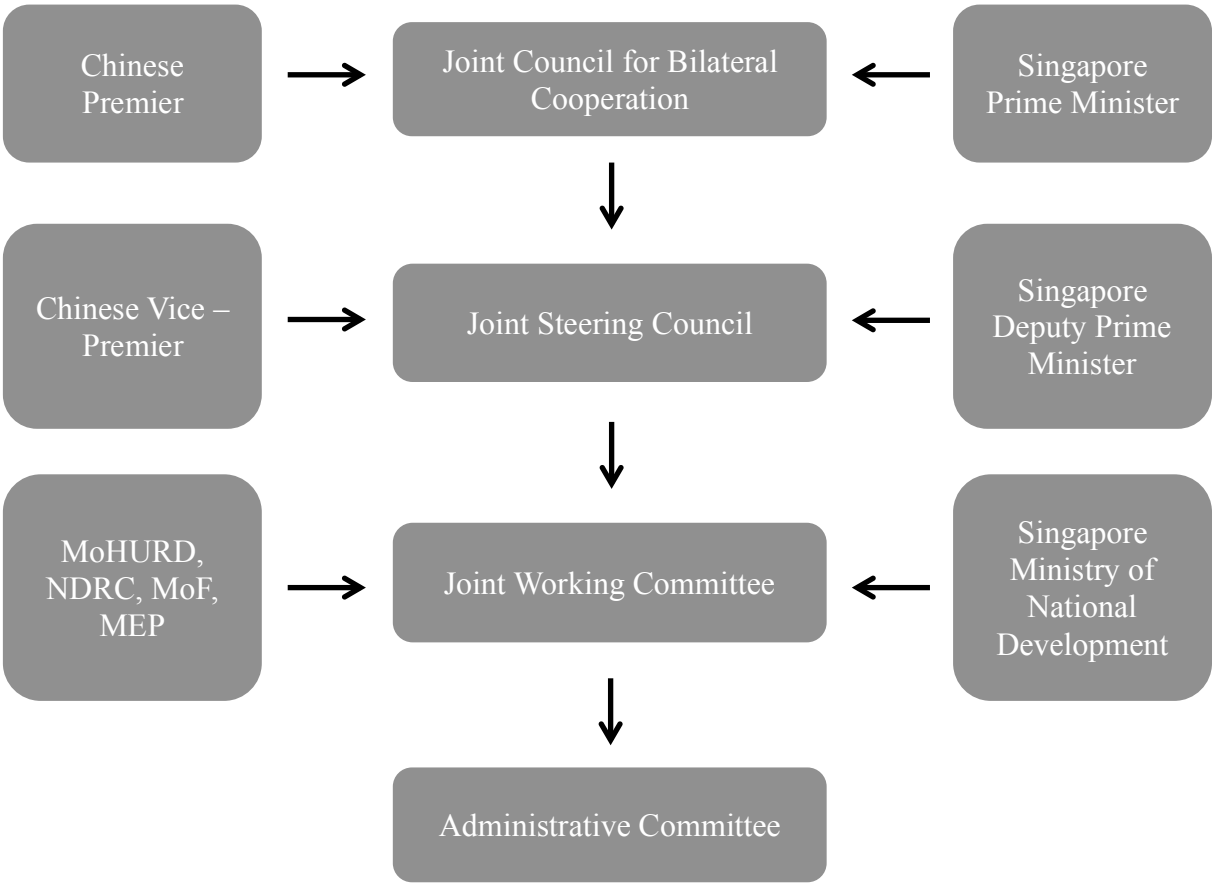

Figure 3: National Actors Involved in the SSTEC (Source: Author's work based on Belle, 2015)

At the top of this hierarchy is the Joint Council for Bilateral Cooperation (JCBC), which is a bilateral forum between the governments of China and Singapore initiated in 2004 that meets once a year (Geroe, 2017). This forum receives an annual report from the Joint Steering Council, which is chaired by the Chinese Vice-Premier and the Singaporean Deputy Prime Minister, who are in charge of overseeing the administration of the SSTEC project on the government level (World Bank, 2009). Directly below the Joint Steering Council is the Joint Working Committee, which includes in total eight ministries and offices. The Joint Working Committee is led by the Chinese MoHURD and the Singaporean Ministry of National Development, but is joined, among others, by the Chinese National Development and Reform Commission (NDRC), the Ministry of Finance (MoF) and the MEP. The Tianjin Eco City Administrative Committee is in charge of examining, approving, supervising and inspecting investments in the eco city, as well as other administrative functions (World Bank, 2009). Because the eco city is an autonomous functional district, rather than an administrative district of the city of Tianjin, the Administrative Committee can be seen as a local branch of the Tianjin Municipal Government (Belle, 2015).

The actual construction, land development, urban planning and operation of public infrastructure occurs on the local level and is the responsibility of the Sino-Singapore Tianjin Eco City Investment and Development Company (Eco City JV) (Geroe, 2017). Figure 4 shows, that because the project is a bilateral undertaking between China and Singapore, the operation of the joint venture company is also divided equally between the two countries.

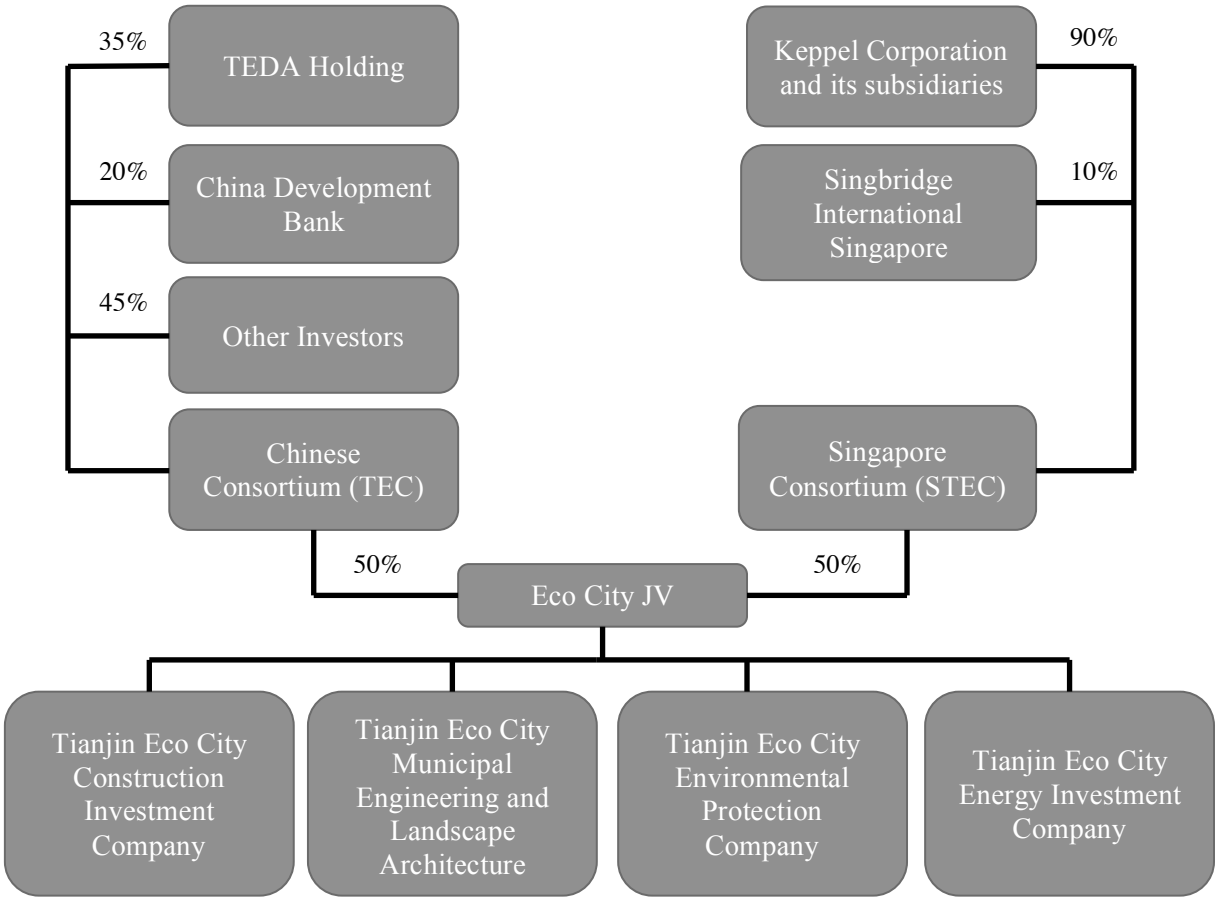

Figure 4: Local Actors Involved in the SSTEC (Source: Author's work based on Belle, 2015)

In broad terms, the Chinese Consortium (TEC) within the joint venture is responsible for the operation, construction and investment of public facilities and infrastructure on site, while the Singaporean Consortium (STEC) is in charge of supervising, offering technological support, construction management, research and development (R&D), innovation, equipment supply and design (Belle, 2015). To make the division of tasks more transparent, four subsidiary companies were set up as part of the Eco City JV. These subsidiaries are in charge of construction, engineering and landscape architecture, environmental protection, energy investment, as well as providing municipal infrastructure services (World Bank, 2009). Apart from these state run enterprises, other enterprises have been attracted to the SSTEC to test their new technologies in a controlled environment (Ng, 2011). Among the many companies

that have agreed to test their products in the eco city are the Dutch electronics company Phillips, the Japanese multinational Hitachi, the American car manufacturer General Motors and a number of Singaporean telecommunications and renewable energy companies. It is important to note, that the constellation of actors involved in the process of developing an eco city is by no means static (Belle, 2015). New actors are recruited, while existing actors may increase or reduce their involvement or even abandon the project. It is important that during this process, the Administrative Committee controls and supervises the various actors in their dealings within the eco city.

Comprehensive Urban Planning

After signing the Framework Agreement in November 2007 (Ghiglione et al., 2015), setting up the basic structure of the bilateral cooperation with Singapore, and attracting initial investors to the project, the third stage in the development of the SSTEC was to find a suitable location for construction (Belle, 2015). Initially, there were four cities competing to host the SSTEC project: Baotou, Tangshan, Tianjin and Ulumuqi (Keeton, 2011). Tianjin was eventually chosen, because the site in the TBNA, where the eco city now stands, fulfilled four important criteria (Belle, 2015). First, the Singaporean delegation especially emphasised the importance of the proposed site having some environmental deficiencies that needed cleaning up (Ghiglione et al., 2015). The site that now houses the eco city consisted of salt paddies, that were partially submerged by seawater (Caprotti, 2013) (for an image of the eco city in 2007, see Appendix 1, Figure 12). Additionally, a local water reservoir, the Ji Canal and the Ji River were all heavily polluted and needed cleansing (Keeton, 2011). The second important factor for choosing Tianjin, was that the proposed site was located in the TBNA, which consists of an agglomeration of free trade areas, such as the Tianjin port and the TEDA (Ghiglione et al., 2015). In 2007, when the decision was made to build the SSTEC in Tianjin, the TBNA accounted for 45 percent of the city's GDP (Swee-Hock et al., 2009). The area also has excellent high-speed rail connections to the airport and city centre of Tianjin, as well as Beijing, which is accessible within two hours (Caprotti, 2013). Another consideration that influenced the decision to grant Tianjin the right to host the eco city project was, that Tianjin's municipal government were offering a piece of land they owned for construction, which made the process of land acquisition "speedy and cost efficient" (Belle, 2015:59). The third and fourth considerations, which would have applied to any of the cities initially vying to host the project, were that the eco city should not be built on arable land and that it had to meet all China's legal requirements (World Bank, 2009).

Urban Design

In the fourth stage, the urban master plan is formulated, which delineates the functions of separate parcels of land within the designated area (Cao, 2015). The urban master plan can be used to attract further investors to the project, as it describes what infrastructure the new city will incorporate, what the overall appearance will be, what synergies with neighbouring districts will be created and how natural eco systems will be integrated. It is also during this fourth stage, that the KPIs are negotiated and decided upon with the main investors (Belle, 2015). In the case of the SSTEC, representatives from both the TEC and the STEC were present at the drafting of the KPIs and urban master plan in April 2008, in order to ensure, that both sides were content with the eco city's objectives. The urban master plan was a combination of three design proposals by two Chinese urban design companies and one Singaporean team, who initially competed for the project and then cooperated, by merging each proposal's best features into one plan (World Bank, 2009). The plan was finally approved by the Tianjin Municipal Government in September 2008.

Land Development

Shortly after the approval of the urban master plan, a groundbreaking ceremony was conducted on the 28th of September 2008 (World Bank, 2009). Present at the ceremony marking the initiation of construction work, were Chinese Premier Wen Jiabao (as head of the JCBC) and the senior minister from Singapore Got Chok Tong. A section of the 34 km^2 area selected to house the eco city was originally occupied by three fishing villages, whose inhabitants had to be compensated, temporarily relocated and then promised work in the eco city, once the project was completed (MacDonald, 2009). The remaining 15 km^2 that were not occupied by the villages, consisted of saline-alkaline non-arable land and polluted water bodies (for an image of the eco city in 2007, see Appendix 1, Figure 12), which had to be reclaimed from the sea and decontaminated (Baeumler et al., 2012). The urban planners who designed the master plan followed the principles of New Urbanism, which postulates "the mixing of green space, commercial and residential functions on a neighbourhood scale with high density at the cores and lower density at the edges" (Belle, 2015:80). The walkability within the SSTEC was to be ensured, by connecting the two main community centres and seven sub-centres by a green spine called 'the eco valley' (Keeton, 2011). The eco valley is an elongated park area with bike and pedestrian areas, that meanders through the eco city with separate 'eco corridors' branching off towards the different compounds (for an image of the eco valley, see Appendix 1, Figure 13). Figure 5 on the following page shows the eco valley in green winding its way from South to North through the eco city, as well as the water reservoir (orange dot) (for an image of the water reservoir, see Appendix 1, Figure 14) and the

park areas along the Ji River that are important aspects of the eco city design, as they offer natural barriers between the different sectors of the city (Belle, 2015) (for an image of the park area along the Ji River, see Appendix 1, Figure 15). Once completed, the eco city will have eight densely populated urban districts that will house shopping centres, medical centres, elementary schools, kindergartens and sports facilities, which will all be within walking distance for residents (World Bank, 2009).

Figure 5: Map of the SSTEC (Source: Author's work based on International New Town Insitute, 2017)

The eco city's residential areas consist of multiple eco cells, which are squares of 400 by 400 metres that are intersected by access roads (Baeumler et al., 2012). Figure 6 on the following page shows how four eco cells constitute an eco neighbourhood and four eco neighbourhoods form one of eight urban districts. These blocks are designed to ensure, that citizens are within 400 meters of a public transport stop. However, some authors criticise the use of this very

typically Chinese urban block design, as it may discourage residents to walk or bike to their preferred destination, especially if the blocks "are separated by large roads" (World Bank, 2009:v) with irregular crossing opportunities.

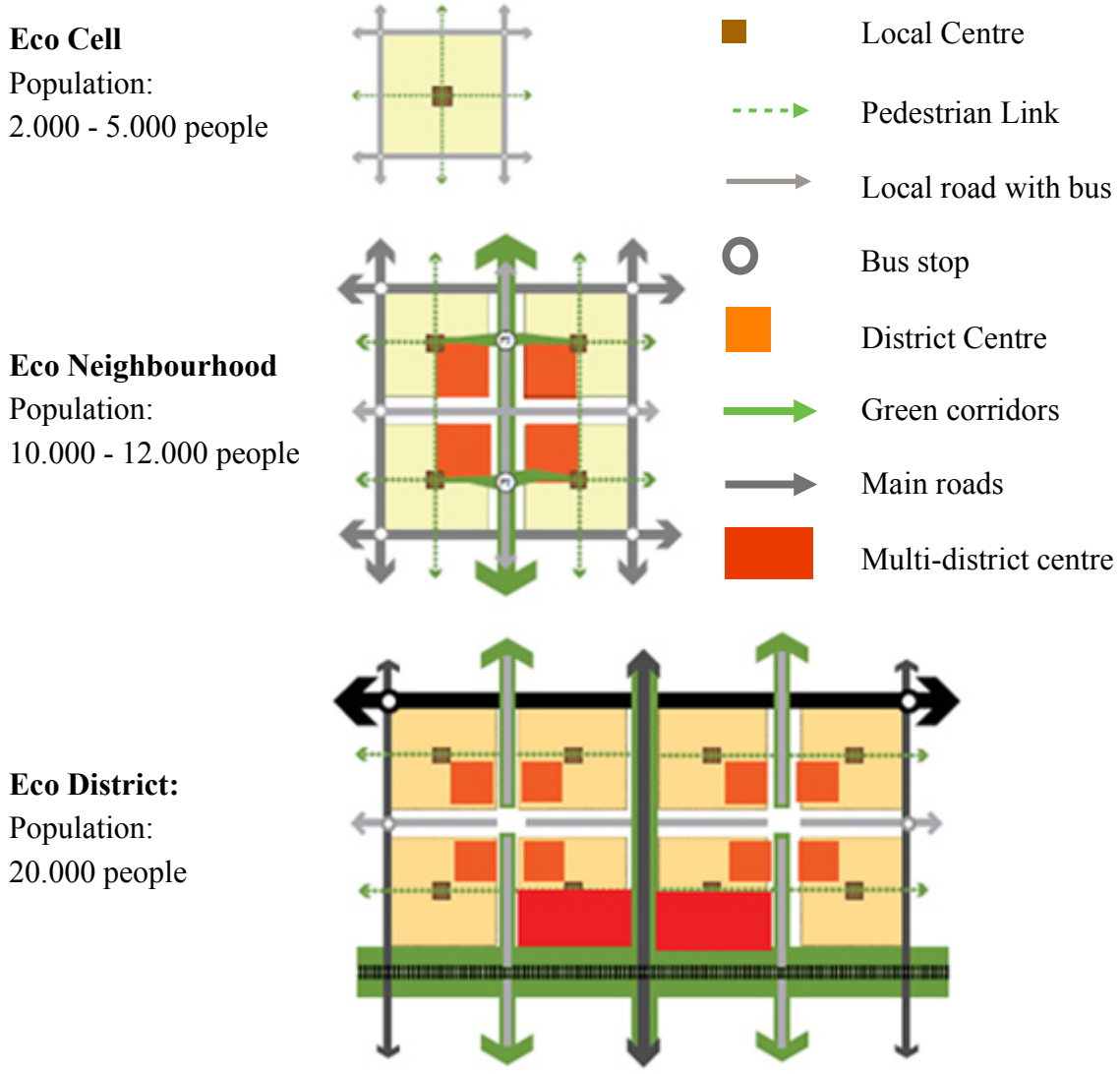

Figure 6: Eco Cells, Neighbourhoods and Districts (Source: Author's work based on Keeton, 2011)

Real Estate Development

The construction of the eco city is divided into three phases (World Bank, 2009). Phase I (from 2008 - 2010) concentrated on building the Southern part of the city around the Southern Business Centre (SBC), as well as the sewage plant to the west of the Qingjing water reservoir (orange dot). Phase II (2011 - 2015) comprised the construction of the basic infrastructure of the city, including the community centres and transport networks to areas outside the city. Finally, in Phase III (2016 - 2020), the districts to the North and East of the lake will be finalised. Because 80 percent of the eco city's area is intended for residential use,

most of the buildings constructed in the eco city will be housing estates and compounds. These vary in quality and price, as the city wishes to attract primarily white-collar workers from the nearby industrial and free trade zones (Caprotti, 2013). However, the eco city's KPIs also require, that at least 20 percent of housing be subsidised by the government and intended for families with lower levels of income (World Bank, 2009). Besides residential compounds and other facilities intended for the city's inhabitants, such as hospitals, community centres, shopping centres, museums and recreational facilities (Caprotti, 2013), the eco city urban master plan also designates areas for industrial use (the three large red circles in Figure 5) (Geroe, 2017). In these eco industrial parks, the eco city especially wishes to attract companies with low emissions and waste generation (for an example of a company in one of the industrial parks, see Appendix 1, Figure 16). These companies should uphold values such as environmental protection and energy conservation or be engaged in R&D, software development, education or cultural activities (Keeton, 2011). A tourist area is intended to be established along the banks of the river leading towards the ocean that will house a Marine Life Centre, various hotels and marinas, as well as a temple dedicated to the goddess Mazu (for an image of a street sign showing the way to the new tourist area, see Appendix 1, Figure 33) (Keeton, 2011). A pre-existing golf course, the Fangte amusement park and an aircraft carrier museum offer further opportunities for entertainment in the eco city (Appendix, Figures 17, 18 and 19). In the eco city, all land is owned by the TEC, who have allocated 53 percent of the available land to the Eco City JV for the purpose of re-sale to real estate development companies (World Bank, 2009). Of the 34 km^2 that belong to the eco city, 25 km^2 are classified as available land, which corresponds to 13,25 km^2 of land intended for real estate construction.

Operation and Management

The final stage of developing a new city is arguably the most important in determining its eventual success or failure. The completed residential compounds are put up for sale, so that residents and enterprises can start purchasing property in the newly developed city (Belle, 2015). In the SSTEC, the original plan was for residents to first move in during the final stages of Phase I in 2010 (World Bank, 2009). However, various reports, as well as my own interviews, suggest the first residents only arrived in the spring of 2012 (Moore, 2012; Flynn, 2012; Vince, 2012). During this stage of the eco city development, new residents need to be encouraged and educated on how to take care of the environment and also given a sense of pride in the achievements of the city (World Bank, 2009). Oftentimes residents moving from large cities in China have never had to separate garbage or look out for the environment as much as they are required to in the eco city. As will be seen in the following section, the

SSTEC's KPIs envision technical solutions to fulfil the city's environmental ambitions, but "environmental campaigns to enhance awareness among residents" (World Bank, 2009:vii) will also be important to mitigate the amount of waste produced by consumers and encourage residents to participate in the completion of the KPIs. The operation of the eco city requires the local government to keep the environment clean and maintain standards (Belle, 2015). Buildings and roads have to be regularly refurbished, trees and flowers replanted, parks maintained and the urban infrastructure managed and improved. The Eco City Framework Agreement foresees an eventual completion of the eco city by 2020, at which point the bilateral nature of the project will end (World Bank, 2009). Until that time, the eco city government has to make sure it manages the myriad of temporary and long term investors, as well as attract new ones to ensure the positive expectations and atmosphere that surround the project are sustained (Belle, 2015).

3.2. The Key Performance Indicators

As documented in previous sections, eco city developments across China can either follow the guidelines set out by the MoHURD and the MEP or draw up their own set of indicators (Belle, 2015). Because of the bilateral nature of the project, the SSTEC opted to draw up its own set of indicators during the urban planning stage of development. The SSTEC KPIs consist of 22 quantitative and four qualitative indicators that provide guidance and planning, but also allow the monitoring of progress throughout the project's development (Caprotti, 2012). They were formed on the basis of national standards in China (including the MoHURD and the MEP indicator sets) and Singapore, as well as international best practices (Belle, 2015). The eco city's KPIs act as a 'score card' that encourages local government officials to pursue environmental targets, rather than solely focus on "economic growth-related indicators" (World Bank, 2009:12). They serve as a monitoring and reporting device, that provides an increased level of transparency to both policy makers, potential residents, enterprises and investors (Caprotti, 2012). The SSTEC's quantitative KPIs are outlined in Table 1 below.

Tabel 1: The SSTEC's Quantitative KPIs

No.	KPI Area and Details	Indicative Value	Timeframe
Natural Environment			
1	Ambient Air Quality	No. of days per year in which ambient air quality meets or exceeds China's national Ambient Air Quality Grade II Standard ≥ 155 (85% of 310 days)	Immediate

No.	KPI Area and Details	Indicative Value	Timeframe
		No. of days per year in which SO_2 and NOx content in the ambient air should not exceed the limits stipulated by China's National Ambient Air Quality Grade I Standard ≥ 155 (85% of 310 days)	Immediate
		To meet the standard stated in the PRC's National Standard GB 3095 - 1996	By 2013
2	Quality of Water Bodies	To meet Grade IV surface water quality standard in the PRC's National Standard GB 3838 - 2002	By 2020
3	Water from taps attaining drinking water standards	100 %	Immediate
4	Noise pollution levels should meet the stipulated standards for different functional zones	100 %	Immediate
5	Carbon emission per unit of GDP	150 ton-C per one million dollars	Immediate
6	Net loss of natural wetlands	0	Immediate
Man-Made Environment			
7	Proportion of green buildings	100 %	Immediate
8	Local plant index	≥ 0.7	Immediate
9	Public green space per capita	≥ 12 m^2 per capita	By 2013
10	Per capita domestic water consumption	≤ 120 Liters per day per capita	By 2013
Living Style			
11	Per capita domestic waste generation	≤ 0.8 kg per day per capita	By 2013
12	Proportion of green trips	≥ 30%	By 2013

No.	KPI Area and Details	Indicative Value	Timeframe
		≥ 90%	By 2020
Infrastructure			
13	Overall Solid waste recycling rate	≥ 60%	By 2013
14	Provision of free recreational and sport facilities within walking distance of 500 meters	100 %	By 2013
15	Treatment to render hazardous and domestic solid wastes non-toxic	100 %	Immediate
16	Barrier-free accessibility	100 %	Immediate
17	Services network coverage	100 %	By 2013
Management			
18	Proportion of public housing	≥ 20%	By 2013
Economic Sustainability			
19	Renewable energy usage	≥ 20%	By 2020
20	Water supply from non-traditional sources	≥ 50%	By 2020
Technological Innovation			
21	Number of R&D scientists and engineers per 10.000 labor force	≥ 50 man-year	By 2020
Employment			
22	Employment-housing equilibrium index	≥ 50%	By 2013

Source: Authors work based on World Bank (2009)

The four qualitative KPIs mainly focus on "regional coordination and economic integration" (World Bank, 2009:12). This entails developing new and innovative policies to encourage the regions surrounding the eco city to follow its example of promoting environmentally conscious policies (Schienke et al., 2012). In short, the qualitative KPIs intend to extend the eco city's ecological ambitions to the surrounding regions. The SSTEC is dependent on the collaboration of surrounding areas, such as Tanggu, Hangu or the TEDA in order to achieve some of the quantitative KPIs outlined in the table above (Geroe, 2017). The quality of water bodies or the ambient air quality, are examples of KPIs that are beyond the eco city government's direct control and therefore demand cooperation with surrounding areas. For this reason, the World Bank describes these KPIs as indicative, rather than obligatory in their assessment of the SSTEC's KPIs. Additionally, the qualitative KPIs allude to the necessity of incorporating residents into the city's development process, by referring to "green consumption and low-carbon operations" (Schienke et al., 2012:76) as desirable lifestyle choices for the city's inhabitants.

In comparison to the eco city indicators developed by the MoHURD and the MEP, the SSTEC's set is "broader and in some areas more advanced, especially for green house gas emissions, renewable energy use, solid waste recycling and water reclamation" (World Bank, 2009:12). The indicator set devised for the SSTEC has in some areas pushed the boundaries as to what is common practice in China, such as the proportion of green buildings and green trips, but in other areas follows national standards and is therefore comparable to other eco city projects in China. For instance the proportion of public green space per capita, the local plant index and the quality of tap water are equal to the standards set by the MoHURD indicator set. Some indicators in the SSTEC's set pursue slightly more ambitious targets than the national standards require, but in principle follow similar goals to the MoHURD's and the MEP's indicator sets. An example are the requirements that relate to maintaining the quality of water bodies, as well as the stipulations regarding the ambient air quality, which are only slightly higher in the SSTEC's indicator set. In terms of differences, both the MEP's and the MoHURD's indicator sets include an evaluation of the citizens' satisfaction with the quality of the environment, forestation rates and treated water utilisation rates. In addition, the MEP's set includes income per capita, as well as other social development indicators, such as the urbanisation rate and central heating coverage that are absent from the SSTEC's indicator set. The MoHURD's set is more specific in terms of infrastructure coverage, as it defines indicators for the number of hospital beds per 10.000 people, tap water coverage, a sewage treatment rate and the average speed on major and secondary roads. Despite the combined extent of the MoHURD's and the MEP's indicator sets, the SSTEC's set comprises a number of indicators not included in the national level indicator sets. The loss of natural wetlands, per

capita domestic waste generation, the recycling rate, the provision of free recreational facilities, the proportion of public housing, barrier free accessibility, renewable energy usage, water supply from non-traditional sources and the number of scientists and engineers per 10.000 inhabitants are all indicators that were devised specifically for the SSTEC project.

Authors' assessments of the SSTEC's indicators vary greatly. Baeumler et al.'s World Bank report in 2012 agrees with the World Bank's original assessment of 2009, by stating, that the SSTEC's indicator set is both broader in scope and more ambitious than the national level indicator sets devised by the MoHURD and the MEP. The report also highlights the potential ability of the SSTEC's indicator set and urban master plan to create a "more ecological urban development pattern" (Baeumler et al., 2012:49), by adhering to "necessary conditions for eco- and low-carbon city development" (Baeumler et al., 2012:49), such as "high population density, transit-oriented development, a mixed land-use plan, an explicit working/living ratio and the provision of affordable housing" (Baeumler et al., 2012:50). Ghiglione et al. (2015) also refer to the aforementioned World Bank report of 2009 when giving their assessment of the SSTEC's KPIs. While criticising the eco city's carbon emissions intensity target of 150 ton-C per one million US dollars as being too high compared to international standards, they commend the eco city's targets with respect to green building and the recycling of hazardous chemicals (Ghiglione et al., 2015).

Geroe highlights, that several of the KPIs devised in the SSTEC project had either already been achieved before their conception (Geroe, 2017), or were "readily achievable by independent SSTEC initiatives" (Geroe, 2017:992). As an example, he cites the KPI regarding the treatment of toxic waste, which had already been common practice in the TBNA by 2009. Geroe also points out, that the fulfilment of KPIs should not be the only consideration in evaluating the success or failure of an eco city project. Instead observers should consider, whether the technologies, green building standards, recycling and green transport systems, as well as the renewable energy facilities that are on trial in the SSTEC, would be replicable elsewhere in China. Keeton (2011) expands on this criticism by pointing out, that considering the SSTEC's self-imposed position as a model city in terms of environmental considerations, some of its KPIs are rather lax when compared to the average on the Chinese mainland. In particular, she highlights the eco city's objective to keep water consumption among its residents to 120 litres per day (Keeton, 2011). Her argument is, that while 120 litres is an admirable objective to achieve compared to international standards (as a reference point, Americans on average consume 262 litres of water a day), the Chinese national average of 86 litres per person per day puts the eco city's goal somewhat into perspective (Keeton, 2011). The same comparative approach is used to argue, that 12m^2 of

green space per capita are low in comparison to the EU, where the average green space per capita is 26m^2 (Keeton, 2011).

Lin (2014) compares the eco city project in Tianjin with the failed eco city development in Dongtan and concludes, that the SSTEC's KPIs are "more pragmatic, and even a bit low-key" (Lin, 2014:567) when compared to its unsuccessful counterpart. Lin points out, that in the municipality of Tianjin, 50 percent of newly constructed housing has to be classified as affordable, which is well above the eco city's KPI of 20 percent. Similarly, other eco city projects in China are reported to have adopted KPIs regarding the share of renewable energy that are significantly higher than the 20 percent decided upon in the SSTEC (Ghiglione et al., 2015). Caofeidian eco city in Tangshan, Hebei province for instance plans to have 50 percent of its energy provided by renewable energy sources.

Finally, Belle (2015) questions whether the KPI regarding green transportation should not have come into effect immediately. She argues, that the KPI does not incentivise the local government to improve the public transportation network before 2020 and as a consequence, residents will be forced to purchase cars to commute to work. Residents may become complacent and accustomed to taking the car and as a result may be less willing to switch to public transport, once it is up and running in 2020. She further argues, that while the KPIs offer a clear indication of what targets are to be achieved, they do not facilitate coordination between stakeholders or offer advice on how to achieve the set targets.

The objective of the previous section was to document on what basis the SSTEC's KPIs are formulated, which objectives they pursue, how they compare to national standards and how they have been evaluated in the associated literature. The following section will take a closer look at what achievements have been accomplished to date, as well as give a more detailed description of the SSTEC as it stands today. The section will conclude with an outline of how the local government in the SSTEC is incorporating its residents into the process of fulfilling KPIs, the central question of this research paper.

3.3. Achievements to Date

3.3.1. Evaluation of External KPIs and Local Government Response

During the evaluation of the SSTEC's KPIs it is important to remember, that the eco city is a work in progress and that consequently, the evaluation of certain KPIs can not be given the full attention they deserve. Nevertheless, this section will attempt to analyse the progress made in achieving the SSTEC's quantitative KPIs. Their level of progress can be measured to

some extent by relying on accounts in literature, the interviews conducted for this master thesis, as well as personal observations.

Table 3 in the previous section shows, that several of the KPIs formulated for the SSTEC project were immediately fulfilled at the time of their conception, as they were already considered common practice in the TBNA in 2008 (Geroe, 2017). One of these KPIs is the requirement, that the ambient air quality meets the national Grade II standard at least 310 days a year (Grade II signifies, that over a forty day measurement, the average concentration of particular matter below a 2.5 micron size ($PM_{2.5}$) is no more than 75 micrograms per cubic meter) (You, 2014). In addition, this KPI requires, that no more than 155 days a year register levels of sulfur dioxide (SO_2) and nitrogen oxide (Nox) exceeding Grade I of the National Ambient Air Quality Standard. This target at present is difficult to achieve, because it is beyond the control of the SSTEC local government (World Bank, 2009). Because pollutants do not recognise jurisdictional barriers (Wong, 2011), the SSTEC government needs to coordinate on a regional level with local neighbouring districts in Tanggu, the TEDA, Dagu and Hangu especially, but arguably also with municipal governments on a national level in the whole of Northern China to address air pollution in their jurisdictions (World Bank, 2012). On a regional level, the eco city's status as a local branch of the Tianjin Municipal Government means the eco city coordinates with its surrounding area on issues such as ambient air and water quality on a regular basis (Belle, 2015). On a national level, the central government's Beijing-Tianjin-Hebei Air Quality Improvement Program, which came into effect in 2015, may be a welcome contribution to tackling air pollution in the TBNA (Asian Development Bank, 2015). The program requires the Hebei provincial government to commit to decreasing industrial production capacities in order to reduce air pollution by 25 percent by 2017 and increasing supervision of emissions in major production facilities.

Other KPIs that were immediately achieved in 2008, due to being common practice in the region, include the quality of tap water attaining drinking water status and noise pollution levels meeting stipulated levels for specific functional zones (Geroe, 2017). The KPI requiring, that green house gas emissions stay below 150 tons per 1 million US$ is described as ambitious when compared to the national standard of 750 tons per 1 million US$ (World Bank, 2009). But the World Bank (2009) also warns, that the limited area of the eco city makes this KPI problematic for comparison purposes. The eco city attempts to attract energy efficient, service and tourism industries, whose emission intensities are lower, thus making this KPI more easily attainable (Baeumler et al., 2012). The World Bank (2009) suggests an additional indicator be included, that measures carbon emissions per capita, which could give a more adequate representation of the eco city's emission standards.

Further KPIs that are marked as immediately achievable in the SSTEC indicator set are attainable under the condition, that the eco city adopt certain policies during the construction phase (Geroe, 2017). This includes the KPI, that 100 percent of newly constructed buildings receive green certification according to the SSTEC Green Building Evaluation Standard. The SSTEC defines a green building as a residential edifice that uses 65 percent less energy for heating (and 50 percent less for public buildings) than similar buildings erected in the early 1980s. Furthermore, 10 percent of the energy in residential buildings and 15 percent in public buildings must stem from renewable energy sources in order for the building to qualify as green under the SSTEC Green Building Evaluation Standard. This KPI is judged as ambitious, as practically no green buildings existed in the municipality of Tianjin in 2008, when construction on the eco city began (World Bank, 2009). Today, the majority of buildings in the eco city are fitted with solar panels that heat the water within the building (Caprotti, 2013). Since 2009, two to three million square meters of building space have been certified as green in the SSTEC, a figure that is set to increase by 2 million square meters annually until 2020 (Yang et al., 2013). An additional construction-related KPI is the target, that no natural wetlands are lost during the construction phase. Different authors argue contrasting viewpoints on this issue. The World Bank (2009) contends, that no natural wetlands, farmland or cultivatable land were lost during construction. Their argument is, that the eco city contributes to the agricultural revitalisation of the area by cleansing local water bodies (Yu, 2014). The contrary is argued by Caprotti, who postulates, that the city was built on natural wetlands, which constitute "a significant global carbon sink" (Caprotti et al., 2015:505). The attainment of this KPI therefore remains a matter of personal opinion, but the fact that the site was chosen specifically for its environmental conditions lends more weight to the former, rather than the latter argument in my eyes.

Further construction policy related KPIs include the local plant index (70 percent of plants have to be indigenous to the region), barrier free access to the eco city, the provision of free recreational facilities, services network coverage, the provision of affordable housing and the treatment of household hazardous waste (World Bank, 2009). The majority of waste produced in the eco city is set to be collected through a pneumatic collection system and treated and recycled in the eco city (Belle, 2015). Non-recyclable waste is then transported and treated in an existing landfill in Hangu, which makes this KPI easily achievable for the eco city today, because no hazardous waste will be treated within its boarders. The provision of free recreational facilities has been achieved through the construction of community centres (for an image of a community centre, see Appendix 1, Figure 20), which house free of charge libraries, gyms, card and pool tables (for images of a free library and recreation room, see Appendix 1, Figures 21 and 22), as well as medical centres. A final construction-related KPI

intended for completion in 2013 was the provision of 12m^2 of green space per capita. The achievement of this target would imply, that the eco city provides more green space for individuals "than almost any other city in China" (Economy, 2014:190). The target was to be achieved by integrating the natural environment along the Ji River into the urban design of the eco city (Wong, 2011) (for an image of the park area along the Ji River, see Appendix 1, Figure 15). By providing ample green areas, residents are encouraged to walk and cycle around the eco city (Economy, 2014).

One KPI set to be completed by 2020, requires 20 percent of the energy in the eco city to stem from renewable energy sources (World Bank, 2009). To achieve this target, the eco city primarily relies on geothermal energy and heat pumps, which provide 70 percent of the eco city's renewable energy (Geroe, 2017). The remaining 30 percent is mainly supplied by solar panels (Geroe, 2017). The few wind energy turbines that exist in the eco city have been described as primarily decorative by some authors (Belle, 2015; Geroe, 2017). Solar panels, which are installed on most roof tops, street lights and garbage cans are used to heat the water in residential and public buildings, as well as provide energy for the illumination of roads and public areas (Caprotti, 2013). Despite this, the World Bank worries, that there are insufficient sources of renewable energy in the Tianjin area to achieve this KPI.

Other KPIs set to be completed by 2020 concern the sourcing and quality of water in the eco city (World Bank, 2009). By 2020, the eco city aims to source 50 percent of its water from desalinated and recycled water sources. The cooperation with Singapore is essential to fulfill this KPI, as Singapore is a world leader in both land and water reclamation. The World Bank judges this KPI as attainable, as long as substantial investments continue to be provided, as water reclamation is both capital intensive and requires high operation costs. In terms of quality, the eco city's water should meet at least Grade IV of the national standards in China (the water is not recommended for swimming (Shemie et al., 2016)). This KPI could be problematic to achieve, as only 22 percent of water bodies in the Tianjin area met Grade IV standards in 2006. The eco city will once again be reliant on neighbouring regions to fulfil this KPI.

3.3.2. Evaluation of KPIs Requiring Citizen Participation

The final KPIs to be analysed in this section are also the most interesting for this master thesis, as they are linked to the consumer behaviour of residents in the eco city. This section will continue the evaluation of KPIs from the previous section, but will also introduce

government measures intended to help citizens fulfil KPIs that require their participation in the achievement process.

The first two KPIs, which require citizen participation, concern the reduction and recycling of waste at the household level (World Bank, 2009). The eco city requires, that waste generated by individual households does not exceed 0.8 kg per day, not including recyclable waste. Additionally, the eco city expects households to recycle at least 60 percent of the waste they generate by 2013. The achievement of these two KPIs is a graded process, with residents expected to generate more waste initially (1.26 kg per capita per day by 2010), but as they get used to their new lifestyle in the eco city, the share of waste they recycle will increase and other waste generated will decrease to the 0.8 kg of waste per day target (Belle, 2015). The World Bank describes the KPI concerning the reduction of waste at household level as an ambitious target, as it is set 27 percent lower than the current rate in the rest of Tianjin, where 1.1 kg of waste is produced per capita per day on average (World Bank, 2009). A 60 percent recycling rate is also high, both compared to the national average of 20 percent (Linzner et al., 2014) and international benchmarks, such as Singapore's 51 percent (World Bank, 2009). A potential hindrance to the completion of this KPI is the fact that the recycling sector in the eco city relies exclusively on formal recycling measures. In China, informal waste pickers play an important role in the recycling industry, with some studies estimating, that informal waste collectors are responsible for collecting between 17 and 57 percent of municipal waste in Chinese cities (Linzner et al., 2014). Furthermore, the fact that the eco city is attempting to attract more affluent white-collar workers, demonstrated by the inclusion of an indicator for the number of scientists and engineers per 10.000 population, implies an increasing amount of waste generated. Studies have shown, that waste generated is positively correlated with the size of the population and their income (Bandara et al., 2007). This makes sense, as people with higher incomes spend more on goods and so create more waste (World Bank, 2009).

In order to counteract these trends, the eco city has adopted several initiatives to encourage citizens to reduce the amount of waste they produce on a daily basis (World Bank, 2009). The first is to sell only processed vegetables in eco city supermarkets to avoid peels and other organic waste, in an attempt to reduce waste generated from food consumption. The eco city's waste reduction plan also proposes the use of recyclable, reusable and biodegradable packaging to wrap goods. The eco city will also follow China's national policy of no longer permitting vendors to hand out free plastic bags to customers (Xing, 2009; Liu et al., 2010). The biggest challenge to achieving the 60 percent recycling rate will be, that it is unlikely, that residents and businesses will have had previous experience of recycling on the scale required in the eco city (World Bank, 2009). For this reason, the World Bank also calls for the

eco city to provide education programs to raise awareness of recycling among citizens, as well as offer financial incentives to encourage citizens to abide by the system. Happily, the interviews conducted for this master thesis revealed, that such an incentive scheme to encourage recycling and waste seperation has been devised and implemented by the eco city municipal government (see Section 6.1.3. Recycling, Heating and Water Use). But the existence of such an incentive scheme does not detract from the necessity for further education programs and community activities on how to separate trash properly, as will be seen in the evaluation of the interview results.

A further KPI that requires citizen participation is the objective to limit daily water consumption to 120 litres per resident by 2013 (World Bank, 2009). Because the freshwater supplies located in the eco city will not be sufficient to meet projected demands, the eco city is forced to consider saltwater desalination and water recycling to cover resident needs (Newman et al., 2013). This also adds importance to the KPI of reducing water consumption per household to 120 litres per day, which is lower than in Beijing and Tianjin, whose residents on average consume around 130 litres of water per person per day. Water recycling is achieved via the use of green roofs that filter rainwater and provide natural cooling to the buildings below them. The eco city also uses "permeable pavements to increase rainwater infiltration into the groundwater" (Newman et al., 2013:87). Drinking water in the eco city is processed by water treatment plants in Hangu and the TEDA (Belle, 2015) and is supposed to be drinkable directly from the tap. Caprotti reports of having been offered water directly from the tap by sales agents during a visit to an apartment in the eco city (Caprotti et al., 2015). The agents claimed, that Singaporean water filtration and purification technologies were capable of rendering water potable in the eco city. But most homes in the eco city today use separate canisters and filtration systems to purify their water; canisters, which residents purchase in the local supermarkets (see 6.1.3. Recycling, Heating and Water Use). This would make the KPI of limiting water consumption per household to 120 litres per day easier to achieve, as the official measurement would not include the households' consumption of purchased water in canisters. In order to achieve this goal, the World Bank recommend the eco city abandon the flat tariff system common in other parts of Tianjin and instead implement a graded tariff system that encourages residents to save on water (World Bank, 2009). In fact, the eco city seems to have heeded the World Bank's advice and now follows such a system, where the utility bill depends on the amount of water consumed per household (see Section 6.1.3. Recycling, Heating and Water Use).

The final KPI to be analysed in this section is the proportion of green transportation exceeding 30 percent by 2013 and 90 percent by 2020 (World Bank, 2009). Green

transportation refers to the use of public transport, cycling or walking instead of driving to the intended destination (Pojani et al., 2015). Compared to other cities in China, a 90 percent target for green trips cannot be considered an overly ambitious target. In 2000 for instance, Tianjin residents used green modes of transportation for 91,5 percent of their journeys. However, the target may become increasingly difficult to achieve, especially in affluent areas such as the SSTEC, because of the increased rate of motorisation in China (World Bank, 2009). The eco city's urban design structure, based on the concept of eco cells, intends to create densely populated urban spaces linked by small, pedestrianised footpaths and bike lanes (Chang, 2017). Footpaths and bike lanes in the eco city are segregated by the use of different coloured slabs to ensure the safety of pedestrians and cyclists (for an image of the segregated pathways, see Appendix 1, Figure 27). The pedestrianised footpaths also include a corrugated pathway for the blind. These measures, as well as the urban design plan in eco neighbourhoods, are intended to encourage residents to walk and cycle within the eco city for short distances (Chang, 2017). For further distances, the eco neighbourhoods are bordered by wider roads that link the various districts within the eco city. The four bus lines that currently operate within the eco city (Belle, 2015) have stops at the corner of every eco neighbourhood (Keeton, 2011). The aim is to ensure, that bus stops are no further than 800 meters away from a resident at any time (Weiss, 2014) and that 100 percent of residents live within 400 meters of a mode of public transport by 2020 (Baeumler et al., 2012). The World Bank however warns, that 400 meters may already be too much for some residents to consider walking and may be a risk to the plan of walkable communities (World Bank, 2009).

Belle (2015) shows, that there were significant disagreements among urban planners as to the priorities concerning green transportation, in particular the nature of the connection to outside districts. The first disagreement between national and municipal level urban planners concerned the timing of construction. The municipal urban planners argued, that a green public transportation system needed to be in place by the time the first residents moved to the eco city in the spring of 2012. They feared path dependencies would cause residents to continue driving to work, even after 2020, when a light rail system will link the eco city to the TEDA, where most residents work (Teo, 2016). The second disagreement concerned the number of stops within the eco city, with national level urban planners opting for three, while municipal urban planners held out for six stations for the light railway line in the eco city. The initial plan was for the light rail system to be built along the eco valley, but planners seem to have opted to construct the line along the main highway that connects to the TBNA and its high-speed railway station at Yujiapu (Teo, 2016). While constructing the railway along the highway maintains the aesthetic beauty of the eco valley (for an image of the eco valley, see Appendix 1, Figure 13), it also increases the distance to residential areas within the eco city,

which may discourage residents from taking the train to work (Belle, 2015). Upon completion, the railway line will enable eco citizens to reach Tianjin city centre within an hour and Beijing South Railway Station within an hour and a half (World Bank, 2009).

The previous chapter has shown the objectives initially defined by the eco city government, how they intend to achieve them and what results have been achieved to date. Table 4 below (author's own work) presents a summary of the previous chapter's findings. It is intended as a tool to enable rapid recollection, following an excursus into green consumer behaviour theory in the following chapter.

Tabel 2: Summary of KPI Evaluation

No.	KPI	Local government action
1	Ambient Air Quality	Requires cooperation with surrounding areas
2	Quality of Water	Requires cooperation with surrounding areas
3	Potable tap water	Achieved in theory, but not trusted by residents
4	Noise pollution	Common practice in TBNA in 2008
5	Carbon emissions	Achievable by attracting low emissions industries
6	Loss of natural wetlands	Attained in theory upon construction, but controversial.
7	Green buildings	Design of SSTEC Green Building Evaluation Standard and green building certification for buildings under construction in eco city
8	Local plant index	Achieved during construction
9	Green space per capita	Achieved during construction
10	Per capita water consumption	Graded pricing system for water. Water recycling by use of green roofs and permeable pavements
11	Per capita waste generation	Only processed vegetables are sold in the eco city, green packaging requirement, no plastic bags in supermarkets
12	Green trips	Separated motor and pedestrian areas, clean and safe bike and footpaths, free e-busses, construction of light rail line in progress
13	Recycling rate	Pneumatic waste collection system; recycling incentive scheme; education programs required

No.	KPI	Local government action
14	Free recreational facilities	Achieved by the construction of community centres with free to use libraries, gyms, card and pool tables and medical centres
15	Hazardous waste treatment	Achieved, because hazardous waste is treated outside of the eco city in Hangu landfill
16	Barrier free accessibility	Achieved during construction
17	Services network	Achieved during construction
18	Affordable housing	Achieved during construction
19	Renewable energy	Through geothermal energy and heat pumps from a plant outside the eco city, as well as the ubiquitous solar panels within the city
20	Water from non traditional sources	Attainable, by depending on Singaporean expertise and further investment
21	Scientists and engineers	Achievable by attracting universities, research centres, software companies and other high-tech industries
22	Employment in eco city	Achievable by attracting any kind of industry

Source: Author's work based on World Bank (2009); Keeton (2011); Wong (2011); Baeumler et al. (2012); Caprotti (2013); Newman et al. (2013); Yang et al. (2013); Yu (2014); Belle (2015); Caprotti et al. (2015); Teo (2016); Chang (2017); Geroe (2017)

4. Excursus: Green Consumer Behaviour Theory

4.1. Previous Research on Green Consumer Behaviour

Various studies have shown, that environmental concern among residents increases with a country's economic development and a consumer's individual disposable income (Rice et al., 1996; Chan, 2008). Environmental concern can have a strong influence on citizens' motivation to take action, purchase organic products (Gunert, 1993) and improve the environment (Seguin et al., 1998). Research on what affects a consumer's decision to purchase environmentally friendly products took off around the same time as the development of eco villages (Rapoport, 2014) and the initiation of discussions on the effects of growth on the environment (Hassan et al., 2014) during the 1970s (Zhao et al., 2014). Most research conducted on green purchasing behaviour during the 1980s and 1990s focused on finding demographic characteristics to explain green purchasing proclivities (Straughan et al., 1999).

In terms of age, findings have been mixed, with some researchers contending, that the younger the consumer, the more likely he or she will pay attention to environmental aspects of a product (Samdahl et al., 1989; Roberts, 1996). Other researchers contend the opposite, that environmental sensitivity increases with age (Anderson et al., 1974; Zimmer et al., 1994). The results for gender are equally as equivocal as the relationship of age to environmental consciousness (Straughan et al., 1999). Research on the relationship of income on environmentally friendly purchasing behaviour has been more conclusive. Numerous studies have shown, that an increase in disposable income will lead to an increased environmental perception (Zimmer et al. 1994; Anderson et al., 1974; Kinnear et al., 1974). The most likely explanation is, that individuals with high incomes are able to bear the additional costs associated with supporting ecological production (Straughan et al., 1999). In terms of the effect of education on environmental awareness, the majority of studies conducted in the past have found a positive relationship (Aaker et al., 1982; Roberts, 1996; Zimmer et al., 1994), with only Samdahl et al. (1989) contending the opposite. Equally, definite results have been found relating to the place of residence (Straughan et al., 1999). Most researchers contend, that residents of urban areas are more likely to be aware of environmental issues (Antil, 1984; Zimmer et al., 1994).

Research over the past ten to twenty years has however increasingly shifted from analysing demographic variables to developing attitudinal and response theories (Berger et al., 1992, Roberts, 1996; Roberts et al, 1997, Chan et al., 2008). One of the theories most regularly cited and commonly used to explain green purchasing behaviour among consumers is the theory of planned behaviour (TPB) (Chan et al., 2008). The TPB consists of several constructs rooted in previous behavioural theories, such as the intention to perform a certain behaviour. A consumer's intention, to purchase green products for instance, is determined by his or her attitude toward a certain behaviour (Kotchen et al., 2000), subjective norms and perceived behaviour control. Subjective norms refer to "perceived social pressure that an individual feels to perform or not perform a particular behaviour" (Chen et al., 2016:2). Social identity theory proposes, that individuals seek to belong to a certain group and form their own personal identity according to the values of the group (Chen, 2014b). In continuation, consumers decide to purchase products that match their own personal values. Therefore, customers that align their identity with an environmentally conscious society will be more inclined to purchase green products (Chan et al., 2008). The TPB differentiates itself from previous consumer behaviour theories in that it incorporates a further construct called 'perceived control behaviour' or 'perceived consumer effectiveness' (Straughan et al., 1999). Perceived control over one's own purchasing behaviour, or "the ease or difficulty of performing the behaviour of interest" (Ajzen, 1991:183) has been described as "the single

strongest predictor of environmentally conscious consumer behaviour" (Straughan et al., 1999:562). The TPB is considered an adequate tool to analyse consumers' behaviour that is beyond their control. Various authors have shown, that if consumers feel in control of their own purchasing behaviour, they will increasingly opt for the environmentally friendly product (Rice et al., 1996). Conversely, if consumers feel they are unable to contribute to solving environmental issues, they will pay less attention to the environmental aspect of a product (Allen, 1982). Contributing factors to a consumer's lack of control over their own purchasing behaviour are the difficulty of locating green products (Rice et al., 1996) and trust towards a green product's authenticity (Chan, 1999). The TPB postulates, that when a consumer has a high degree of control over his or her own purchasing behaviour, then his or her attitude towards that behaviour and subjective norms become stronger in comparison to perceived behavioural control (Chan et al., 2008). As an example, should Chinese consumers have limited volitional control over their own green purchasing behaviour (due to the limited availability of green items in supermarkets for example), then perceived behavioural control would exert a stronger influence than their attitude toward green purchasing and subjective norms. The TPB's use can be extended beyond purchasing to other ethical considerations faced by consumers that impact the environment, such as recycling (Taylor et al., 1995) and saving water (Lynne et al., 1995).

Over the years there has been a proliferation of frameworks attempting to describe variables that influence green consumer behaviour (Berger et al., 1992; Roberts, 1996; Straughan et al., 1999, Chan et al., 2008). These frameworks are partly based on the TPB, but also include further variables that merit discussion in this section. In an attempt to integrate the multitude of frameworks on green consumer behaviour theory, Kaufmann et al. (2012) designed a framework, pictured on the following page in Figure 7, which includes eight independent variables and six demographic variables that influence green consumer behaviour.

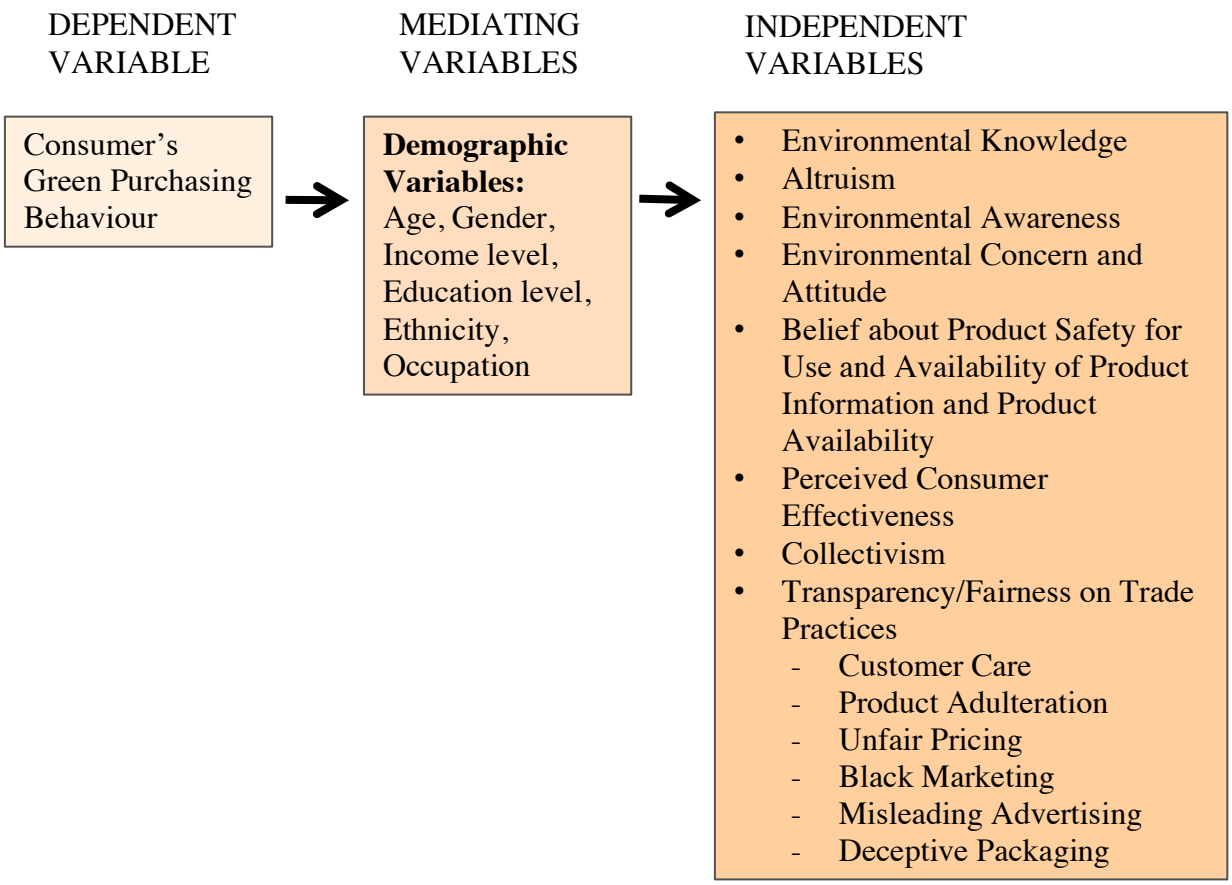

Figure 7: Kaufmann et al.'s Framework for Green Consumer Behaviour (Source: Author's work based on Kaufmann et al., 2012)

The demographic variables are described as mediating variables, because the independent variables vary from one individual to the next, depending on demographics (Kaufmann et al., 2012). The independent variables include variables from the TPB, such as attitude and perceived consumer effectiveness, but also include other important variables, such as environmental knowledge and awareness, which are both positively correlated to green consumer behaviour. The difference between the two terms is, that knowledge describes what people generally know about the environment, while awareness is a type of knowledge, where people understand the "impact of human behaviour on the environment" (Kaufmann et al., 2012:53). Concurrently, authors argue, that an altruistic individual, or an individual concerned "for the welfare of others" (Straughan et al., 1999:561) is more likely to be "aware of the harmful consequences to others" (Kaufmann et al., 2012:52) and will therefore be more aware of the ramifications of his or her actions on the environment. Mostafa (2009), for instance, found that altruism has a positive influence on a person's intentions to purchase organic foods. In order to do so however, the consumer needs to be provided with information on organic products, including content, origin, health aspects and packaging (Kaufmann et al., 2012). Related to this concept is the consumer's trust in the information and safety of the

product (Kaufmann et al., 2012). Treated separately by Kaufmann et al. (2012), but linked to the question of trust, are fair trade practices and transparency, which cover several exploitative behaviours, such as misleading advertising and deceptive packaging. The final concept, 'collectivism', is especially interesting in the Chinese context, considering the collectivist culture of the Chinese people (Hofstede, 1980). A collectivist culture tends to set the priorities of the group over individual considerations, is more cooperative and is concerned for the wellbeing of others (Hofstede, 1980). Several studies have shown, that collectivism is significantly and positively correlated with an awareness of one's individual impact on the environment (Dunlap et al., 2000; Chan et al., 2008; Kaufmann et al., 2012).

An interesting phenomenon, that merits discussion in this section, is the 'attitude/behaviour gap' or 'value/action gap' that has been observed and discussed in previous research (Roberts, 1996; Boulstridge et al., 2000; Young et al., 2010,). The gap describes the paradox, where consumers report, that they are concerned about the environment, but struggle to translate this concern into actual behaviour. Attribution theory offers one explanation for the existence of the value/action gap by stating, that because people do not "see themselves as the cause of the problem" (Juvan et al., 2013:78), they see no reason for a behavioural change on their part to help solve the problem. An example of the value/action gap is presented in a study by Hughner et al. (2007), who found that 46 to 67 percent of consumers have very positive attitudes towards organic food, but only four to ten percent of their respondents had actually purchased organic food in the past year. This discrepancy in the desire to purchase green products and the actual behaviour can lead to cognitive dissonance, which manifests itself in a consumer feeling frustrated, confused or uncertain (Juvan et al., 2013). During the purchasing process, consumers are often faced with a trade-off between what is practical in terms of cost and what is ethical (Boulstridge et al., 2000; Young et al., 2010). This results in a "motivational and practical complexity of green consumption" (Moisander, 2007:404). In order to buy green products, consumers have to spend more time researching whether a company is complying with their corporate social responsibility (Boulstridge et al., 2000).

However, various studies have shown, that while consumers do consider corporate social responsibility in the purchasing process (Boulstridge et al., 2000; Kaufmann et al., 2012), price, quality and convenience remain the main factors that determine the final purchase (Chan et al. 2008; Young et al., 2010). Buying green products reduces the convenience of a purchase, as it requires more time to research where a product is produced, what ingredients are included and where the ingredients are sourced (Biel et al., 2005). Price also poses a major barrier that reduces a consumer's green values in the purchasing process. Despite this, Creyer (1997) shows, that 51 percent of his respondents were willing to pay more for a product, if the

product supported a cause they cared for. In research conducted by Young et al. on barriers for green consumption, price was second only to a lack of information "on the environmental and social performance of products and manufacturers" (Young et al., 2010:10). The same study also uncovered two facilitation techniques to reduce time and effort in the purchasing process (Young et al., 2010). The first facilitation technique was trusting specific labels, organisations, brands and information sources (Young et al., 2010). The second technique was relying on mainstream retailers as reliable sources of green products (Young et al., 2010). A final aspect, that can help a consumer overcome the value/action gap, is guilt (Young et al., 2010; Juvan et al., 2013). When consumers feel guilty for not prioritising green criteria in their decision-making process and are then confronted with this guilt, they express an increased motivation to change their purchasing behaviour toward greener options (Young et al., 2010; Juvan et al., 2013). Consumers attempt to reduce cognitive dissonance by adjusting their behaviour to eliminate inconsistencies that make them feel guilty (Juvan et al., 2013).

The preceding section offered a general overview of previous research on green consumer behaviour, highlighted the major factors influencing green purchasing behaviour, presented the most relevant theories and introduced the 'value/action gap', as well as facilitation techniques as to how it can be overcome. The following section will first present a brief evolution of green consumer behaviour research in China, before applying international research on the TPB to China, as well as presenting the challenges and barriers to green purchasing on the Chinese market. The section will conclude with a demographic assessment of the Chinese green consumer.

4.2. Green Consumer Behaviour Research in China

China has enjoyed rapid economic development and social advancement since the reform period in the late 1980s (Chan et al., 2008). However, Chinese citizens, particularly in urban areas, have gradually started to realise the consequences of breakneck economic development on the environment and their health. Despite this increased interest, research in China on green consumer behaviour before the turn of the millennium is scarce (Liu et al., 2010; Zhao et al., 2014). Studies that focus on green consumer behaviour in China, have only started to increase since 2001, the year the Chinese Consumer's Association declared the year of green consumption (Chan, 2001; Chan et al., 2008; Chen, 2014b; Zhao et al., 2014; Awuni et al., 2015). These post-millennial studies often use internationally recognised theories and frameworks, such as the TPB, and apply them to the Chinese context (Chan et al., 2008, Chen, 2014b, Chen et al., 2016). Of the three variables outlined in the TPB that influence a consumer's intention to purchase green products (attitude, subjective norms and perceived

behavioural control), subjective norms are highlighted as significant in the Chinese context (Chan et al., 2008; Awuni et al., 2015; Chen et al., 2016). As a collectivist culture heavily influenced by Confucian values (Hofstede, 1980), Chinese people tend to conform to the norms of a reference group (Lee, 1990) and sacrifice their own interests in place of society's. In terms of green purchasing behaviour and the TPB, studies have shown, that subjective norms "exert a stronger influence on Chinese consumers" (Chan et al., 2008:32) than attitude and perceived behavioural control. Additionally, a comparison between American and Chinese consumers has shown, that perceived behaviour control plays a larger role in influencing green purchasing intentions in China. Chinese consumers "were found to exhibit a lower degree of volitional control over their green purchases" (Chan et al., 2008:33). Researchers have attributed this finding to the Chinese belief in 'yuan', or fate that is beyond an individual's control (Cheung, 1993).

Chinese consumers have remarked, that a paucity of money, time and environmental knowledge, as well as the insufficient availability of organic products were barriers to purchasing green products in China. Although interest and attention in the environment have increased in recent years (Xu et al., 2012; Awuni et al., 2015), the most significant barrier highlighted in various studies is a lack of knowledge on environmental issues in China (Chan, 2001; Chen, 2014b; Awuni et al., 2015). Researchers therefore call for more education programs, environmental action groups and the increased use of social media in China to enhance environmental understanding among the population (Liu et al., 2010; Zhao et al., 2014; Awuni et al., 2015). Liu et al. point out, that many environmental education programs already exist on a national and local level in China, but that oftentimes they "cannot satisfy the various needs of different groups of people" (Liu et al., 2010:12). They recommend a more direct focus on education, that aims to inform residents on how they can improve their environmental contribution by making changes to their behaviour on a daily basis (Liu et al., 2010). The media plays a crucial role in environmental education in China, as the Chinese absorb most of their environmental knowledge via the Internet (Liu et al., 2010; Zhao et al., 2014). Information diffusion through mobile applications such as Wechat may be an effective method to enhance the Chinese understanding of environmental issues (Liu et al., 2010), as increased environmental education has been shown to lead to more active green purchasing behaviour (Aaker et al., 1982; Roberts, 1996; Zimmer et al., 1994; Zhao et al.; 2014). Chinese policy makers, as well as marketing departments, have to pay special attention to these Chinese characteristics when devising their marketing strategies (Zhao et al., 2014) by, for example, using celebrity testimonials to convey environmental education.

In terms of demographics, gender has the weakest influence on environmentally friendly behaviour in China (Zhao et al., 2014). Literature on gender differences in China is divided upon whether males or females demonstrate stronger intentions to behave in an environmentally friendly fashion. This equivocacy is, however, in line with international literature's uncertainty on the issue. A study by Lee (2009) contends, that "female adolescents scored significantly higher in environmental attitude, environmental concenr, perceived seriousness of environmental problems, perceived environmental responsibility, peer influence and green purchasing beahviour than male adolescents" (Lee, 2009:87). This conclusion is corroborated by Deng et al. (2006), who argue, that females display more environmental values. In contrast, men in Hong Kong have been found to be more active in researching green products and also tend to purchase more organic foods (Ling-Yee, 1997). The strongest factor that influences a Chinese person's environmental consciousness is education (Zhao et al., 2014), which corresponds to international studies analysed in the previous section (Aaker et al., 1982; Roberts, 1996; Zimmer et al., 1994). Better-educated people tend to have a better understanding of complex environmental issues, are therefore more environmentally concerned and are consequently more inclined to purchase green products than people with lower levels of education (Zhao et al., 2014). The relationship between income and green purchasing behaviour is similar in China to descriptions in international research. Consumers with higher incomes are able to bear the extra cost of purchasing green products, as well as prioritising healthy and expensive consumer lifestyles (Chen, 2014b). Contrarily however, income is negatively correlated with recycling and saving behaviours in China. This can be explained by the fact, that lower income households in China are more incentivised to recycle and save, because of economic considerations (Roberts, 1996, Zhao et al., 2014). A similar negative correlation was found in the analysis of the effect of age on green consumer behaviour (Zhao et al., 2014). This rather surprising finding can be explained by the fact, that the older generation in China have lived through periods of hardship, that helped them develop a sense of saving and reuse which is less developed in younger generations.

The previous section has shown, that Chinese consumer behaviour research exhibits some unique traits compared to results gathered in international research. In terms of the TPB, Chinese consumers place greater emphasis on subjective norms in relation to attitudes and perceived behavioural control (Chan et al., 2008; Awuni et al., 2015; Chen et al., 2016), despite perceived behavioural control playing a greater role in influencing green purchasing behaviour in China than in the US (Chan et al., 2008). China's collectivist culture means, that Chinese consumers pay close attention to the opinions of reference groups and society-related trends (Ling-Yee, 1997). Additionally, the Chinese innate belief in 'yuan' places greater

importance on influences, which are beyond their control (Cheung, 1993). The analysis of the effects of demographics on Chinese environmental awareness mostly corresponds with the research conducted by international scholars (Chan, 2001). But, like in other countries, demographic variables in China have less of an influence on environmental responsive behaviour (Chen, 2014b) than variables included in attitudinal and response theories, such as the TPB (Chan, 2001). The excursus on green purchasing behaviour concludes the theoretical analysis of this master thesis. The following sections will first describe the methodology of how the findings in this paper were uncovered, before presenting the results of the nine interviews conducted in the SSTEC.

5. Methodology

5.1. Research Design

The preliminary desk research conducted on the SSTEC and green consumer behaviour theory in advance of the formulation of the research questions revealed an absence of a consumer based approach in research on eco cities (see Literature Review). For this reason the research conducted for this master thesis follows a theoretical/interpretative approach, as described by Creswell (2012). The theoretical/interpretative research methodology focuses on human action and experiences (Bevir et al., 2008), and attempts to "understand phenomena through accessing the meanings participants assign to them" (Orlikowski et al., 1991:5). However, as the research conducted in this paper seeks "insights into the general nature of the problem, possible decision alternatives or identification of relevant variables" (Arnould et al., 2004:225), the research approach can also be described as exploratory in nature (Creswell, 2012). After having gained an overview of the existing literature, as well as a basic understanding on the subjects of eco cities and green consumer behaviour, the research questions were formulated and a preliminary outline suggested (Elliott et al., 2005). The decision to conduct qualitative, rather than quantitative research, was made, due to the anthropocentric nature of the research questions. Qualitative research draws on "intensive knowledge of only a few cases" (Alpermann, 2009:346) and is based on "open, exploratory research questions" (Elliott et al., 2005:147). Additionally, qualitative research has the advantage of allowing the researcher to adapt the inquiry to the individual in question (Creswell, 2012). Individuals have varying degrees of knowledge on different topics and qualitative research allows the researcher to tap into these individual and potentially more personal pockets of knowledge (Creswell, 2012). In doing so, the researcher can extract more in-depth information, that may be essential to answering the research questions (Creswell, 2012).

5.2. Data Collection Process

5.2.1. Identification of Interview Partners

Because the research was conducted in the SSTEC, the recruitment of respondents was initially a major concern for the researcher, as no previous contacts existed in the region that could help in the recruitment process. However, concerns subsided immediately upon arrival, as the initial contact through the accommodation booked in the eco city offered to help find and recruit neighbours in the compound that were willing to participate in the interviews (see 5.2.4. Limitations and Drawbacks). The snowballing technique (Atkinson et al., 2001) was then utilised to find six further contacts following a conversation with a neighbour. The researcher then recruited an additional two interview partners personally in the community centre's recreation facilities. The study's sample population initially consisted of two male and six female adult respondents between the ages of 32 and 47. However, following a conversation with a ten-year-old boy, who showed an avid interest in environmental concerns in general and recycling in particular, the researcher, having received his parents' permission, decided to include his contributions in the study. Despite being an unexpected addition to the study sample, his views were invaluable in shedding light on the next generation's stance on environemtal protection, as well as their level of education and understanding of issues such as recycling, water preservation and energy use. The interviews were for the most part conducted at either the researcher's rented accommodation or at the homes of the respondents. Two of the interviews were conducted in a relatively quiet café of the respondents' choosing, as they did not feel comfortable conducting the interviews at home. It was important to the researcher, that the respondents felt comfortable with their surroundings and so allowed them to decide, where the interview would be conducted.

5.2.2. The Interview Process

The 'Long Interview' as introduced by McCracken is a qualitative tool that allows the researcher to "step into the mind of another person, to see and to experience the world as they do themselves" (McCracken, 1988:9). The 'Long Interview' offers the researcher more time to conduct interviews in greater depth, rather than a superficial interrogation of numerous respondents. Because the interviews conducted for this research were of a more personal nature, as they concerned the participants' consumption habits and lifestyle choices, a semi-structured interview process was selected (Creswell, 2012). Semi-structured interviews involve the preparation of questions in advance to give a general structure of the relevant topics, but allow the researcher to deviate from the guideline, add further questions or change their sequence on the spot, when the researcher realises additional knowledge can be gleaned

from a respondent through probing. This offers the researcher a certain degree of flexibility during the interview. Furthermore, the process can create a more relaxed atmosphere resembling a conversation between the interviewer and the interviewee. The questions, which for this research were first conceived in the English language and then translated into Chinese, served as a guideline, in case the conversation turned stale (for the guidline questionaire in English and Chinese, see Appendix 5). The guideline also ensured, that all the topics were covered during the interview process. In order to guarantee a natural conversation flow, open-ended questions were designed, so as to ensure respondents were able to answer freely. The researcher allowed the respondents to dictate the flow of the conversation and tried not to interrupt, unless the conversation drifted too far off topic. For the purpose of avoiding possible language barriers and misunderstandings, probing and follow-up questions were used. Needless to say, the interview questions were withheld from the interviewees before, during and after the interview process to ensure they were not handed on to other potential interview partners. In addition, interviewees were asked not to discuss the contents of the interview with their neighbours in the compound, so as to avoid biased answers forming for subsequent interviews (see 5.2.4. Limitations and Drawbacks). The sequence of questions was designed so that the topic ‘environment’ featured only in the latter stages of the interview. This was important to avoid influencing the interviewees’ responses concerning their purchasing behaviour.

The in-depth, face-to-face interviews were conducted separately and in Chinese. The use of the respondents’ native language was both beneficial to extract the maximum amount of information and necessary, as none of the interview partners spoke sufficient English to hold a conversation for any length of time. Whenever the researcher did not understand the gist of the conversation, the interview partner was prompted to rephrase or use symbolism to avoid misunderstandings. The average interview took 55 minutes to complete, with the longest going on for over an hour and a half. Even the ten-year-old boy was able to hold a conversation on environmental concerns and life in the eco city for 35 minutes. For the most part, the interviews followed the general structure set out in the interview guideline (for the guidline questionaire in English and Chinese, see Appendix 5). Only one of the interviews involved two people, when the husband of one of the interview partners, intrigued by the topic, unexpectedly decided to participate in the dialogue (Appendix 3, Interview 7). All interviews began with a brief introduction, where the researcher explained in broad terms the topic of the thesis as concerning the eco city and China’s economy. The researcher avoided mentioning the terms ‘environment’, ‘organic’ or ‘green’ during the initial stages of the interview to prevent bias in latter stages. Furthermore, the interviewee was ensured, that there were no wrong answers, that they could answer freely and terminate the interview at any time.

Before the conversation began, the interviewer required, that interview partners offered their consent on tape to the recording of the interview. In accordance with ethical considerations concerning privacy (Creswell, 2012), the interviewees were informed, that the recording would be deleted upon completion of the master thesis. Furthermore, interview partners were notified in advance, that their anonymity would be guaranteed, by using aliases in the final document. For the purpose of creating rapport, interview partners were first asked to briefly introduce themselves and their home. The interview was concluded by thanking the respondents for their contributions and exchanging WeChat contacts in case of follow-up questions arising during the writing process. Upon termination, the respondents were asked if they felt comfortable with the information they had provided and reminded of the option of deleting the recording and taking their contributions out of the thesis. Thankfully, all interview partners felt content with the information they had provided. Presenting the option of retracting their statements was nonetheless important, as it guaranteed the integrity and accuracy of the data provided.

5.2.3. Data Analysis

In qualitative interviews, a respondent's body language or hesitations can be equally as important and revealing as orally communicated information (Creswell, 2012). For this reason, a rapid transcription of the audio recordings was essential to salvage these small, yet significant details. Because Chinese is not the researcher's native language, the audio recordings were first transcribed verbatim and then translated by the researcher into the English language. Despite the process taking a considerable amount of time, it guaranteed as little a loss of information as possible and facilitated the careful handling and analysis of the data collected (see 5.2.4. Limitations and Drawbacks). The verbatim transcriptions also allowed the researcher to "determine the categories, relationships, and assumptions that informs the respondent's view of the world in general and the topic in particular." (McCracken, 1988:42).

As such, in order to structure the masses of information available to the researcher in the transcripts, qualitative content analysis was used (Mayring, 2000) in combination with McCracken's (1988) five stages of analysis. The combining of methodologies for analysing qualitative data was beneficial for this research, because it provided the opportunity to cross-reference external sources with evidence collected in the interviews; a methodology absent from McCracken's five stages. In the first stage, the individual responses were analysed as to their meaning and significance (McCracken, 1988). Separate categories were identified, that had been mentioned by all interview partners (McCracken, 1988). Statements, that belonged

to these categories, were then highlighted within each interview and summarised in a separate spread sheet (McCracken, 1988). This stage also allowed the researcher to identify relevant observations that were sorted out and analysed in greater detail in later stages. In the second stage, the observations were cross-referenced with other information provided by external sources, such as journal articles, websites or blogs. The third stage then aimed to find patterns and overarching topics, which connected observations across interviews (McCracken, 1988). In the fourth stage, these topics were then reduced to those most relevant to answer the research questions (McCracken, 1988). Finally, the fifth stage integrated all topics to create generic themes applicable to all nine interviews (McCracken, 1988). These generic themes are the basis for answering the research questions and form a support structure for the entire paper. The themes identified for this master thesis constitute the subheadings of the following chapter, namely green consumer behaviour in the SSTEC and awareness of KPIs and city schemes.

5.2.4. Limitations and Drawbacks

Due to the qualitative nature of the research design, several limitations arose and need to be discussed in this section. One of the limitations of qualitative research in general is, that findings from qualitative interviews "are vulnerable if generalised from subset to superset" (Alpermann, 2009:347). In other words, findings from qualitative research cannot so easily be extended to the overall population as findings from quantitative research (Atieno, 2009). Qualitative research relies on a very small sample size, which several academics have argued detracts credibility from the overall results (Anderson, 2010). In this study, the relatively small sample size of nine was necessarily limited by the amount of time available to the researcher in China (18 days). With more time, a comparative study would have been possible, by interviewing residents of a neighbouring district (for instance in the TEDA or Tanggu) to discover differences in purchasing behaviour. For this study, only eco city residents were interviewed, but a temporal comparison of consumption habits was still possible, by analysing changes in the respondents' purchasing behaviour before and after moving to the eco city.

An additional limitation in terms of the sampling for this study was that the majority of interview partners lived in the same compound. Ideally, a more diverse geographic dispersion of residents from separate compounds would provide more representative data for the entire eco city. Only two of the interview partners resided in different compounds and their results were for the most part consistent with the findings from the majority compound. The main concern for the researcher was, that despite having been asked not to discuss the contents of

the interview with their neighbours, there was no way to guarantee the respondents' restraint. The findings however revealed no indication of collusion. The neighbours naturally shared similar opinions on certain topics, but there was sufficient variance in their responses for the researcher to be confident, that what was expressed was their own opinion. Nonetheless, a wider spread of respondents from separate compounds would have been preferred. The final limitation in terms of the sample population, that has to be mentioned in this section, concerns the instance during one of the interviews, when the husband of the interview partner unexpectedly joined the conversation, due to a personal interest in the research topic (Appendix 3, Interview 7). While his extensive knowledge, particularly on the eco city, was a valuable contribution to the findings, his participation also changed the dynamic of the interview and may have had an effect on his wife's responses.

The use of Chinese to conduct the interviews was both advantageous and challenging for the data collection process. Using the respondents' mother tongue to conduct the interviews guaranteed, that as much information was collected as possible, as there was no language barrier for the respondents to contend with. The language barrier existed solely on the part of the researcher, who had to contend with a variety of regional accents during the interviews and transcription process. Transcribing audio recordings in a foreign language takes more time, energy and perseverance, which inevitably leads to minor mistakes as words are uttered at pace during a conversation. The researcher is confident however, that the gist of the meaning was always captured in the translations, even though the verbatim transcription may not have always identified the right character. Translations necessarily affect the authenticity of the data, as they are influenced by the translator's own personal and cultural biases (James, 2002). The translations for this study were conducted by the author, which only exaggerates the personal bias, as the researcher was present at the interviews and knows the interview partners personally.

A general limitation to qualitative research that concerns bias is, that the researcher is necessarily present during the data collection phase to conduct the interviews (Anderson, 2010). The researcher's presence "can affect the subjects' responses" (Anderson, 2010:141) by revealing often unconscious encouraging or discouraging signals through body language. The researcher learns with practice how to limit these signals (Atieno, 2009) and stay as neutral and passive as possible during the interview process. Even though the present study was not the researcher's first qualitative research, his personal impact and cultural bias during the data collection and analysis cannot be entirely ruled out.

6. Findings

6.1. Green Consumer Behaviour in the SSTEC

The findings obtained from the nine in-depth, face-to-face interviews first analyse the eco citizens' green consumer behaviour with respect to purchasing behaviour, transportation and finally recycling, heating and water use. These three sub-sections on green consumer behaivour in the SSTEC intend to offer an impression of life in the eco city and present quotidian behavioural patterns among residents. To answer this study's central research question, the analysis then concentrates on how aware respondents are of the SSTEC's KPIs, as well as the measures and incentive schemes in place to help them achieve the eco city's objectives.

6.1.1. Purchasing Behaviour

The interview partners in the eco city were very open, direct and collaborative when discussing their regular purchasing behaviour. For the most part, the respondents conducted their daily shopping within the eco city at either the large retailers in the community centres or at the small convenience stores at the foot of the individual compounds (Appendix 3, Interviews 1, 3, 4, 6 and 8). Interviewee 2 offered a good overview of the shopping opportunities within the eco city: "*Currently the eco city has shops to fulfil the basic daily needs, so there is no need to go outside the eco city, because at the moment in the pedestrian area there are three community centres. Each community centre is a concentration of shops. There you can buy food, you can buy daily necessities, you can eat there*" (Appendix 2, Interview 2) (for an image of a community centre, see Appendix 1, Figure 20). The interviewees were all very satisfied with the number of food stores in the eco city, but often complained about the range of products available. For Interviewee 4, the limited selection and the quantity of food available in supermarkets were reasons she preferred leaving the eco city to do her shopping (Appendix 3, Interview 4). In fact, a number of respondents indicated, that they drove to the TEDA once every couple of weeks to stock up on food (Appendix 3, Interviews 2, 4 and 5). Another reason for leaving the eco city to buy food were path dependencies (Belle, 2015), which were reflected in several residents' indication, that they still prefered supermarkets in the TEDA or Tanggu, despite adequate alternatives existing in the eco city. Interviewee 4 stated, that the biggest supermarket "*was only opened last year, not that long ago*" (Appendix 2, Interview 4). When prompted if she now purchased her food there, she said "*not regularly, […], once I went there and they had run out of what I wanted*" (Appendix 2, Interview 4).

Two of the respondents bought their food from a local farmer online (Appendix 3, Interviews 3 and 7). According to them, the main reason for purchasing food online was, that they personally knew the farmer and trusted his food was fresh and organic. In fact, various interviews revealed, that a personal acquaintance with the producer of green products was an important factor to residents purchasing environmentally friendly products (Appendix 3, Interview 3, 6 and 7). Another interview partner indicated, that he had purchased green products, such as air purifiers, water filters and organic rice online "*because my friend from university is doing that kind of work. If it weren't for him, I wouldn't pay attention to that either*" (Appendix 2, Interview 6). The importance of personal acquaintance in influencing the residents' green purchasing behaviour corresponded with findings from previous research on the importance of subjective norms and the collectivist culture in influencing Chinese green consumer behaviour (Chan et al., 2008; Awuni et al., 2015; Chen et al., 2016). The eco city residents' purchasing decisions were influenced by some kind of reference group, be it their direct neighbours (Appendix 3, Interviews 1, 3, 4 and 8) or friends from university (Appendix 3, Interviews 6 and 7). With respect to the influence of reference groups, Interviewee 1 admitted that, "*I go to places where the neighbours say the prices are relatively cheap or the food is fresh*" (Appendix 2, Interview 1).

In assessing the residents' proclivity for purchasing environmentally friendly products, a basic issue that arose with most interview partners, was their narrow understanding of what constituted an organic or green product. When prompted to give examples of green products, all respondents exclusively and instantly thought of food. None of the interviewees considered automobiles, health care products or clothing, which could be considered green or organic. An explanation could be, that the Chinese terms for green (lüse 绿色) and organic (youji 有机) bare more comestible connotations than the English equivalents. One of the respondents actually asked, whether "*green products and organic products [were] the same concept?*" (Appendix 2, Interview 3). In spite of these definitional difficulties, the respondents had a clear individual understanding of organic and green products. Organic products to them were natural products that "*don't have any kind of contamination*", are pure and "*are not fake*" (Appendix 2, Interview 3). The absence of genetic modification, chemicals and pesticides were also mentioned as important criteria for foods to qualify as organic (Appendix 3, Interviews 2, 5, 7, 8 and 9). One interview partner expanded on this definition and added, that in her opinion, organic food was hard to find in China. She stated, that "*actually in China it is very rare to get green products, except if you grow them yourself. I think green products, […] are products that have not been grown with chemicals to change their appearance, no chemical fertilisers […]. But actually, there will always be a bit of*

doubt, because people will always tell you that their product is green" (Appendix 2, Interview 5).

The doubt surrounding organic products in China was echoed by several respondents, who agreed, that the only guarantee of consuming organic food was by personally planting, growing and harvesting the food (Appendix 3, Interviews 3, 5 and 7). Only one of the interview partners was certain, that the organic food sold in the eco city was reliably green (Appendix 3, Interview 4). Some of the interviewees indicated, that they felt they did not receive sufficient information to be able to judge, whether a product was green (Appendix 3, Interviews 1, 2, 3 and 4). In accordance with previous literature on Chinese green consumer behaviour (Young et al., 2010), these residents laid greater trust on big brands and certain retailers to supply truly organic food products. One respondent equated big brands with a heightened sense of security (Appendix 3, Interview 1). Another respondent proclaimed, that he had greater confidence in the security of the food sold in the eco city than the food available in the centre of Tianjin (Appendix 3, Interview 6). But food security (Appendix 3, Interviews 1, 3 and 6) was not the only consideration in an eco citizen's purchase decision. Health aspects (Appendix 3, Interviews 4, 7 and 9), as well as hygiene and freshness (Appendix 3, Interview 1) also played important roles in persuading eco city residents to purchase organic products. Accentuating the health aspect of environmentally friendly purchasing behaviour, one resident summed up the issue by stating, that "*organic vegetables are good for your health and people these days look much more at the health aspect*" (Appendix 2, Interview 3).

Respondents believed, that an organic product could be identified as organic by its taste (Appendix 3, Interview 4, 5, 8 and 9) and price (Appendix 3, Interviews 3, 6 and 8). Interviewee 6 gave an example of how he identified organic products: "*When I buy fish, that is 3 yuan for one fish and on another one there will be a label saying that it is organic, they will sell it for 6 yuan for one fish. Then I will know. From a personal perspective that is very expensive*" (Appendix 2, Interview 6). Interviewee 6 was one of only three, who referred to the national China Organic Food Certification (COFC) (Appendix 3, Interviews 2, 4 and 6) (for an image of the COFC, see Appendix 1, Figure 27). All interview partners were aware of organic products in general demanding a higher price. When asked how much more they were willing to spend on a product, in the knowledge that the purchase of the product would help improve the environment, the residents interviewed indicated, that they would be willing to spend between 10 (Appendix 3, Interview 3) and 150 percent more (Appendix 3, Interviews 4 and 5) on a product that was organic, with most accepting a 30 percent price increase for organic products (Appendix 3, Interviews 1, 2, 6 and 7). But price was not seen as a hindrance

to realising the respondents' green purchasing intentions. Only one of the respondents complained of the high prices charged in supermarkets for organic products (Appendix 3, Interview 6). The other residents were more amenable to the increased prices, with one interviewee concluding, that "*they may be a bit more expensive than the rest, […] for example the same kind of vegetable, but only by a couple of kuai*" (Appendix 2, Interview 4). This result runs counter to findings from previous research, where price was mentioned as one of the major barriers for Chinese consumers to purchase green products (Chan et al., 2008). In the eco city, the rejection of price as a barrier for purchasing environmentally friendly products may be due to demographic reasons. Previous sections have shown, that education and income are both positively correlated to a Chinese citizen's disposition for purchasing organic products (Zhao et al., 2014; Chen, 2014b). The eco citizens matched these demographic descriptions, which may explain why their responses ran counter to findings from previous research.

Besides price, time was a further barrier identified in previous research (Chan et al., 2008) that was not mentioned by eco city residents as a hindrance to their green purchasing intentions. None of the nine interview partners raised the issue of having to research or look for green products for any length of time. This is surprising, considering the citizens' responses on another previously established barrier to green purchasing behaviour: the availability of green products in China. Of the eight adult respondents, four found it relatively difficult to find organic food products (Appendix 3, Interviews 1, 2, 5 and 8), three believed organic food could be found in most supermarkets (Appendix 3, Interviews 3, 4 and 7) and only one did not pay attention to organic products in the eco city (Appendix 3, Interview 6). It is surprising that those interview partners that found it difficult to locate green products in the eco city did not mention time as a hindrance to their green purchasing behaviour. The contrasting viewpoints on the availability of green products in the eco city are best exemplified by the following contradictory statements. Interviewee 8 proclaimed, that "*in the eco city there are very few places that sell organic vegetables. Basically, none of us have seen it, there is no specific place that sells organic food*" (Appendix 2, Interview 8). In contrast, Interviewee 7 asserted, that "*the normal supermarkets will all have organic foods*" (Appendix 2, Interview 7). The interview partners were also asked, at what point in time they felt they had started paying attention to organic or green products and whether they felt their shopping behaviour had changed following their move to the eco city. The results to this query were mixed, with several interviewees responding in the negative (Appendix 3, Interviews 2, 3, 4 and 7). One respondent indicated, that she had started "*a couple of years ago*" as a consequence of stories of food scandals published on the Internet (Appendix 2, Interview 3). Others were either unable to specify when they had started paying attention (Appendix 3,

Interview 1 and 6) or were not convinced, that green food could be found in the eco city at all (Appendix 3, Interview 5 and 8). None of the respondents mentioned, that their move to the eco city had acted as a catalyst for more environmentally friendly purchasing behaviour.

The final barrier to green purchasing behaviour identified in previous research (Young et al., 2010), which was also mentioned by interview partners in this master thesis, was environmental knowledge. In order to assess the eco citizens' awareness of environmental issues, the interview partners were required to grade themselves on a scale from one to ten (one = not aware at all; ten = very much aware). Four of the respondents gave themselves a very high score of eight, suggesting a belief in their own environmental efficacy (Appendix 3, Interviews 2, 4, 5 and 7). In addition to the four most confident self-evaluations, two others opted for a similarly high score of 7 (Appendix 3, Interviews 3 and 6). Of the remaining three interview partners, one provided an intermediate self-evaluation of six (Appendix 3, Interview 8), another humbly gave herself a very low score of four (Appendix 3, Interview 1), while the final participant abstained from rating his own environmental self-awareness (Appendix 3, Interview 9). The most self-depreciating respondent explained her low score by stating, that *"[she thought] a lot about environmental protection, but then when it [came] to acting on those thoughts, [she tended] to forget, or not pay attention as well as [she] should*" (Appendix 2, Interview 1). Besides their self-evaluations, respondents were also asked to name various environmental issues that were regularly discussed in media reports in China. Examples raised included air pollution (Appendix 3, Interviews 1, 3 and 8), climate change (Appendix 3, Interview 2), soil erosion (Appendix 3, Interview 9) and water contamination (Appendix 3, Interview 4). Air pollution was mentioned as especially impacting on the lives of eco citizens (Appendix 3, Interview 1, 3, 4, 5, 6). Respondents also believed, that environmental protection and green purchasing behaviour were important to preserve the natural environment of the eco city. All of the interview partners stated, that the environment was a frequently discussed dinner topic and those respondents with children emphasised the importance of handing down their knowledge of environmental protection to future generations (Appendix 3, Interviews 1, 3, 4 and 8). The environmentally favourable conditions in the eco city were mentioned by all respondents as major factors for moving to the eco city.

In contrast to these generally positive expressions of environmental fervour, respondents were extremely self-critical as to their own contributions to environmental protection (Appendix 3, Interviews 1, 2, 3, 4, 6 and 8). One respondent was especially self-depreciating, when he stated, that "*I don't think I have contributed that much to the environment of this city since moving here*" (Appendix 2, Interview 6). Other respondents admitted to wasting "*too much*

electricity and water" (Appendix 2, Interview 1, 3 and 8) or ordering way too much food (Appendix 3, Interview 9). The influence of subjective values and the Chinese collectivist culture was revealed (Chan et al., 2008; Awuni et al., 2015; Chen et al., 2016), when the respondents were asked, how they could personally help improve the environment. While respondents offered constructive suggestions, such as creating "*as little trash as possible*" (Appendix 2, Interview 5), or using less water (Appendix 3, Interviews 1 and 8), they also emphasized the collective effort required in creating healthier and cleaner surroundings. Interviewee 2 suggested, that "*improving the environment cannot be done by one single person*" (Appendix 2, Interview 2). This point was echoed by Interviewee 3, who dramatically declared, that "*a person's individual contribution is actually very small, but this small power we have, if everyone uses it, it will become bigger*" (Appendix 2, Interview 3). This belief in a collective effort to improve the local environment was endowed with connotations of 'yuan' (Cheung, 1993), or that personally improving the environment was beyond the citizens' control and therefore futile (Appendix 3, Interviews 3, 4, 6 and 8). Interestingly, several respondents stated, that the best way for them to improve the environment was by improving others (Appendix 3, Interview 1, 5, 7 and 9). One interviewee lamented her parents' lack of environmental fervour and expressed regret at not being more active in her efforts of conversion by stating, that "*in order to keep that comfort between daughter and parents you won't say anything*" (Appendix 2, Interview 5).

While the interviews revealed considerable knowledge on how to improve or ameliorate environmental problems, they also showed, that transgressions due to personal convenience were common, but lamented (see Recycling; Transportation; Heating and Water Use). Despite these transgressions, the eco citizens' green purchasing behaviour does not correspond with the findings from previous research, that show a value-action gap in respondents' attitudes towards organic food in China (Hughner et al., 2007). By purchasing products from a specialised source online, several eco citizens go to extreme lengths to ensure that their food is definitely organic (Appendix 3, Interviews 3, 6 and 7). Furthermore, while doubt remains over the authenticity of organic products, those citizens that conduct their daily shopping within the eco city, at least portray an intention to purchase environmentally friendly products (Appendix 3, Interviews 1, 3, 4, 6 and 8). The value-action gap also suggests a conflict between what is ethical and costs, which does not exist in the case of eco citizens. The previous analysis on the price of organic food has shown, that for all but one of the residents, price posed no barrier to purchasing green products. So while inconsistencies exist in the eco citizens' values versus some of their daily actions (see section 6.1.3. Recycling, Heating and Water Use; Transportation), a value-action gap in terms of purchasing behaviour cannot be identified among eco citizens. In fact, the trust bestowed by eco citizens' on certain brands

(Appendix 3, Interviews 1, 2, 3 and 4), retailers and suppliers corresponds with facilitation techniques to circumvent the value-action gap and to reduce time and effort in the purchasing process of organic products that were identified in previous sections (Young et al., 2010). Despite certain inconsistencies, the paradoxical relationship between values and actions plays a negligible role in influencing eco citizens' purchasing behaviour. Touching upon the dissonance between environmental knowledge and active behaviour, the ten-year-old interview partner memorably summed up these inconsistencies by stating, that in terms of environmentally friendly citizenship "*improvements are limitless*" (Appendix 2, Interview 9).

6.1.2. Transportation

While the previous section argued, that no value-action gap was found in the eco citizens' purchasing behaviour, this section will argue the contrary with respect to transportation. The previous section also described the eco citizens' values in terms of environmental protection. Similarly positive values were also found in the citizens' attitude towards driving and transportation. All but one of the adult respondents owned at least one car, with the one respondent explaining her reason for not possessing a car, as her belief, that she "*would not use it very much*" (Appendix 2, Interview 5) due to her working in the eco city. Those respondents owning a car emphasised the importance of limiting the amount of driving when possible (Appendix 3, Interview 2, 3, 7, 8 and 9). Interviewee 3 for instance stated, that "*if we can avoid driving the car, we don't drive*" (Appendix 2, Interview 3). Meanwhile, the ten-year-old regretted, that "*sometimes I prefer to take the car to some places*" (Appendix 2, Interview 9) and mentioned this predilection as an area for personal improvement in the future. However, in terms of acting on their values, eco citizens lag behind their own expectations. Of the seven adults in possession of a car, five drove the car to work every day (Appendix 3, Interview 1, 2, 3, 7 and 8). Despite the existence of public and company busses to the TEDA, where most residents in the eco city work, only one respondent took advantage of public transport to get to work. But even he admitted, that "*sometimes I am not able to get out of bed in the morning, so I will take the car to work*" (Appendix 2, Interview 6). The eco city currently encourages the purchase and use of cars by not providing adequate transportation links to neighbouring districts and by deciding not to adopt policies common to other cities in China, that curtail the use of cars on certain days (Appendix 3, Interview 7).

For trips within the eco city, all respondents were aware of the availability of free public transport, but the opinions on the convenience of the bus service in the eco city among residents were predominantly negative (Appendix 3, Interview 1, 2, 3, 4, 5). The main reason for this dissatisfaction with the public transport system was the limited distances you could

travel for free with these busses. The four bus lines that presently operate within the eco city cover an area that is feasible to walk or bike (Appendix 3, Interview 1). One of the respondents questioned the point of taking the bus within the eco city by stating, that "*the environment here is very good, so if I can walk, why would I take the bus?*" (Appendix 2, Interview 5). Contrarily, those satisfied with the free bus service highlighted the short distances as an advantage that increased, rather than detracted from the convenience of taking the bus (Appendix 3, Interviews 6, 7 and 8). Interviewee 8, for instance, compared the current service to past experiences in neighbouring Tanggu, by emphasising, that the bus in the eco city "*is free and within two minutes you have arrived. It is very fast, very convenient. And for short distances you always have a seat. In Tanggu that was very different"* (Appendix 2, Interview 8). While all residents were aware of the free bus service, none of the interview partners mentioned the energy efficiency of the busses themselves. The busses in the eco city all run on electricity, rather than petrol and are therefore environmentally friendlier than their counterparts in the TBNA (Belle, 2015).

While the bus service divided opinion, the residents were united in their desire for more convenient and faster connections to neighbouring districts, especially to the high-speed rail service at Yujiapu. Unsurprisingly, all the interview partners were aware of the construction of a light railway line along the main highway. However, some of the residents were under the impression, that a subway, rather than a light railway line, was being constructed (Appendix 3, Interviews 4, 6 and 8). A complete evaluation, whether a value-action gap exists among eco city residents, will arguably only be possible upon completion of the light railway line, when professionals working in the TEDA will have easier, directer and faster alternatives to get to work. Belle's (2015) prediction, that a failure to prioritise public transport facilities from the outset could lead to path dependencies, may however still come true. Currently, only one bus line connects the eco city directly with the high-speed railway station at Yujiapu and the TEDA, which means eco citizens are heavily reliant on a personal vehicle to exit the eco city. The lack of adequate public transportation links to neighbouring districts somewhat mitigates the citizens' value-action gap, but the scheduled completion of the light railway line in 2020 will give citizens' an opportunity to prove, that their good intentions are more than just empty words.

Besides motorised transportation, respondents repeatedly highlighted the eco city's public infrastructure, that allowed for safe and convenient walking and biking in pedestrianised park areas as a key factor for moving to the eco city. The parents among the interview partners especially praised the eco city's urban design plan, which excludes motorised vehicles from residential compounds and park areas, as it provides a safe environment for their children

(Appendix 3, Interviews 3, 4 and 8). In addition to vehicle-free residential areas, the eco city's urban planners also designed segmented pathways for bikes and pedestrians that intend to promote non-motorised transportation (for an image of the segregated pathways, see Appendix 1, Figure 26). These tricoloured pathways have however so far failed to gain traction among residents. Only one of the respondents was able to explain the different colours, which indicate where pedestrians walk and bikes ride (Appendix 3, Interview 1). As a consequence, bikes regularly ride where pedestrians walk and vice versa. Despite these early teething problems, the residents hailed the walkability of the eco city. The predominant sentiment among residents was, that the urban design plan was a major contributor to improved health among citizens, as it encouraged non-motorised transportation (Appendix 3, Interview 1, 3, 4, 5. 7 and 8). Interviewee 1 enthusiastically stated, that "*the amount of times I do sports has increased*" and that her "*health has got a lot better*" (Appendix 2, Interview 1) as a result. A further contribution to physical activity in the eco city is the emergence of dock-less bicycles, that have become popular across China in 2017 (for an image of a dock-less bicycle, see Appendix 1, Figure 28). Despite all but two of the respondents owning their own bicycles, they were all aware of these "*small yellow bikes*" (Appendix 2, Interviews 4, 6, 7, 8 and 9) and some had used them before (Appendix 3, Interviews 1, 2, 4, 5, 8 and 9). The ten-year-old respondent was especially enthusiastic about this new option of seamless transportation in the eco city. Describing the bikes, he said, that "*if you don't have your own bike, that is not bad either, everyone has the small yellow bikes*" (Appendix 2, Interview 9). Most of the respondents used bikes to get to places within the eco city almost every day (Appendix 3, Interviews 1, 2, 4, 5, 8 and 9). One of the respondents was even a member of the local cycling club that meets for outings once a week in the summer months (Appendix 3, Interview 5).

The completion of the eco city's KPI, that foresees eco citizens adopting green transportation methods for more than 90 percent of their outings within the eco city, hinges on the residents' willingness to walk or bike to places within the eco city, as well as switching to public transportation to get to work on a daily basis, once adequate public infrastructure is in place (World Bank, 2009; Belle, 2015). Interviewee 8's response on how she conducts her daily shopping, bodes well for the fulfilment of this KPI. She stated, that "*if I am not buying too many things in the eco city, I will not take the car. Sometimes I take the bus. In front of our building there is a bus stop, or we take the bike or walk*" (Appendix 2, Interview 8). The respondents were enthusiastic and excited by the prospect of being able to reach Tianjin city centre within 45 minutes and Beijing within an hour and a half (Appendix 3, Interviews 1, 2, 4 and 7). But whether they will routinely use the light railway to get to work and thereby avoid a value-action gap remains to be seen.

6.1.3. Recycling, Heating and Water Use

Previous sections in this master thesis have alluded to an incentive scheme that encourages eco citizens to separate and recycle trash (see 3.3.2. Evaluation of KPIs Requiring Citizen Participation). For the purpose of making the process of recylcing and disposing trash as simple as possible, the eco city government requires every compound to include a recycling station (for an image of the recycling station, see, Appendix 1, Figure 24), which is a machine that allows residents to register their previously separated garbage with an automatic chip card (for an image of the automatic chip card, see Appendix 1, Figure 25). Once the residents have informed the machine what type of garbage is being disposed (i.e. plastic, card board, paper…) and the garbage has been collected and verified at the recycling plant within the eco city, the citizens receive points, which can in turn be exchanged for goods at local supermarkets. By using the recycling plant's mobile application, the residents can monitor the amount of points they have received on their smart phones (Appendix 3, Interview 2). All but one (Appendix 3, Interview 4) of the adult eco citizens interviewed were aware of this scheme and could describe it in detail. While most of the respondents expressed a keen desire to abide by the system (Appendix 3, Interviews 1, 2, 5 and 7), some honestly confessed, that they did not separate trash at home or use the recycling station in the compound (Appendix 3, Interviews 4, 6 and 8). Interviewee 8, for instance, flatly stated, that "*I have never collected points*" (Appendix 2, Interview 8). Her reason for ignoring the recycling station was, that her family did not produce enough trash for the system to be worthwhile. She also complained, that "*the points you get are not a lot. Also, sometimes you lose the points*" (Appendix 2, Interview 8). But hers was the only account of the system breaking down or depriving a resident of points. Those respondents that collected points, were for the most part satisfied with the recycling station. One resident even highlighted the "*overall design of the machine [as being] very beautiful*" (Appendix 2, Interview 1). But while respondents praised the system's design as easy and intuitive (Appendix 3, Interviews 1, 2, 3, 5, 7 and 8), observation during research and the researcher's personal experience uncovered two major design flaws. First, because the recycling station was positioned in the direction of the sun, the sun's reflection on the screen made reading the content on display very difficult. The legibility of the screen was exacerbated by the dimness of the screen. Second, there was no designated area or container for residents to deposit the trash they wished to recycle. The result was, that trash was deposited directly in front of the screen. This could be discouraging to recyclers, as they first had to climb over a pile of trash to get to the screen. Nonetheless, citizens seemed content with the overall design and functionality of the system, but doubts were raised over what happened to the waste, after it was collected from the recycling station (Appendix 3, Interviews 2, 5 and 7). The Chinese collectivist culture shone through in one of the resident's

responses, when he emphasised, that a joint effort was required for the recycling system to work in the eco city (Appendix 3, Interview 2). He worried "*that when the waste gets brought to the treatment plant they will just mix it all up again. […] In that case all the things that you do as an individual are rendered useless*" (Appendix 2, Interview 2).

When asked how they could improve their own environmental conduct, most of the citizens, even those that followed the recycling scheme, said they could be more diligent in separating trash (Appendix 3, Interviews 1, 2, 3, 8 and 9). One of the eco citizens recounted a holiday experience in Japan, where she had admired the earnest application of the Japanese towards recycling (Appendices 2 and 3, Interview 1). She hoped, that the "*Chinese people can do this*", but admitted, that her generation had not received adequate waste disposal education for widespread recycling to occur. Like most other respondents (Appendix 3, Interviews 2, 3, 4, 6, 7, 8 and 9) she placed her hope on the next generation to adopt recycling as a rule, rather than an exception (Appendix 3, Interview 1). Previous studies have however found, that the older generation in China find it easier to recycle goods, because of hardships suffered in the past (Zhao et al., 2014). All respondents, regardless of age, were aware of the importance of recycling and counted recycling as an important contributor to environmental protection. Despite accepting their generation's responsibility to improve the environment, the two respondents that admitted to not recycling or separating trash, were two of the younger adult respondents (Appendix 3, Interviews 6 and 8). For these two respondents, a value-action gap could be identified, as their elevated values towards recycling were not matched by their actions on a daily basis. The ten-year-old was remarkably knowledgeable on the issue of recycling (Appendix 3, Interview 9). He was able to define recycling, name recyclable products and even recount instances when he had scolded his parents for not separating trash properly. He highlighted his desire to reform his parents as one of his biggest contributions to environmental protection, by stating, that "*when I see that my mother has not separated the trash according to the system, I will quickly grab her*" (Appendix 2, Interview 9).

In addition to receiving points for shopping, the eco city government encourages residents to recycle, by sending free white and yellow plastic bags for trash disposal once a month (Appendix 3, Interview 5). All but two of the respondents (Appendix 3, Interviews 4 and 5) were capable of differentiating between the yellow bags for recyclable or biodegradable trash and the white bags for non-recyclable trash. Apart from recycling stations, all the compounds in the eco city provide regular segregated trash cans at the foot of every building for everyday trash (Appendix 3, Interview 6). These trash cans separate paper, plastic and batteries and will be linked to a pneumatic waste collection system in the next couple of years (Appendix 3, Interview 7). Those residents that collected points at the recycling station also used these

regular trash cans for daily waste, but reserved cardboard, bottles and larger items for the recycling station (Appendix 3, Interviews 1, 2, 3, 4 and 7). Similar segregated trash cans are set up at regular intervals throughout the eco city and are lined with solar panels that illuminate the trash cans at night (Appendix 3, Interview 9) (for an image of the trash cans in the eco city, see Appendix 1, Figure 23). Despite the numerous opportunities for disposing trash in an environmentally friendly fashion, instances of burning rubbish are a common scene at night in the eco city (for an image of a person burning garbage in the SSTEC, see Appendix 1, Figure 29). While most of the residents had a clear understanding of the term 'recycling' (Appendix 3, Interviews 1, 2, 3, 4, 5, 7, 8 and 9), several were unsure what trash could be recycled or where certain products belonged (Appendix 3, Interviews 1, 6 and 8). Interviewee 8 for instance was hesitant on whether bottles could be brought to the recycling station (Appendix 3, Interview 8), while Interviewee 1 was unsure where to dispose of a teapot. Brooding over the issue for several minutes, she concluded, that "*if I want to throw this out, I am not sure where to put it*" (Appendix 2, Interview 1).

The interviewed residents highlighted the need for educational programs to help new residents adapt to the new system and learn how to recycle (Appendix 3, Interviews 1, 5, 7 and 8). One of the residents involved in the planning of the eco city indicated, that education programs already existed, but were badly advertised and therefore unknown to most residents (Appendix 3, Interview 5). She herself had never attended and was rather vague in her description of what was included in these programs. Interviewee 8 complained, that there had been "*no one that specially told us how to recycle, how to separate the trash*" (Appendix 2, Interviewee 8). With better-advertised education programs or group instructions for new residents, incidences of waste incineration on street corners could be reduced and wider understanding promoted. A more draconian method suggested by one of the respondents was to implement a punishment scheme, "*because it will encourage people*" (Appendix 2, Interview 7). The same respondent also suggested "*a tax on garbage disposal*" (Appendix 2, Interview 7). Such a system already exists in Taiwan, where inhabitants are forced to buy plastic disposal bags off the government. The money generated from the sale of rubbish bags is then reinvested in the waste management system. The respondent affirmed, that he "*would support this kind of system here as well*" (Appendix 2, Interview 7). In order to guarantee a 60 percent recycling rate, as envisioned in the eco city's KPI set (World Bank, 2009), alternative solutions to encourage recycling, such as punishment schemes, a tax on waste disposal or citizen education programs are desperately required.

In terms of energy and heating, several of the eco citizens were able to describe how the water was heated in their buildings (Appendix 3, Interviews 1, 2, 3, 4 and 7). "*On top of our roofs*

there are huge solar panels that collect energy for the residents of these apartments. So, when we wash food, […] hands […] and clothes the water is heated through solar energy" (Appendix 2, Interview 1) (for an image of solar panels on top of buildings in the eco city, see Appendix 1, Figure 10). The sourcing of their electricity and heating was one of the most proudly discussed topics during the interviews. Respondents often highlighted, that the water boiler installed in their apartments was "*very good for the environment*" (Appendix 2, Interview 3) as it was powered by solar energy (Appendix 3, Interviews 1, 2, 3, 4, 7 and 9). When asked to list the amenities in her apartment, Interviewee 4 emphasised the water boiler's energy efficiency, by stating, that the apartment included a "*washing machine, boiler that is powered by solar power, TV, water container, toaster, oven, microwave…*" (Appendix 2, Interview 4). However, she was also quick to stress, that solar energy only constituted "*a very small part*" of overall energy use in the eco city and declared, that "*you cannot expect the entire eco city to use solar energy*" (Appendix 2, Interview 4).

Only half of the respondents mentioned the fact, that public amenities, such as street and traffic lights were also powered by a combination of solar and wind energy (Appendix 3, Interviews 1, 2, 7 and 9). This is somewhat surprising, as solar panels and small wind energy turbines are attached to the top of most street lights within the city (for an image of solar panels attached to street lights in the eco city, see Appendix 1, Figure 10). Interviewee 7 was the only respondent aware of renewable energies being included in the eco city's KPIs. He proved his knowledge by stating, that "*all the lights on the road, all the public electric amenities, all use solar energy, that is also a must*" (Appendix 2, Interview 7). The same respondent further asserted, that the solar panels attached to the top of trash cans will be responsible for powering the pneumatic waste disposal system (Appendix 3, Interview 7). The ten-year-old mentioned the eco city's use of solar energy as one of the reasons he enjoyed living in the eco city. He memorably announced, that "*the electricity here doesn't come from these big smoke chimney factories. Here we use solar energy. So the lights are powered from solar panels that use the sun's energy during the day. Also, I don't know if you have noticed this, our garbage bins at the bottom of the building will light up at night*" (Appendix 2, Interview 9). When asked, how the eco city powered its street lights on cloudy or smoggy days, one respondent explained, that "*if there is no sun, they must have a sort of back-up system from the state electricity grid, normal electricity, not the environmentally friendly electricity*" (Appendix 2, Interview 1).

The respondents in general were not entirely clear on where the electricity provided by the state grid was sourced. Some (Appendix 3, Interview 4 and 6) correctly speculated, that "*the electricity comes from a generation plant in Hangu or in the development zone*" (Appendix 2,

Interview 6). Others simply did not know (Appendix 3, Interviews 1 and 3). In contrast to their extensive knowledge on the use of solar energy, only one of the respondents mentioned the large wind energy turbines at the entrance to the eco city (Appendix 3, Interview 1), lending credence to Belle's conclusion, that the turbines are primarily decorative (Belle, 2015). However, the most encouraging aspect of the interviewees' responses on heating and energy was their pride in the eco city's use of renewable energy to power a small part of their daily lives. By expanding the use of renewable energies in the eco city, the local government may be able to increase and harness this pride to promote citizen participation in other aspects of environmental protection, such as recycling or water use.

When questioned on how they could personally help improve the local environment, citizens often mentioned saving energy and water (Appendix 3, Interviews 1, 2, 3, 4, 7, 8 and 9). Interviewee 7 demonstrated his intention by stating, that "*we want to save energy as much as possible*" (Appendix 2, Interview 7). Interviewee 1 also asserted, that she wants "*to use less electricity, use less water*" (Appendix 2, Interview 1). Her responses on water use revealed a value-action gap, as she admitted to using too much water for cleaning and washing up. However, she was aware of her inefficiency by stating, that "*water I could use less of. I could get the plates clean with less water, that is just waste*" (Appendix 2, Interview 1). Her transgressions were echoed by several other respondents, who first highlighted the importance of conserving water and then admitted to wasting it (Appendix 3, Interviews 3, 4 and 8).

As mentioned in previous sections, the eco city's KPIs envision the possibility of drinking water straight from the tap (Caprotti et al., 2015). All interview partners unequivocally affirmed, that they never drank the water straight from the tap. Their responses did not claim the water to be contaminated, but they did indicate a divergence from behavioural patterns intended by the eco city government. Most residents either boiled the water before drinking (Appendix 3, Interviews 1 and 4), used a water filter (Appendix 3, Interviews 5, 6 and 7) or a combination of both (Appendix 3, Interviews 2, 3, 8 and 9). Their behaviour is most likely due to established habits from previous places of residence, rather than a mistrust in the eco city's water quality. To convince citizens to drink water straight from the tap, the local government have to prove the impeccability of the water's quality. For this, the eco city is reliant on the heavily industrialised neighbouring districts (World Bank, 2009). When asked if they feared the effects of emissions and water pollution from the TEDA, most residents surprisingly responded in the negative. Interviewee 1 for instance believed, that "*the water ways are most likely not affected, but maybe the air*" (Appendix 2, Interview 1) and Interviewee 7 was sure, that "*the area [between the TEDA and the eco city] is wide enough*" (Appendix 2, Interview 7) to prevent contamination.

The respondents' relationship with the eco city's neighbouring districts appears to be a balancing act between reliance on the TEDA for jobs (Appendix 3, Interviews 1, 2, 3, 4, 6, 7 and 8) and a heightened awareness of the region's potential environmental threat (Appendix 3, Interviews 1 and 3). On the one hand, the citizens were desirous for more and faster links to facilitate travel from the eco city to the TEDA (Appendix 3, Interviews 3, 4, 7 and 8), but on the other hand also sensed the potential harm the development area could do to the eco city's environment (Appendix 3, Interviews 1 and 3). However, none of the residents feared, that pollution emanating from the TEDA could affect the eco city's water supply or the natural environment along the Ji River, an important nesting ground for migratory birds (Appendix 3, Interviews 3 and 7). The interviews have shown, that residents seem confident of the quality of the eco city's water supply, but not confident enough to take even a sip of water directly from the tap without boiling or filtering it.

Several of the respondents supplemented their domestic water use by buying bottled water from supermarkets on a regular basis (Appendix 3, Interviews 1, 3 and 4). Two of the interview partners avoided buying bottled water, because of time concerns (Appendix 3, Interview 6) or because of fears the water did not "*contain all the minerals the human body needs*" (Appendix 2, Interview 2). Unfortunately, none of the respondents were aware of the water-cleansing and recuperation technologies from Singapore, such as permeable pavements and green roofs, that are implemented in the eco city to reduce domestic water consumption (Newman et al., 2013). In terms of achieving the eco city's water-related KPIs, the local government will have to find ways to persuade citizens to trust in the potability of the tap water, as well as discourage the purchasing of bottled water. A reduction in bottled water purchases could also help reduce household waste, another KPI that relies on citizen participation.

6.2. Awareness of Key Performance Indicators and City Schemes

The term 'KPI' was only mentioned on one occasion in all the interviews conducted with the eco city residents (Appendix 3, Interview 5). The respondent in question works for the Singaporean company Keppel Cooperations, who own a 90 percent share in STEC, the Singaporean branch of the eco city joint venture. However, despite having heard of the term 'KPI', the respondent did not go into specific details on any single KPI, but only brought a list of the KPIs with her to the interview. In fact, none of the interview partners could name specific targets, such as for example reaching a 90 percent proportion of green trips by 2020. One resident critically asked: "*What is the actual target of the government here? Not a lot of*

people are too clear about this. […] The goals are not clear enough" (Appendix 2, Interview 7). However, the fact that not one resident could correctly name a numerical target, should not be interpreted as a damning assessment of the probability of completing the eco city's KPIs, but more as the local government's failure to adequately spread information. The interviews showed, that residents were aware of the eco city's more general objectives, such as reducing emissions, adopting renewable energies, creating green spaces and attracting talent. The local government could however be more active in disseminating knowledge on specific objectives and target dates, as this could increase citizen participation and generate a sense of pride in the eco city.

The same resident that criticised government dissemination of specific eco city targets, also believed, that the government did not sufficiently explain the underlying objective behind some of the services on offer in the eco city (Appendix 3, Interview 7). As an example, he doubted whether many residents understood, why the eco city provided a free bus service within the eco city. His view was, that not many residents made the connection between the free bus service and the actual aim, that "*they don't want you to drive your car*" (Appendix 2, Interview 7). For the purpose of analysis, a more extensive knowledge on numerical targets would have been desirable, as it may have permitted an estimation towards the rate of completion of several KPIs that require citizen participation (see 3.3.2. Evaluation of KPIs Requiring Citizen Participation). Nevertheless, the residents' knowledge on general objectives allows for equally interesting insights into government programs and dissemination channels, the importance and weighting of certain KPIs for residents, as well as the participation of eco citizens in the completion of set targets. Because an eco city follows economic as well as environmental and social objectives (Belle, 2015), findings that indicate, which targets are most valued by residents, could be of great interest to urban planners of eco city projects across China in the future.

In the section analysing those KPIs that require citizen participation to be completed (see 3.3.2. Evaluation of KPIs Requiring Citizen Participation), strategies adopted by the local government were presented that intend to help citizens fulfil the targets stipulated in the eco city's KPI set. In addition to being unaware of the exact numerical targets, the respondents were often also oblivious to the measures adopted by the local government to achieve those KPIs requiring citizen participation. For instance, to ensure that households generate less than 0,8 kilograms of waste per day and recycle 60 percent of the waste they produce, the eco city government requires supermarkets to sell only processed vegetables and use biodegradable and recyclable packaging for other items (World Bank, 2009). These measures were never mentioned during the interviews. Besides the incentive scheme involving the recycling

station, the only other waste reduction measure mentioned during the interviews was the prohibition of free plastic carrier bags at supermarkets (Appendix 3, Interview 7). This measure is however not exclusive to the eco city and has become common practice in cities across China, since the ban became law in 2009 (Xing, 2009; Liu et al., 2010). In order to achieve the KPI that targets limiting water use to 120 litres per household per day, the eco city government relies on innovative technological solutions from water recycling, such as green roofs and permeable pavements. These measures were also never mentioned during the discussions with residents on water consumption. But because of the technological nature of these measures, combined with their lack of expertise in this area, the eco citizens may be forgiven for not having heard mention of these innovative solutions. The graded tariff for water consumption was directly mentioned only once during the interviews (Appendix 3, Interview 4). In general however, the eco citizens seemed aware of how their utility bill was structured (Appendix 3, Interviews 7 and 8), but did not connect the graded system to the possible benefit of saving water. Interviewee 4 best described the graded tariff, when she recounted how she warned her son, that "*if you waste water you are wasting money. And if you waste money, you will not get any toys*" (Appendix 2, Interview 4). The final KPI requiring citizen participation, that the proportion of green trips within the eco city exceeds 90 percent of all outings by 2020, has already been analysed extensively in previous sections (see 6.1.2. Transportation). As a short side note however, the urban design in eco cells was also not discussed during the interviews. Residents only touched upon the advantages of the urban design plan, when they discussed the eco valley (Appendix 3, Interviews 5 and 7) and the vehicle-free residential compounds (Appendix 3, Interviews 1, 2, 3, 4, 5, 7, 8 and 9).

Despite their nescience on specific targets and certain measures, the residents were not entirely in the dark on the general objectives pursued by the eco city. When eco citizens expressed ignorance of the eco city's goals, they were prompted to imagine what objectives could be conceivable in a place designed to achieve environmental standards. One of the most frequently mentioned objectives, was the planting of trees and construction of green areas for recreational use. The fact, that the research was conducted in March was often lamented by residents, who repeatedly reiterated, that "*during the summer it is really beautiful here. The trees are all very densely placed, during spring there are a lot of flowers*" (Appendix 2, Interview 1). The importance of maintaining the green areas in the eco city was a point of major concern for several eco citizens (Appendix 3, Interviews 3, 4, 6, 7, 8 and 9). One of the respondents, who was a 'building chief' (louzhang 楼长) and a member of the compound assembly, explained, that local assemblies often discussed topics on "*how we can make our compound greener, or even how we can make the entire eco city greener*" (Appendix 2, Interview 6). Other citizens had even participated in tree planting activities organised by their

child's school (Appendix 3, Interview 8) or local companies (Appendix 3, Interviews 5 and 7). But none of the interview partners were aware of activities organised by the local government to encourage citizens to plant trees. The 'building chief' explained, that "*the eco city has its own department that takes care of these things*" (Appendix 2, Interview 6) and was not sure whether citizens would be interested in attending tree planting activities themselves (Appendix 3, Interview 6).

Several citizens did mention one environmental activity organised by the government. During the period of research in the eco city, the local government heavily advertised 'Earth Hour', by taping posters around the compound and the elevators within the buildings (for an image of a poster advertising 'Earth Hour', see Appendix 1, Figure 30). On the 25th of March between 20:30 and 21:30 all residents were encouraged to turn off their lights and discuss environmental issues in the dark (Appendix 3, Interviews 6 and 9). Three of the respondents knew of the activity, but all three admitted to not having participated on the day (Appendix 3, Interviews 2, 6 and 9). Interviewees 1 and 6 were both active in the local assembly and so were able to explain how activities were disseminated by the local government. Interviewee 1 explained, that the government often stuck "*posters in the entrance of this building, […] maybe now you have seen it in our lifts, they were also put there by the government. Also, through the people's assembly […] they will tell us ordinary people […] what kind of activities are going on*" (Appendix 2, Interview 1). Other government activities mentioned during the interviews included activities on fire prevention (Appendix 3, Interviews 3), childrens' entertainment (Appendix 3, Interview 8), biking (Appendix 3, Interview 5), as well as the possibility of visiting the recycling plant (Appendix 3, Interview 1). The interviewees were asked, whether the eco city organised keynote speeches on environmental topics, but none of the respondents had heard of such events. Several citizens were aware of "*domestic political leaders coming to the eco city for a visit*" (Appendix 2, Interview 5), "*for example Chairman Xi, or Premier Li*" (Appendix 2, Interview 6), but none of the citizens mentioned having attended a political event promoting environmental protection in the eco city.

Nonetheless, the interviews proved, that the government had organised activities for residents, but that these activities were either badly advertised or very scarce indeed. Evidence suggests the latter to be more likely, due to the existence of the mobile application 'Eco City Dream' (shengtaimengwang 生态梦网) (Appendix 3, Interviews 2, 4, 5, 6, 7 and 8) (for the QR code of the 'Eco City Dream' mobile application, see Appendix 1, Figure 31). The 'Eco City Dream' has been up and running since before the first respondents moved to the eco city in 2014 (Appendix 3, Interview 7). "*The point of the application is to create awareness*" (Appendix 2, Interview 7) by providing information on "*what activities are being organised*

in every compound, what is happening in the eco city" (Appendix 2, Interview 8). Respondents believed, that "*a lot of people have it here, everyone looks at the information on there*" (Appendix 2, Interview 4). Interviewee 8 indicated, that if she didn't "*have anything on*", then she would check the application "*every day*" (Appendix 2, Interview 8). Even though the application is run by a private company and includes various functions, such as selling personal items, posting pictures or a platform for chatting (Appendix 3, Interview 6), "*the government will also use this platform to spread some information*" (Appendix 2, Interview 7) on "*individual events and also events of the eco city*" (Appendix 2, Interview 6). The 'Eco City Dream' provides a platform for the government to promote all kinds of activities, so the fact, that residents were either vague or completely reticent when asked about environmental activities in the eco city, lends credence to the conclusion, that such activities occur rather sporadically. These activities are however an important mechanism to raise awareness among residents and to encourage participation in protecting the local environment (Liu et al., 2010; Zhao et al., 2014; Awuni et al., 2015).

A further objective that was raised on several occasions was the importance of attracting talented individuals, by enticing high-tech low emissions industries to set up shop in the eco city (Appendix 3, Interviews 1, 2, 3, 4 and 8). Interviewee 1 best summed up the industrial blueprint of the eco city by proclaiming, that "*in fact these companies have to be emission free. […]. Also these companies have to be engaged in the high-tech industry, which means the technology content has to be very high, but emissions very low*" (Appendix 2, Interview 1). In terms of schooling, Interviewee 4 said, that "*attracting good schools, especially more famous schools, as well as building a university*" (Appendix 2, Interview 4) were important considerations for her family to move to the eco city. The eco city currently provides a number of extravagantly designed kindergartens and schools (for an image of a kindergarten in the eco city, see Appendix 1, Figure 32) that employ highly qualified and often foreign teachers (Appendix 3, Interviews 4 and 8). Interviewee 4 especially lauded the quality of the teachers in the eco city, by proclaiming, that "*the teachers in our schools at the moment are very young […], but they are all researchers, doctors. The talent that they can teach will attract more and more talent and this will influence the entire eco city. The quality of the entire eco city's inhabitants will collectively increase*" (Appendix 2, Interview 4).

Other objectives mentioned were related to current and future infrastructure construction, such as the pneumatic waste management system underground (Appendix 3, Interview 7), more entertainment, shopping and educational facilities (Appendix 3, Interviews 1, 2, 8 and 9), as well as territorial expansions in residential and industrial areas. One respondent estimated, that "*the geographic area will double in size*" (Appendix 2, Interview 2) and will

include a tourist district (Appendix 3, Interview 7), complete with newly constructed beaches, hotels, an inland marina connected to the sea by waterways and a temple honouring the goddess Mazu (Keeton, 2011) (for an image of a street sign showing the way to the new tourist area, see Appendix 1, Figure 33). Other respondents highlighted the macro objectives of the eco city and its potential to influence other areas to adopt environmentally friendly policies. Interviewee 5 for instance, saw the eco city's main objective as becoming a standard for further eco city projects across China (Appendix 3, Interview 5). She succinctly summarised her understanding of the eco city's goals, by announcing, that "*the primary goal is to build a city with sustainable development for China, to become a standard. […] Because the concept is that it can be replicated*" (Appendix 2, Interview 5). Other residents also believed, that the eco city could serve as a standard, not only for other eco cities across China (Appendix 3, Interviews 4, 5 and 7), but also for other parts of Tianjin (Appendix 3, Interviews 3, 5 and 7). Speaking of the environmental concept of the eco city, Interviewee 3 believed and hoped, that "*Tianjin and the rest of China, that the whole country can follow these goals*" (Appendix 2, Interview 3).

The final question in every interview was how the respondents envisioned the eco city would look in ten years time. The overwhelming sentiment among all respondents was optimism and a conviction, that moving to the eco city had been the correct step for their families. Most respondents were convinced, that the current shortage of entertainment and shopping facilities would be amended in the next ten years (Appendix 3, Interviews 6, 7, 8 and 9), the public transport connections to surrounding areas improved (Appendix 3, Interviews 4, 6 and 8) and that the eco city would "*lead the whole of China in many educational aspects*" (Appendix 2, Interview 4). Residents were realistic, that higher environmental standards would attract more people, which could lead to problems in the future (Appendix 3, Interviews 1, 2, 3, 5, 6 and 8). Interviewee 5 worried, that "*in ten years the population of the eco city will have increased to 350.000 or more*" and this could lead to "*traffic jams in the start-up area*" (Appendix 2, Interview 5). Her fears were echoed by other respondents, who worried, that an increase in population could detract from the current serenity of the eco city's environment (Appendix 3, Interviews 1, 6 and 8). But most believed, that the eco city "*will change for the better, it will not get worse*" (Appendix 2, Interview 7). In terms of environmental protection, the eco city government would "*continue with what they have been doing, including promoting better living quarters and parks*" (Appendix 2, Interview 7). Citizens were also convinced, that the next generation would take responsibility and improve the environment, not only in the eco city and its surrounding areas, but across China (Appendix 3, Interviews 1, 2, 3, 5, 6 and 7). To do so "*the environmental awareness of the Chinese citizens has to be improved through propaganda campaigns, information has to be spread better*" (Appendix 2, Interview 3).

Even though banners with catchy slogans, such as 'protect the environment, build the homeland' (for an image of the banner, see Appendix 1, Figure 34) decorate the facades of buildings and community centres throughout the eco city, their messages are far too vague to motivate citizens to act in a specific manner.

The interviews revealed, that residents have a general idea of the eco city's objectives, but Interviewee 7's question, "*what is the actual target of the government here?*" (Appendix 2, Interview 7), also reflects the need for more detailed instruction, as to how citizens should behave to reach those targets. The findings in this section have shown, that currently, the eco city government does not organise sufficient environmental activities for residents, but that schools and companies compensate this deficiency to some extent (Appendix 3, Interview 5, 7 and 8). Despite adopting progressive measures to help residents improve the local environment and achieve the eco city's consumer related KPIs, such as the use of innovative technologies for water recycling and energy efficient transportation, residents still often don't connect the measures in place with the overlying objectives. Eco citizens need to be made more aware of these objectives in order to instill a sense of pride, understanding and motivation in the eco city's environmental protection policies. This section also found, that an adequate platform for disseminating knowledge already exists in the 'Eco City Dream' mobile application, but that it has so far not been used to enhance understanding on specific KPIs or measures adopted to achieve said objectives. The following section will present personal recommendations on how the eco city can improve the dissemination of information on environmental protection in general, the KPIs and the measures adopted to achieve them.

7. Recommendations

Several authors on environmental concerns in China have called on the government to organise more environmental education programs for citizens (Liu et al., 2010; Zhao et al., 2014; Awuni et al., 2015). These calls are echoed here for the residents of the SSTEC. First and foremost, with a view to increasing individual understanding of the eco city's specific targets, the local government have to organise more environmental activities and education programs. The findings in this master thesis showed, that eco citizens were all rather vague when asked if environmental activities or education programs existed in the eco city. If environmental activities were commonplace in the eco city, residents would surely not have such a hard time giving examples or describing activities, even if they had not attended personally. The local government, therefore, have to organise more programs to instruct citizens on how to separate trash, save water and electricity, highlight misconduct and offer prevention techniques. These education programs should motivate citizens to share

information, so as to avoid situations, where interviewees dare not talk about environmental misconduct with parents, friends and colleagues for fear of rocking the boat. Even though the eco citizens already have an enhanced understanding of environmental concerns and for the most part possess admirable values towards environmental protection, they still have doubts, for instance over how to separate trash. The possibility of being able to attend a garbage separation presentation was mentioned only once during the interviews, which implies, that these kind of events are badly advertised.

In order to spread information more effectively, the findings introduced a simple and far-reaching dissemination platform in the form of the mobile application 'Eco City Dream'. Most of the adult respondents indicated, that they used this mobile application on a regular basis. The government are definitely aware of this private platform and use it to advertise various individual and public events. The local government could therefore also use the 'Eco City Dream' to present the eco city's KPIs and the measures adopted to guarantee their achievement to residents more clearly. Furthermore, the application could also be linked to the mobile incentive scheme for separating and recycling trash. The importance of 'face' in Chinese culture could be used to the eco city's advantage, by allowing residents to share their recycling scores on the 'Eco City Dream' to create a competition or game amongst residents. Additionally, the recycling scheme linked to the 'Eco City Dream' could conceivably also be extended to incentivise citizens to post and share environmental activities organised by the government. By scanning their phones over a QR code at the entrance of an event, citizens could be rewarded for attending environmental activities. Of course, measures would then have to be taken to avoid double-attendance, attendance for the sake of gaining points and other undesirable behaviour. The points granted would have to be high enough to encourage attendance, but not too high so as to attract attendees who are only interested in collecting points. By doing so, the activities would receive a much wider audience, which in turn would increase understanding and awareness of environmental issues, eco city objectives and measures among residents.

The final recommendation targets new arrivals to the eco city, who in most cases are likely to have never received an extensive environmental education. As an example, most residents moving to the eco city will unlikely have had to separate trash or recycle in their previous place of residence, so an initial instruction into how the eco city's waste management system works would be invaluable. A welcome package containing useful information on the eco city's environmental practices, objectives, policies and measures could offer new arrivals an insightful first impression into the lifestyle awaiting them in their new home. Welcome packages for residents are a common practice in Denmark for example (Work In Denmark,

2017), where new arrivals are made aware of the local transport, shopping, education and entertainment facilities, as well as upcoming events and activities. The packages often contain small gifts, such as kitchen towels, postcards or key rings, but these gifts could be adapted to serve environmental education purposes in the eco city. In addition to containing leaflets with useful information on city schemes and activities, the package could also include the first batch of white and yellow plastic disposal bags, a smartly designed canvas bag for shopping or a reading light powered by solar energy. The major drawbacks to this scheme are the costs associated with supplying every new household with a small gift bag, as well as the administrative effort involved. Naturally, the cost of the bags would have to be weighed against the potential educational value and long-term benefits from reduced environmental misconduct among citizens in the future.

8. Conclusion

The intention of this master thesis is to investigate the measures adopted by the Tianjin Eco City Municipal Government to encourage its citizens to act in an environmentally sustainable fashion in order to achieve the city's KPIs. The theoretical section first uncovered a plethora of measures designed to achieve KPIs that do not require citizen participation. These measures mainly target construction related KPIs, that are part of the urban master plan (World Bank 2009; Wong, 2011; Geroe, 2017) or require the cooperation with surrounding areas (World Bank 2012; Belle, 2015). Measures that were implemented during the design phase include the construction of a pneumatic waste collection system (Belle, 2015), the urban design in eco cells that encourages walkability and biking (Keeton, 2011; Newman et al., 2013; Belle, 2015), as well as the provision of green areas and free recreational facilities (World Bank, 2012). Furthermore, the SSTEC Green Building Evaluation Standard ensures, that newly constructed buildings use less energy, which is provided by renewable energy sources (Geroe, 2017). During the design phase, the SSTEC also benefitted from innovative water recycling and land reclamation techniques from Singapore, such as green roofs and permeable pavements (Newman et al., 2013). Finally, the industrial design plan invites high-tech, low emissions industries, research centres and educational facilities to set up in the eco city, with the aim of attracting top talent to improve the quality of the citizens (World Bank, 2009; World Bank 2012).

The findings then analysed, how aware citizens are of the eco city's KPIs and their methods of achievement. While citizens seem aware of the general objectives, such as providing a clean environment by recycling waste, adopting renewable energies and constructing green areas, they were often in the dark on certain measures to aid them in fulfilling these

objectives. For instance, the requirement, that supermarkets sell only processed vegetables and use biodegradable and recyclable packaging for other items, was never mentioned during the interviews. Apart from the pneumatic waste disposal system, other innovative technological solutions, such as green roofs or permeable pavements, were also not known to residents. The respondents were however able to name measures, that had more of a direct impact on their personal lives, such as the graded tariff system for water consumption, the solar powered water boiler and public lighting, as well as the incentive scheme for recycling waste in their compound. The prohibition on free plastic carrier bags in supermarkets was raised by only one of the respondents as a method adopted across China to improve the environment.

An excursus into the field of green consumer behaviour helped answer the second research question, which sought to shed light on green consumer behaviour trends in China, by analysing, whether an environmentally friendly environment influenced consumers' green purchasing decisions. The findings showed, that for the most part eco citizens consider the environmental aspect of a product when making a purchasing decision. Food safety, as well as freshness, health and hygienic aspects, were determining factors that influenced the respondents' choice of product. The importance of reference groups and subjective norms in influencing Chinese green consumer behaviour became evident during the discussion on where residents purchased their organic food. Whether or not a respondent purchased organic products was often dependent on whether they knew the vendor personally. The responses were mixed with respect to the availability of organic food products in the eco city, with four of the citizens indicating they found it hard to locate green products in local supermarkets. Despite previous research indicating the contrary, price was found to pose no barrier for purchasing environmentally friendly products in the eco city. While a value-action gap was rejected during the discussion on green purchasing behaviour, the respondents' frequent use of automobile transportation stood in stark contrast to their values towards green transportation. When questioned on whether they felt their move to the eco city had acted as a catalyst for improved green consumer behaviour, none of the respondents answered in the affirmative.

However, their repudiation does not necessarily mean, that respondents do not act in a more environmentally friendly manner. Several of the measures to achieve the eco city's KPIs have undoubtedly had a significant impact on the lives of the eco citizens. For instance, the vehicle-free compounds, the segregated pavements, the extensive green areas, the free recreational centres, busses, libraries and medical centres, as well as the use of renewable energies were all measures the eco citizens took great pride in mentioning during the

interviews. Of course, there is room for improvement, especially in terms of green transportation links to neighbouring districts, the provision of entertainment and shopping facilities and most importantly the dissemination of knowledge throughout the community. The eco city government need to utilise existing communication technology to spread awareness of the KPIs among residents, as well as the measures designed to help citizens achieve specific KPIs. The government also have to organise more environmental activities and educational programs to improve environmental conduct in the city.

Eco cities in general, and the SSTEC in particular, offer fantastic opportunities for consumer behaviour research, because of their novelty, their purpose and the fact, that control and treatment groups are so clearly defined by jurisdictional borders. Further research could examine, for instance, whether differences in consumer behaviour exist between eco city residents and the neighbouring district of Tanggu or whether the SSTEC's environmental objectives have spillover effects in neighbouring districts. Temporal studies would also be a possibility to examine those KPIs destined for completion in 2020 or whether the demographic composition of eco city residents changes over time. With the population of the SSTEC expected to increase with continued development, the local government need to guarantee, that new and current residents alike are aware of the measures in place to achieve the KPIs laid out in the urban master plan. The speed of development so far has been breathtaking. Ten years ago, the site upon which the residential compound stands that now houses the respondents for this master thesis, was surrounded by saline-alkaline non-arable land and polluted water bodies (for an image of the eco city in 2007, see Appendix 1, Figure 12). In ten years time, the SSTEC could stand as an outstanding example of innovative and sustainable urban development; a model for further projects across China. The onus to realise this urban utopia lies with those inhabiting the eco city, the respondents to this master thesis, to whom I express my deepest gratitude and best wishes for a clean, green and prosperous Sino-Singapore Tianjin Eco City.

9. References

Aaker, David A. and Bagozzi, Richard (1982). "Attitudes toward Public Policy Alternatives to Reduce Air Pollution". *Journal of Marketing and Public Policy*, Vol. 1, No. 1, pp. 85 - 94

Afiff, Suraya A. (2010). "Challenges to implementing the eco-city concept in Indonesia's major cities". in: Lye, Liang Fook and Chen Gang (eds.), *Towards a liveable and sustainable environment: eco-cities in East Asia.* (Singapore: World Scientific Publishing), pp. 129 - 140

Ajzen, Icek (1991). "The Theory of Planned Behaviour". *Organisation Behaviour and Human Decision Processes*, Vol. 50, pp. 179 - 211

Allen, Chris T. (1982). "Self-Perception Based Strategies for Stimulating Energy Conservation". *Journal of Consumer Research*, Vol. 8, March, pp. 381 - 390

Alpermann, Björn (2009). "Political Science Research on China: Making the Most of Diversity". *Journal of Chinese Political Science*, Vol. 14, No. 4, pp. 343 - 356

Anderson, Claire (2010). "Presenting and Evaluating Qualitative Research". *American Journal of Pharmaceutical Education*, Vol. 74, No. 8, pp. 141

Anderson, W. Thomas, Henion, Karl E. and Cox, Eli P (1974). "Socially vs. Ecologically Responsible Consumers". *AMA Combined Conference Proceedings*, Vol. 36, Autumn, pp. 304-11

Antil, John H. (1984). "Socially Responsible Consumers: Profile and Implications for Public Policy". *Journal of Macromarketing*, Vol. 5, Autumn 1984, pp. 18 - 39

Arnould, Eric; Price, Linda and Zinkhan, George (2004). *Cosumers 2nd edition*. (Boston: McGraw-Hill/Irwin)

Asian Development Bank (2015). "People's Republic of China: Study on the Coordinated Development of Beijing-Tianjin-Hebei". ADB Technical Assistance Report. Available: https://www.adb.org/sites/default/files/project-document/178358/48462-001-tar.pdf (Accessed: 9 May 2017)

Atieno, Ochieng Pamela (2009). "An Analysis of the Strengths and Limitations of Qualitative and Quantitative Research Paradigms". *Problems of Education in the 21st Century*, Vol. 13, 2009, pp. 13 – 18

Atkinson, Rowland and Flint, John (2001). "Accessing Hidden and Hard-to-Reach Populations: Snowball Research Strategies". *Social Research Update*, Vol. 33, 2001, pp. 1 – 4

Awuni, Joseph Agebase and Du, Jianguo (2015). "Sustainable Consumption in Chinese Cities: Green Purchasing Intentions of Young Adults Based on the Theory of Consumption Values". *Sustainable Development*, Vol. 24, No. 2, pp. 124 - 135

Baeumler, Axel; Ijjasz-Vasquez, Ede and Mehndiratta, Shomik (2012). *Sustainable Low-Carbon City Development in China.* (Washington D.C.: Directions in Development)

Bandara, Nilanthi J.G.J; Hettiaratchi, J. Patrick A; Wirasinghe, S.C. and Pilapiiya, Sumith (2007). "Relation of waste generation and composition to socio-economic factors: a case study". *Environ Monit Assess*, Vol. 2007, No. 135, pp. 31 - 39

Barton, Hugh (1998). "Eco-neighbourhoods: A review of projects". *Local Environment*, Vol. 3, No. 2, pp. 159 - 177

Belle, Iris (2015). *From Economic Zone to Eco City? Urban Governance and Urban Development Trends in Tianjin's Coastal Area.* (Stuttgart: Borntraeger Science Publishers)

Berger, Ida E. and Corbin, Ruth M. (1992). "Perceived Consumer Effectiveness and Faith in Others as Moderators of Environmentally Responsible Behaviors". *Journal of Public Policy and Marketing*, Vol. 11, No. 2, pp. 79 - 100

Bevir, Mark and Kedar, Asaf (2008). "Concept formation in political science: An anti-naturalist critique of qualitative methodology". *Perspectives on Politics*, Vol. 6, No. 3, pp. 503-17.

Biel, Anders and Dahlstrand, Ulf (2005). "Values and habits: a dual-process model". in: Krarup, Signe and Russel, Clifford S. (eds.), *Environment, Information and Consumer Behaviour (New Horizons in Environmental Economics)*. (Northampton: Edward Elgar Pub), pp. 33 - 49

Blassingame, Lurton (1998). "Sustainable cities: Oxymoron, utopia or inevitability?" *The Social Science Journal*, Vol. 35, No. 1, pp. 1 - 13

Boulstridge, Emma and Carriage, Marylyn (2000). "Do consumers really care about corporate responsibility? Highlighting the attitude-behaviour gap". *Journal of Communication Management*, Vol. 4, No. 4, pp. 355 - 368

Brauch, Hans Günter; Spring, Úrsula Oswald; Grin, John and Sheffran, Jürgen (2016). *Handbook on Sustainability Transition and Sustainable Peace*. (Zürich: Springer AG)

Bulkeley, Harriet and Betsill, Michele (2005). "Rethinking sustainable cities: multilevel governance and the "urban" politics of climate change". *Environmental Politics*, Vol. 14, No. 1, pp. 42 - 63

Bullivant, Lucy (2007). "Dongtan - a Shangri-La for Shanghai?" *Architecture and Urbanism*, No. 440, pp 122 - 127

Cao, Junjian (2015). *The Chinese Real Estate Market: Development, Regulation and Investment.* (New York: Routledge).

Caprotti, Federico (2015). *Eco-Cities and the Transition to Low-Carbon Economies.* (New York: Palgrave Macmillan)

Caprotti, Federico; Springer, Cecilia and Harmer Nichola (2015). "'Eco for whom? Envisioning Eco-urbanism in the Sino-Singapore Tianjin Eco-city, China". *International Journal of Urban and Regional Research*, Vol. 39, No. 3, pp. 495 - 517

Chan, Ricky Y. K. (1999). "Environmental Attitudes and Behaviour of Consumers in China: Survey Findings and Implications". J*ournal of International Consumer Marketing*, Vol. 11, No. 4, pp. 25 - 51

Chan, Ricky Y. K. (2001). "Determinants of Chinese Consumers' Green Purchase Behaviour". *Psychology and Marketing*, Vol. 18, No. 4, pp. 389 - 413

Chan, Ricky Y. K. and Lau, Lorett B. Y. (2008). "Explaining Green Purchasing Behaviour". *Journal of International Consumer Marketing*, Vol. 2, No. 3, pp. 9 - 40

Chang, I-Chun Catherine (2017). "Failure matters: Reassembling eco-urbanism in a globalising China". *Environment and Planning*, Vol. 1, No. 24, pp. 1 - 24

Chen, Kai and Deng, Ting (2016). "Research on the Green Purchase Intentions from the Perspective of Product Knowledge". *Sustainability*, Vo. 8, No. 943, pp. 1 - 16

Chen, Sijia (2014a). "The Green Stuff: Buying Organic in Beijing". The Beijinger. Available: https://www.thebeijinger.com/blog/2014/09/20/green-stuff-buying-organic-beijing (Accessed 5 July 2017)

Chen, Wen Jung (2014b). "A Comparative Analysis of Consumers' Attitude and Behaviour toward Green Practices". *Journal of Tourism and Recreation*, Vol. 1, No. 2, pp. 15 - 25

Cheung, Fanny M. C. (1993). “Psychopathology among Chinese People”. in: Bond, Michael Harris (ed.), *The Psychology of the Chinese People*. (New York: Oxford University Press), pp. 171 - 211

Creswell, John W. (2012). *Qualitative Inquiry and Research Design 3rd edition*. (Thousand Oaks: Sage publications)

Creyer, Elizabeth H. (1997). “The influence of firm behaviour on purchase intention: do consumers really care about business ethics?” *Journal of Consumer Marketing*, Vol. 14, No. 6, pp. 421 - 432

Deng, Jinyang; Walker, Gordon J. and Swinnerton, Guy (2006). “A Comparison Of Environmental Values And Attitudes Between Chinese In Canada and Anglo-Canadians”. *Environment and Behaviour*, Vol. 38, No. 1, pp. 22 - 47

Dunlap, Riley E.; van Liere, Kent D.; Mertig, Angela G. and Jones, Robert Emmet (2000). “Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale”. *Journal of Social Issues*, Vol. 56, No. 3, pp. 425 - 442

Dujardin, Sébastien; Marique, Anne - Françoise and Teller, Jacques (2014). “Spatial planning as a driver of change in mobility and residential energy consumption”. *Journal of Energy and Buildings*, No. 68, pp. 779 - 785

Ecodreamers (2017). “QR Code”. Available: http://www.ecodreamers.com/ (Accessed 5 July 2017)

Elliott, Robert and Timulak, Ladislav (2005). “Descriptive and interpretive approaches to qualitative research”. in: Miles, Jeremy and Gilbert, Paul (eds.), A Handbook of Research Methods for Clinical and Health Psychology. (Oxford: Oxford University Press), pp. 147 - 160

Flynn, Andrew (2012). “Eco-Cities in China”. Cardiff Case Studies. Available: https://www.cardiff.ac.uk/__data/assets/pdf_file/0010/348652/EcoCitiesChina.pdf (Accessed 8 May 2017)

Geroe, S.J.W. (2017). “The Sino-Singapore Tianjin Eco-City: A Case Study Of Chinese Experimental Regulatory And Institutional Development”. *International Journal of Sustainable Development and Planning*, Vol. 12, No. 6, pp. 987 - 994

Ghiglione, Silvio and Larbi, Martin (2015). "Eco-Cities in China: Ecological Urban Reality or Political Nightmare?" *Journal of Management and Sustainability*, Vol. 5, No. 1, pp. 101 - 114

Goodman, David S.G. (2014). *Class in Contemporary China*. (Hoboken: John Wiley & Sons).

Hart, Sara (2007). "Zero-carbon cities". *Architectural Record*, Vol. 195, No. 3, pp. 162 - 164

Hassan, Abbas M. and Lee Hyowon (2014). *The paradox of the sustainable city: definitions and examples.* (Heidelberg: Springer)

Jabereen, Josef Rafeq (2006). "Sustainable urban forms: their typologies, models and concepts". *Journal of Planning Education and Research*, Vol. 26, No. 1, pp. 38 - 52

Hofstede, Geert (1980). *Culture's Consequences: National Differences in Thinking and Organising*. (Thousand Oaks: Sage Publications)

Hughner, Renée Shaw; McDonagh, Pierre; Prothero, Andrea, Schutz II, Clifford J. and Stanton, Julie (2007). "Who are organic food consumers? A compilation and review of why people purchase organic food". *Journal of Consumer Behaviour*, Vol. 6, No 2-3, pp. 94 - 110

James, Kate (2002). "Cultural Implications for Translation". Available: http://translationjournal.net/journal/22delight.htm (Accessed 16 May 2017)

de Jong, Martin; Wang, Dong and Yu, Chang (2013). "Exploring the Relevance of the Eco-City Concept in China: The Case of Shenzhen Sino-Dutch Low Carbon City". *Journal of Urban Technology,* Vol. 20, No. 1, pp. 95 - 113

de Jong, Martin (2015). "The history and geography of the eco city indicator system in China: How did the eco-city assessment framework evolve in China and how is it used in a variety of eco-city projects around the nation?". Tomorrow's City Today: An International Comparison of Eco City Frameworks. Available: https://www.westminster.ac.uk/sites/default/files/Eco-City-Frameworks-at-a-Crossroads-China-Workshop-III-Synthesis-Report.pdf (Accessed 4 May, 2017)

Joss, Simon (2011). "Eco-cities: the mainstreaming of urban sustainability: key characteristics and driving factors". *International Journal of Sustainable Development and Planning*, Vol. 6, No. 3, pp. 268 - 285

Juvan, Emil and Dolnicar, Sara (2013). "The attitude-behaviour gap in sustainable tourism". *Annals of Tourism Research*, Vol. 48, 2014, pp. 76 - 95

Kaiman, Jonathan (2014). "China's 'eco cities': empty of hospitals, shopping centres and people". The Guardian Newspaper Report. Available: https://www.theguardian.com/cities/2014/apr/14/china-tianjin-eco-city-empty-hospitals-people (Accessed 4 May 2017)

Kaufmann, Hans Rüdiger; Panni, Mohammed Fatah Ali Khan and Orphanidou, Yianna (2012). "Factors Affecting Consumer's Green Purchasing Behaviour: An Integrated Conceptual Framework". *Amfiteatru Economic*, Vol. 14, No. 31, pp. 50 - 69

Keeton, Rachel (2011). *Rising in the East - contemporary new towns in Asia*. (Amsterdam: SUN Architecture)

Kinnear, Thomas C., Taylor, James R. and Ahmed, Sadrudin, D. (1974). "Ecologically Concerned Consumers: Who Are They?". *Journal of Marketing*, Vol. 38, No. 2, pp. 20 - 24

Kolte, Santos; Kandya, Anurag; Lakhtaria, Ketan; Patel, Vishal; Ghosh, Priyanka; Singh, Pratima and Morabia, Harsh (2013). "Evolving sustainable cities through the fabric of technological transformation". *Procedia Engineering*, No. 51, pp. 480 - 486

Kostka, Genia (2015). "Command without control: the case of China's environmental target system". Regulation and Governance, Forthcoming. Available: https://ssrn.com/abstract=2613427 (Accessed 4 May 2017)

Larson, Christina (2009). "China's Grand Plans for Eco Cities Now Lie Abandoned". Yale Environment 360. Available: http://e360.yale.edu/features/chinas_grand_plans_for_eco-cities_now_lie_abandoned (Accessed 4 May 2017)

Lee, Choi (1990). "Modifying an American Consumer Behaviour Model for Consumers in Confucian Culture: The Case of Fishbein Behavioural Intentions Model". *Journal of International Consumer Marketing*, Vol. 3, No. 1, pp. 27 – 50

Lee, Kaman (2009). "Gender differences in Hong Kong adolescent consumers' green purchasing behaviour". *Journal of Consumer Marketing*, Vol 26, No. 2, pp. 87 - 96

Lin, Zhongjie (2014). "Constructing Utopias: China's Emerging Eco-cities". *Architectural Research Centres Consortium Journal*, 2014 Edition, pp. 564 - 572

Lindsay, Greg (2011). "City-in-a-Box: Are made-from-scratch metropolises the answer to Asia's urban overpopulation? Departures". Available: http://www.slate.com/articles/life/departures/2011/11/brand_new_asian_cities_are_made_from_scratch_cities_the_answer_to_urban_overpopulation_.html (Accessed 5 July 2017)

Ling-Yee, Li (1997). "Effect of Collectivist Orientation and Ecological Attitude on Actual Environmental Commitment". *Journal of International Consumer Marketing*, Vol. 9, No. 4, pp. 31 - 53

Linzner, Roland and Salhofer, Stefan (2014). "Municipal solid waste recycling and the significance of informal sector in urban China". *Waste Management Research*, Vol. 32, No. 9, pp. 1 - 12

Liu, Xianbing; Wang, Can; Shishime, Tomohiro and Fujitsuka, Tesuro (2010). "Sustainable Consumption: Green Purchasing Behaviours of Urban Residents in China". *Sustainable Development*, Vol. 20, No. 4, pp. 293 - 308

Lynne, Garry, D.; Casey, C. Franklin; Hodges, Alan and Rahmani, Mohammed (1995). "Conservation technology adoption decisions and the theory of planned behaviour". *Journal of Economic Psychology*, Vol. 16, No. 4., pp. 581 - 598

Mayring, Philip (2000). *Qualitative Inhaltsanalyse*. (Weinheim: Beltz Verlag)

McCracken, Grant (1988). *The Long Interview*. (Newbury Park: Sage Publications)

Moisander, Johanna (2007). "Motivational complexity of green consumerism". *International Journal of Consumer Studies*, Vol. 31, No. 4, pp. 404 - 409

Moore, Malcolm (2012). "Chinese move to their eco-city future". The Telegraph. Available: http://www.telegraph.co.uk/news/worldnews/asia/china/9151487/Chinese-move-to-their-eco-city-of-the-future.html (Accessed 8 May 2017)

Mostafa, Mohamed M. (2009). "Shades of green: A psychographic segmentation of the green consumer in Kuwai using self-organising maps". *Expert Systems with Applications*, Vol. 36, No. 8, pp. 11030–11038

Mott, MacDonald (2009). "Sino-Singapore Tianjin Eco-city Project: Report on Review of Land Acquisition and Resettlement". Financing Organisation GEF. Available: http://documents.worldbank.org/curated/en/571151468025449528/pdf/RP9070v20P09891on0report1Eng1Nov-09.pdf (Accessed 5 May 2017)

Nader, Sam (2009). “Paths to a low-carbon economy - the Masdar example”. *Energy Procedia*, Vol. 1, No.1, pp. 3951 - 3958

Newman, Peter and Matan, Anne (2013). *Green Urbanism in Asia.* (Singapore: World Scientific Publishing Co.Ltd.)

New Town Institute (2017). “Tianjin Eco City”. Available: http://www.newtowninstitute.org/newtowndata/newtown.php?newtownId=1664 (Accessed 17 May 2017)

Ng, Grace (2011). “Eco-city Can Be Model for Others: First Residents Will Move in Next Year”. The Straits Times. Available: http://www.tianjineco-city.com/userfiles/20110418/The%20Straits%20Times-18Apr2011.pdf (Accessed 5 May 2017)

Nielsen, Stine Lykke (2003). “Chinese Interpretations of Sustainable Development”. Paper for the Nordic Conference of China Studies. Available: http://www.helsinki.fi/nacs/nacs2003_papers/nacs_papers_fulltext_lykkenielsen.pdf (Accessed 5 May 2017)

Orlikowski, Wanda J. and Baroudi, Jack J. (1991). “Studying Information Technology in Organisations: Research Approaches and Assumptions”. *Information Systems Research*, Vol. 2, No. 1, pp. 1 - 28

Pojani, Dorina and Stead, Dominic (2015). “Sustainable Urban Transport in the Developing World: Beyond Megacities”. *Sustainability*, Vol. 2015, No. 7, pp. 7784 - 7805

Pow, Choon-Piew and Neo, Harvey (2013). “Seeing red over green: Contesting urban sustainabilities in China”. *Urban Studies*, Vol. 50, No. 11, pp. 2256 - 2274

Rapaport, Elizabeth (2014). “Utopian Visions and Real Estate Dreams: The Eco-city Past, Present and Future”. *Geography Compass*, Vol. 8, No. 2, pp. 137 – 149

Register, Richard (1987*). Ecocity Berkeley: building cities for a healthy future.* (Berkeley: North Atlantic Books).

Rice, Gillian; Wongtada, Nittaya and Leelakulthanit, Orose (1996). “An Investigation of Self-Efficacy and Environmentally Concerned Behavior of Thai Consumers”. *Journal of International Consumer Marketing*, Vol. 9, No. 2, pp. 1 - 19

Roberts, James A. (1996). “Green Consumers in the 1990s: Profile and Implications for Advertising”. *Journal of Business Research*, Vol. 36, 1996, pp. 217 - 231

Roberts, James A. and Bacon, Don (1997). “Exploring the Subtle Relationships Between Environmental Concern and Ecologically Conscious Consumer Behaviour”. *Journal of Business Research*, Vol. 40, No. 1, pp. 79 - 89

Roseland, Mark (1997). “Dimensions of the eco-city”. *Cities*, Vol. 14, No. 14, pp. 197 - 202

Samdahl, Diane M. and Robertson, Robert A. (1989). “Social Determinants of Environmental Concern: Specification and Test of the Model”. *Environment and Behaviour*, Vol. 21, No. 1, pp. 57 - 81

Schienke, Eric (2012). “Eco-City China: An Ethos under Development”. in: Christensen, Steen Hyldegaard; Mitcham, Carl; Li Bocong and An, Yanming (eds.), *Engineering, Development and Philosophy*. (Dordrecht: Springer), pp. 69 - 85

Shemie, Daniel; Vigerstol, Kari, Quan, Mu; Karres, Nathan and Wang, Longzhu (2016). „China Urban Water Blueprint”. The Nature Conservancy. Available: nature.org/waterblueprint (Accessed: 9 May 2017)

Shepard, Wade (2015). “Can hundreds of new “ecocities” solve China’s environmental problems?”. Citymetric News Report. Available: http://www.citymetric.com/skylines/can-hundreds-new-ecocities-solve-chinas-environmental-problems-1306 (Accessed 4 May 2017)

Stirling, Andrew (1999). “The appraisal of sustainability: Some problems and possible responses”. *Local Environment: The International Journal of Justice and Sustainability.* Vol. 4, No. 2, pp. 111 - 135

The Straits Times (2017). “Eco-land living up to its mission”. http://www.straitstimes.com/opinion/eco-land-living-up-to-its-mission (Accessed 3 July 2017)

Straughan, Robert D. and Roberts, James A. (1999). “Environmental segmentation alternatives: a look at green consumer behaviour in the new millennium”. *Journal of Consumer Marketing*, Vol. 16, No. 6., pp. 558 - 575

Sun, Weiping; Liu, Juke and Wang, Dingjun (2016). “Report on China’s Eco-City Development”. in: Li, Jingyuan and Yang, Tongjin (eds.), *China’s Eco-city Construction*. (Heidelberg: Springer)

Swee-Hock, Saw and Wong, John (2009). *Regional Economic Development in China.* (Singapore: Institute of South East Asian Studies)

Taylor, Shirley and Todd, Peter (1995). "Understanding Household Garbage Reduction Behaviour: A Test of an Integrated Model". *Journal of Public Policy and Marketing*, Vol. 14, No. 2, pp. 192 - 204

Teo, Esther (2016). "Work on rail-link for Sino-Singapore Tianjin Eco-city project begins". The Straits Times News Report. Available: http://www.straitstimes.com/asia/east-asia/work-on-rail-link-for-sino-singapore-tianjin-eco-city-project-begins (Accessed: 10 May 2017)

United Nations Human Settlement Programme (2000). "Sustainable Cities and Local Governance". UN Habitat Report. Available: http://www.mirror.unhabitat.org (Accessed: 26th July 2017)

Vince, Gaia (2012). "China's eco-cities: sustainable urban living in Tianjin". BBC News Report. Available: http://www.bbc.com/future/story/20120503-sustainable-cities-on-the-rise (Accessed: 8 May 2017)

Weiss, Louisa (2014). "Tianjin, Eco-City, China". Urban NEXUS Case Study. Available: http://www2.giz.de/wbf/4tDx9kw63gma/05_UrbanNEXUS_CaseStudy_Tianjin.pdf (Accessed: 10 May 2017)

White, Leroy and Lee, John Gregory (2009). "Operational research and sustainable development: Tackling the social environmental relations in the UK". *Urban Studies Journal*, Vol. 40, No. 7, pp. 683 - 692

Wong, Tai Chee (2011). *Eco-city Planning: Policies, Practice and Design*. (Dordrecht: Springer)

Work In Denmark (2017). "Welcome to Denmark, Useful information which will make it easier for you to settle into your professional and private life in Denmark". Work in Denmark Paper. Available: http://icitizen.dk/~/media/Workindenmark/Publikationer/Welcometodenmark17.ashx (Accessed 5 July 2017)

World Bank (2009). "Sino-Singapore Tianjin Eco City: A Case Study of an Emerging Eco City in China". World Bank Technical Assistance Report 2009. Available: http://documents.worldbank.org/curated/en/776301468029076278/pdf/590120WP0P114811REPORT0FINAL1EN1WEB.pdf (Accessed 4 May 2017)

Xing, Xiufeng (2009). "Study on the Ban on Free Plastic Bags in China". *Journal of Sustainable Development*, Vol. 2, No. 1, pp. 156 - 158

Xu, Pei; Zeng, Yinchu; Fong, Quentin; Lone, Todd and Liu, Yuanyuan (2012). "Chinese consumers' willingness to pay for green- and eco-labeled seafood". *Food Control*, Vol. 28, No. 1, pp. 74 - 82

Xu, Kai 许凯 (2013). "中国制造要有新玩法" Zhongguo zhizao yao you xin wanfa [Made in China will have a new game]. 人民网 (Renmin Wang) [People's Daily News Report 2013]. Available: http://paper.people.com.cn/gjjrb/html/2013-10/28/content_1315730.htm. (Accessed 12 May 2017)

Yang, Wen and Deng, Wu (2013). "Building related KPIs in Sino-Singapore Tianjin Eco City". *APCBEE Procedia*, Vol. 5 of 2013, pp. 112 - 115

You, Mingqing (2014). "Addition of $PM_{2.5}$ into the National Ambient Air Quality Standards of China and the Contribution to Air Pollution Control: The Case Study of Wuhan, China". *The Scientific World Journal*, Vol. 2014, pp. 1 - 10

Young, William; Hwang, Kumju; McDonald, Seonaidh and Oates, Caroline J. (2010). "Sustainable consumption: green consumer behaviour when purchasing products". *Sustainable Development*, Vol. 18, No. 1, pp. 20 - 31

Zhao, Hui Hui; Gao, Qian; Wu, Yao Ping; Wang, Yuan and Zhu, Xiao Dong (2014). "What affects green consumer behaviour in China? A case study from Qingdao". *Journal of Cleaner Production*, Vol. 63, January 2014; pp. 143 - 151

Zimmer, Mary R., Stafford, Thomas F. and Stafford Marla Royne (1994). "Green Issues: Dimensions of Environmental Concern". *Journal of Business Research*, Vol. 30, No. 1, pp. 63 – 74

10. Appendix 1: Figures from the SSTEC

The images in this section were, unless indicated by a source, taken by the author during field research in the SSTEC from the 19th of March to the 14th of April 2017.

Figure 8: Home Advertisement in the 947 Bus from the TBNA to the SSTEC

Translated, the advertisement reads: Housing sale in eco city, special price for new apartments: average price 5500RMB/m2 for an apartment and 9000RMB/m2 for a villa. A free shuttle bus is offered for all those willing to look around the apartments or houses. Good for both living and investment.

Figure 9: Crossing the Rainbow Bridge (彩虹桥) to the Eco City

Figure 10: Solar Panels on the Street Lights and Roof Tops in the SSTEC

Figure 11: Stone Welcoming Visitors to the SSTEC

Figure 12: Eco City in 2007 before Construction Began (Source: Lindsay, 2011)

Figure 13: The Eco Valley

Figure 14: The Qingjing Water Reservoir

Figure 15: The Park Area along the Ji River

Figure 16: The Southern Central Business District's Cartoon Company

Figure 17: The Golf Course

Figure 18: The Fangte Amusement Park

Figure 19: The Russian Aircraft Carrier Amusement Park

Figure 20: The Community Centre Number 1

Figure 21: The Free Library in Community Centre Number 2

Figure 22: The Free Pool Tables in Community Centre Number 2

Figure 23: Solar Panels on Garbage Cans in the SSTEC

Figure 24: The Recycling Station in a Compound in the SSTEC

Figure 25: The Automatic Chip Card for Recycling Trash

Figure 26: The Segregated Pathways to Encourage Green Transportation

Figure 27: The China Organic Food Certification (Source: Chen, 2014a)

Figure 28: A Dock-less Bike in front of the Hilton Hotel in the SSTEC

Figure 29: A Person Burning Trash at the Side of the Road

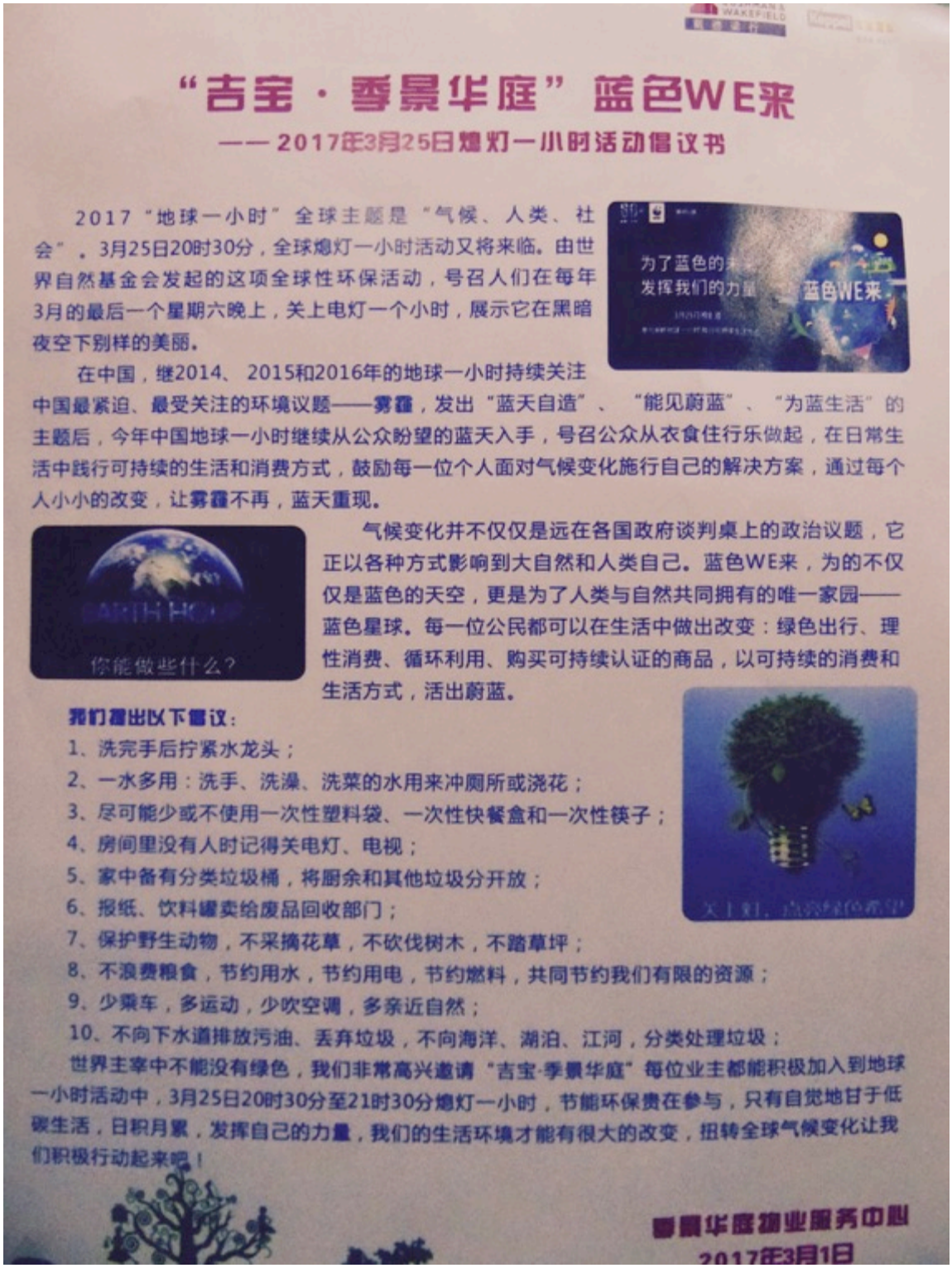

Figure 30: Poster Advertising Earth Hour in a Lift in the SSTEC

Figure 31: Eco City Dream Mobile Application QR Code (Source: Ecodreamers, 2017)

Figure 32: A Kindergarten in the SSTEC

Figure 33: A Street Sign Showing the Tourist Area under Construction（ 在建 ）

Figure 34: A Slogan to Encourage Environmentally Friendly Conduct

11. Appendix 2: Original Chinese Source of Direct Citations in Findings

The citations in this appendix are listed in chronological order of their appearance in the Findings of this Master thesis. To understand the context of the phrase, refer to the original Chinese transcripts in Appendix 4.

Interview 2: 现在生态城如果说满足日常的应用的话，不用去外面，就在生态城的内部就可以了。 因为目前起步区的范围内有三个社区中心。 每个社区中心都相对是一个商业的综合体。 里面可以买菜，可以买一些日用品，可以在里面吃饭 (21st of March 2017)

Interview 4: 刚过年前它有的。没多久 (22nd of March 2017)

Interview 4: 不经常。 它的东西， 怎么说？ 反正，一次性那边的购物买完了 (22nd of March 2017)

Interview 6: 因为我的大学同学是做这方面，所以他推荐我。如果没有他的话，我不会 (26th of March 2017)

Interview 1: 邻居们说的比较便宜的地方去买。比较便宜，比较新鲜的地方 (20th of March 2017)

Interview 3: 我还想问一下，绿色和有机是一个概念？(22nd of March 2017)

Interview 3: 有机就是一种很天然的一种东西把。没有什么污染的这种，就是纯天然的这种。 没有假的的这种。(22nd of March 2017)

Interview 5: 其实是在中国你很少能够吃得到，除非是自己去种啊。 然后我觉得绿色产品多半大家就会告诉我们。 就是说比如说这个东西没有上什么换药，没有上化肥，没有做这个化学学习化的这种。这样有可能会比较绿色， 但是其实也是出满了质疑啊。因为比近视人会这样告诉你。(25th of March 2017)

Interview 3: 老百姓都认识这种有机蔬菜的这种健康，健康问题也很关注 (22nd of March 2017)

Interview 6: 比如说我的鱼腥是买三块钱一个。 然后我的另外一个上面会有标签有机形式，它会卖六块钱一个， 我就知道。从我个人来说， 这个很贵。(26th of March 2017)

Interview 4: 其实也不是很贵，很离谱，可能比其他的稍微贵。 比如同样的小青菜，可能贵不了几块钱 (22nd of March 2017)

Interview 8: 生态城这边卖有机蔬菜的很少。基本上我们就没看到的，没有固定的卖有机蔬菜的地方。(28th of March 2017)

Interview 7: 一般超市都会有 (26th of March 2017)

Interview 3: 那是几年来吧 (22nd of March 2017)

Interview 1: 因为我觉得有的时候，脑子里想得会比较多。 但是好像到时候行为不会太注意的不是很好。(20th of March 2017)

Interview 6: 对这个城市？因为现在我到这个城市之后我感觉我对这城市没有大贡献 (26th of March 2017)

Interview 1 (supported by claims from Interviews 3 and 8): 就是有时候还是把那个电和水还有点浪费 (20th of March 2017)

Interview 5: 我尽量少制造一些垃圾 (25th of March 2017)

Interview 2: 首先我觉得这个整个环保的改善不是一个人能够做的 (21st of March 2017)

Interview 3: 对个人来讲吧，贡献, 就是环保方面的话，没有太大的贡献。 只是支持，没有贡献。 这个贡献都是由每个人来做的 (22nd of March 2017)

Interview 5: 你就会觉得， 他们自己舒服一点， 自己舒服，为了舒服一点就会不说了 (25th of March 2017)

Interview 9: 进步肯定是无限的 (28th of March 2017)

Interview 5: 我没有买车的原因是一辆车对于我来说的那种利用率不是很高 (25th of March 2017)

Interview 3: 我们基本减少汽车这个出行的这个时间。 基本的话能尽量不开的 (22nd of March 2017)

Interview 9: 并且一般我有可能会懒一些，就是一般还是喜欢坐车去一些地方什么的 (28th of March 2017)

Interview 6: 上有的时候起不来， 所以自己会开车去公司 (26th of March 2017)

Interview 5: 因我我觉得这边的环境很好啊。 如果我能够走路， 为什么会坐车？(25th of March 2017)

Interview 8: 他是免费的。免费的话，两份种就到了。也很快， 很方便。而且近距离的话也有座位。塘沽那边的话不一样 (28th of March 2017)

Interview 1: 但是我的运动量升去了 (20th of March 2017)

Interview 1: 我的身体比原来好了 (20th of March 2017)

Interview 4 (supported by Interviews 6, 7, 8 and 9): 小黄车 （22nd of March 2017)

Interview 9: 所以说自己没有自行车也没有怎么丑，谁都会有小黄车。(28th of March 2017)

Interview 8: 如果不是买太多东西的话，我不开车。我有的时候坐公交。我们的楼底就是公交站盘。 或者骑车会走路 (28th of March 2017)

Interview 8: 我没有这样去做 (集分)。 （28th of March 2017)

Interview 8: 因为集分不多。而且有的时候会有那个集分丢到的情况 (28th of March 2017)

Interview 1: 但是它前面设计规划得很美 (20th of March 2017)

Interview 2: 我还会担心这两个垃圾桶最终到垃圾处理的时候， 它还会混在一起 […] 你光靠一个人去做这个事情是不现实的 (21st of March 2017)

Interview 1: 我希望中国人可以这样做 (20th of March 2017)

Interview 9: 不过呢我妈妈要是没分类好，我很快就会抓起她！(28th of March 2017)

Interview 1: 比如说这个东西我要扔（茶壶），我不太清楚 (20th of March 2017)

Interview 8: 没有人专门给我们讲关于这个怎么去回收 (28th of March 2017)

Interview 7: 因为人毕竟会鼓励 (26th of March 2017)

Interview 7: 比如说那个政府的垃圾的一个清理费 (26th of March 2017)

Interview 7: 现在在这儿里我会支持这种做法 (26th of March 2017)

Interview 1: 在我们房顶上有一块大大的太阳能板，收集起来我们能够这些民居们使。然后洗菜，洗手，洗脸，还包括洗衣服的什么都可以用 (20th of March 2017)

Interview 3: 很环保的 (22nd of March)

Interview 4: 洗衣机，热水器，太阳能热水器，电视，液相，面包机，烤箱，微波炉 (22nd of March 2017)

Interview 4: 但是小小的一部分 (22nd of March 2017)

Interview 4: 你不能， 还是不够做生态城的能怎么去求 (22nd of March 2017)

Interview 7: 所有的路灯，基本上的公共用电，都是靠太阳能。这也是必需。(26th of March 2017)

Interview 9: 而且这儿里不需要在那些大烟囱来发电。这块儿都有太阳能版。 所以我们一般的灯胆全使用白天出送太阳能版的。然后，不知道你有没有发现，我们楼下垃圾桶的可回收垃圾跟不可回收垃圾在晚上的时候它会亮。(28th of March 2017)

Interview 1: 没有太阳的时候应该是， 可能用的就是那个电网里的， 就是普通的电，不是那个环保的电 (20th of March 2017)

Interview 6: 我感觉应该是汉沽或者开发区的电力公司供应 (26th of March 2017)

Interview 7: 希望能够这个能源，节约能源，这个power能节约好 (26th of March 2017)

Interview 1: 就是有时候还是把那个电和水还有点浪费 (20th of March 2017)

Interview 1: 比如说洗碗，那个水可以少用一点，它也可以把碗洗干净，这就是浪费 (20th of March 2017)

Interview 1: 水道应该没有什么大问题，可能会是空气 (20th of March 2017)

Interview 7: 这个空间够宽 (26th of March 2017)

Interview 2: 可能它里面的那个人体所需的矿物质不如那个自然的自来水 (21st of March 2017)

Interview 7: 政府的一个target到底是什么？ 这个定位并不一定很多人很清晰。它最重要做到什么方面？ […] 它的目标要非常清楚。(26th of March 2017)

Interview 7: 因为它不希望你在这儿里drive (26th of March 2017)

Interview 4: 浪费水就是浪费钱。我会告诉他，如果你浪费水就是浪费钱。 浪费钱，没有钱买玩具。(22nd of March 2017)

Interview 1: 夏天的时候特别特别美这个地方。 树很茂密，春天的时候花特别特别多 (20th of March 2017)

Interview 6: 我们会谈一些我们小区的绿化，会谈一些这个生态城的绿化 (26th of March 2017)

Interview 6: 因为生态城它有自己的部门来做这样的事情 (26th of March 2017)

Interview 1: 它会一时在我们大楼贴一些广告，现在可能在电梯里面你已经看过。 那也是政府给我们的，它也是通过居民约会，居民们约会介绍政府下一级的机关。 那它会在那些居民约会给我们老百姓说，现在有一个什么样的活动。(20th of March 2017)

Interview 5: 国家的一些领导人可能会过来生态城做过一些访问 (25th of March 2017)

Interview 6: 习主席，还有李总理 (26th of March 2017)

Interview 7: 它的意思是透过Internet应该是创成自觉 (26th of March 2017)

Interview 8: 比如说关于各个小区的有什么活动啊，发生了什么事儿啊 (28th of March 2017)

Interview 4: 大家都看一下最近的问题 (22nd of March 2017)

Interview 8: 如果没什么事儿每天都可以看 (28th of March 2017)

Interview 7: 政府也会透过这个管道，把政府的一些需要的一些Information，它就往这边走 (26th of March 2017)

Interview 6: 个人的事情和生态城的事情 (26th of March 2017)

Interview 1: 这些企业和公司必须是低污染的，就是没有污染的。这是一个条件，低污染的企业。 还是应该高科技的企业，就是它的技术含量很高。 但是它的污染非常少 (20th of March 2017)

Interview 4: 他们引进了好多学校吧。 然后是那些相对有名的学校，包括还有大的那个大学， 还有大学。 (22nd of March 2017)

Interview 4: 我们现在学校的这些老师， 虽然很年轻， […] 但是他们都是研究生， 博士。 […] 它教育的人才出来的， 它吸走的人才， 就会带动整个生态城的这个生活这人的范围。[…] 整个生态城的生活人体的素质整体在提高。(22nd of March 2017)

Interview 2: 会有一半的面积 (21st of March 2017)

Interview 5: 标我觉得先到打造在中国的一个可持续发展城市的一个目标吧。就是去做一个标杆。 然后就是在个个方面的话可能去做得非常的这个有钱崭新。因为它的概念就是可复制 (25th of March 2017)

Interview 3: 希望就是整个天津， 中国范围内，整个全国能够按照这个目标 (22nd of March)

Interview 4: 生态城会领先中国好多东西。在教育方面。 (22nd of March 2017)

Interview 5: 我觉得在十年的未来生态城的人口会增长到三十五万多。(25th of March 2017)

Interview 5: 可能会形成一个堵车的现象。(25th of March 2017)

Interview 7: 应该讲就是这儿里会变得更好。不会变得更差。 (26th of March 2017)

Interview 7: 它未来的十年它应该还是，包括因为它提倡住宅和公园 (26th of March 2017)

Interview 3: 这个国民的这种环保的意识，一点点通过宣传，宣传会越来越好 (22nd of March 2017)

Interview 7: 政府的一个target到底是什么？ (26th of March 2017)

12. Appendix 3: English Transcripts of Interviews 1 – 9

For the English transcripts of Interviews one to nine please refer to the electronic version of this Master thesis.

13. Appendix 4: Original Chinese Transcripts of Interviews 1 – 9

For the Original Chinese Transcripts of Interviews one to nine please refer to the electronic version of this Master thesis.

14. Appendix 5: Guideline questionnaires

This appendix contains the questionnaire used to conduct the interviews according to the semi-structured interview process. As discussed in the methodology section of this paper, the questionnaire was first devised in the English language and then translated into Chinese with the help of a Chinese friend. For the sake of transparency, both versions are included in this Appendix 5.

14.1. English Guideline for Interviews:

Part 1: Wrap Up

- Welcome and Thank you
- Data anonymity explained
- Everything is important, no wrong answers
- Explain purpose of study (master thesis Chinese business, don't mention environmental focus)
- Short introduction of interviewee (name, age, profession, marital status, children, years of education, income…)
- Origin and time in Tianjin eco city

Part 2: Daily Lives

- Please describe your apartment. What amenities do you have (air conditioning, heating, pool, shower/bath, dishwasher, washing machine…)? How often do you use these?
- Please describe your average day. How do you get to work? Do you own a car/bike? How often do you use it? How often do you use public transport? What affects your decision on your mode of transport?

Part 3: Green Consumer Behaviour

Typical Shopping Experience

- Please describe your typical shopping experience (Where do you shop? How often do you go shopping? Do you always shop at the same place?)
- How often do you buy bottled water? Do you drink tap water here?
- What is the most important aspect for you when you buy a product?

Importance of Environmental Aspects/Green Products

- When you shop, do you consider the environmental aspects of a product?
- What does environmental protection mean to you? How environmentally conscious would you say you are on a scale from 1 to 10 (1 = not at all, 10 = very much so)?

- What is a green product in your eyes? How do you know if a product is green or not? Could you name examples of green products?
- Do you check if a product is recyclable or biodegradable when purchasing a product?

Information on/availability of Green Products

- How do you inform yourself on if a product is green or not?
- Is it difficult to find environmentally friendly products where you live?
- For how long have you paid attention to if a product is green or not?

Willingness to Buy

- When was the last time you bought a green product? What did you buy exactly? (e.g. fresh product)?
- How much more in percent would you be willing to spend, if you knew a product was green?

Part 4: The SSTEC

Environmental Protection in General

- What does environmental protection mean to you? How environmentally conscious would you say you are on a scale from 1 to 10 (1 = not at all, 10 = very much so)?
- What does environmental protection include for you?
- Is environmental protection a topic of discussion in your family? Are your children aware of environmental issues/the need to protect the environment?

Before Moving to Tianjin

- What aspects attracted you to the SSTEC?
- Are/were you aware of any schemes in the city to improve the environment?
- What were your expectations before coming here? Were these expectations fulfilled?

Experiences in the SSTEC

- What is the best thing about living in the SSTEC?
- How has your lifestyle changed since moving to the SSTEC?
- What do you miss from where you previously lived?
- What does recycling mean to you? How is waste recycled in the SSTEC?

Knowledge of SSTEC

- Could you name some of the key indicators (goals) of the SSTEC?
- Do you receive any information from the SSTEC municipal government? If so, what are the topics? How often do you receive news? How is this information communicated?
- How often are environmental issues mentioned in the media? Could you name an example of a recent news broadcast on the environment? Were any about your local area?

Future Outlook

- How aware are you of environmental problems in China? Could you name some environmental problems that affect you here in the SSTEC?
- How can you personally help improve the environment in your local habitat? In what aspect do you contribute the most? Which aspects do you feel you can improve on (e.g. housing situation, purchasing behaviour, transportation…)?
- Are you satisfied with your living conditions in the SSTEC?
- Do you have any recommendations on how the city could improve?
- What do you think the city will look like in five year? In 20 years?

Thank you and goodbye

14.2. Chinese Guideline for Interviews:

Part 1: 引言

- 欢迎和谢谢受访者
- 给受访者解说资料匿名条件
- 什么都很重要，没有不正确的答案
- 解说研究的目的（说是中国经济学的硕士论文，别提环保的环节）
- 受访者的简短介绍 （名字，年龄，职业，婚姻状况，孩子们，受教育水平，收入水平）
- 本地和住在天津生态城的时间

Part 2: 日常生活

- 请介绍一下您的住宅。住宅有什么样的设备？（空调，暖气，游泳池，淋浴 / 浴池，洗碗机，洗衣机。。。）你们每周几次用设备？
- 请介绍一下你们的正常日常生活。你们怎么去工作？你们有汽车 / 自行车吗？你们每周几次用汽车 / 自行车？你们每周几次坐公交车？有什么因素影响你们交通工具的选择？

Part 3: 绿色消费者行为

正常的购物经历

- 请介绍一下你们的日常购物。你们去哪儿购物？你们每周几次购物？你们一直都去一样的超市吗
- 你们一周几次买瓶装水？你们在这儿喝自来水吗？
- 你们买东西的时候，产品的 什么方面是你们最注意的？（价格，品牌，质量， 绿色什么的）

环保的重要性 / 绿色产品

- 你们去购物的时候，你们注意到产品的环保方面吗？
- 对你们来说，什么样的产品叫绿色产品？你们怎么知道一个产品是否绿色的？请列举一下一些绿色产品。
- 你们买东西的时候，你们会先查看产品是否可回收的或降解的吗？

关于绿色产品的信息

- 你们怎么收到关于绿色产品的信息？你们是主动去查看的，或是来自广告营销收到信息的？
- 在你们住的范围很难找到绿色产品吗？你们去哪儿买绿色产品？
- 你们从何时开始注意产品的环保性？

愿意买绿色产品

- 你们上次买绿色产品是什么时候？你们买了什么样的产品？（例如新鲜产品）
- 用百分数表示，为了买绿色产品，如果你们知道这个产品对环境很好，你们愿意花多少更多的钱？

Part 4: 天津生态城

普遍的环保方面

- 对你们来说，环保是什么意思？环保包括哪个方面？你们对环保方面有多大的自觉，请评论从一到十。（1=没有什么自觉，10 = 很有自觉）
- 你们在家里经常讨论环保吗？你们家人有什么意见？你们的孩子对环保也有自觉吗？他们知道环保的重要性？他们在学校里讨论过吗？

搬到天津生态城以前

- 搬到这里之前，天津生态城的哪个方面吸引过你？
- 你们知道天津生态城市政府是否对住户进行哪些环保宣传活动 / 计划 / 专门部门负责？天津生态城市政府怎么尝试改善环境保护？
- 你们搬到这儿里之前对天津生态城有什么期待？你们的期待实现了吗？

在天津生态城的经历

- 住在天津生态城你们感受最好的地方是什么？最大的好处是什么？
- 自从搬到天津生态城以来，你们的日常生活得到了什么改变？
- 天津生态城还缺乏什么方面？请比较一下天津生态城跟你们以前住的地方， 有什么你们想念的方面？
- 对你们来说，回收是什么？天津生态城怎么回收垃圾？

对于天津生态城的理解

- 请你们列举一下天津生态城的一些目标？
- 你们有时候收到天津生态城市政府的一些资料 / 信息吗？如果收到的话，资料是关于哪个主题？你们每年几次收到资料？天津生态城市政府用什么样的渠道来把资料发给你们？
- 媒体每周几次播环境问题的新闻？请你们列举一下最近关于环境保护播放的一些新闻！有些新闻是特别关于天津生态城的吗？

未来的展望

- 你们对于中国环境保护有多大的自觉？请列举一下对你们在这儿里住的生活水平真正有影响力的一些环保问题。
- 你们自己怎么能帮助保护本地的环境？你们在什么方面有最大的贡献？你们觉得在什么方面你们还能改善自己？（例如住房状况，购物行为，交通方式。。。）
- 你们对于你们住在天津生态城的情况满意吗？
- 天津生态城在什么方面还能改善？你们有建议吗？
- 你们觉得天津生态城在未来的十年会是什么样子？在未来的 20 年呢？ 会有什么改变？

谢谢和再见

15. Appendix 6: The MoHURD's and the MEP's Indicator Sets

This appendix contains the detailed list of the MoHURD's and the MEP's indicator sets.

Tabel 3: The MoHURD's Quantitative Indicator Set

No.	Indicator Area	Indicative Value
Natural Environment		
1	Species Diversity Index	≥ 0.5
2	Local Plant Index	≥ 0.7
3	Proportion of previous surface in roads and squares in built up area (%)	≥ 50
4	Urban heat-island effect (°C)	≤ 2.5
5	Forestation coverage in built-up area (%)	≥ 45
6	Public green area per capita in built-up area	≥ 12
7	Green space coverage in built-up area	≥ 38
Living Environment		
8	No. of days per year in which ambient air quality meets or exceeds China's National Ambient Air Quality Grade II standard	≥ 300
9	Quality of water bodies meeting national surface water quality standard (%)	100
10	Quality of water from pipe network meeting national drinking water quality standard	100
11	Noise pollution levels meeting national noise standard in built-up area (%)	≥ 95
12	Citizen satisfaction with environmental quality (%)	≥ 85
Infrastructure		
13	Infrastructure good condition index	≥ 85
14	Tap water coverage (%)	100, 24 - hour hot water supply
15	Sewage treatment rate (%)	≥ 70
16	Treated water utilisation rate (%)	≥ 30

No.	Indicator Area	Indicative Value
17	Domestic solid waste non-toxic treatment rate (%)	≥ 90
18	No. of hospital beds per 10.000 people	≥ 90
19	Average vehicle speed of major and secondary roads (km/h)	≥ 40
Updated Indicators from National Standard for Garden Cities (2005 Revised)		
20	Proportion of energy-efficient building and green buildings	≥ 50
21	Proportion of trips by public transport	≥ 20% in big cities ≥ 15% in medium cities

Source: Baeumler et al., 2012

Tabel 4: The MEP's Quantitative Indicator Set

No.	Indicator Area	Indicative Value	Type
1	Rural net annual income per capita (RMB)		Obligatory
	In developed areas	≥ 8000	
	In underdeveloped areas	≥ 6000	
2	Share of tertiary industry in GDP (%)	≥ 40	Indicative
3	Energy consumption (tonnes Standard Coal Equivalent per RMB 10.000 GDP)	≤ 0.9	Obligatory
4	Fresh water consumption (m^3 per RMB 10.000 industry Value Added)	≤ 20	Obligatory
	Efficiency coefficient of irrigation water	≥ 0.55	
5	Passing rate of enterprises that are required for clean production (%)	100	Obligatory
Environment Protection			
6	Forestation coverage (%)		Obligatory
	In mountainous area	≥ 70	
	In hilly area	≥ 40	

No.	Indicator Area	Indicative Value	Type
	In plain area	≥ 15	
	Forest-grass coverage in cold area and meadow area (%)	≥ 85	
7	Proportion of protected area in total land area (%)	≥ 17	Obligatory
8	Ambient air quality	Meeting stipulated standard for different functional zones	Obligatory
9	Quality of water bodies	Meeting stipulated standard for different functional zones, no lower than Grade V	Obligatory
10	Major pollutant emission (kg per RMB 10.000 GDP)		Obligatory
	COD	< 4.0	
	SO_2	< 5.0	
12	Industrial water reuse rate (%)	≥ 80	
13	Noise pollution levels	Meeting stipulated standard for different functional zones	Obligatory
14	Urban domestic solid waste nontoxic treatment rate (%)	≥ 90	Obligatory
	Industrial solid waste treatment rate (%)	≥ 90, no hazardous waste	
15	Urban public green space per capita	≥ 11m^2	Obligatory
16	Environmental protection investment in GDP (%)	≥ 3.5	Obligatory
Social development			

No.	Indicator Area	Indicative Value	Type
17	Urbanisation rate (%)	≥ 55	Indicative
18	Central heating coverage in heated region (%)	≥ 65	Indicative
19	Citizen satisfaction with environment quality (%)	≥ 90	Indicative

Source: Baeumler et al., 2012

16. Appendix 7: Declaration

Erklärung

Ich erkläre, dass das Thema dieser Arbeit nicht identisch ist mit dem Thema einer von mir bereits für ein anderes Examen eingereichten Arbeit. Ich erkläre weiterhin, dass ich die Arbeit nicht bereits an einer anderen Hochschule zur Erlangung eines akademischen Grades eingereicht habe.

Ich versichere, dass ich die Arbeit selbständig verfasst und keine anderen als die angegebenen Grundlagen benutzt habe. Die Stellen der Arbeit, die anderen Werken dem Wortlaut oder dem Sinn nach entnommen sind, habe ich unter Angabe der Quelle der Entlehnung kenntlich gemacht. Dies gilt sinngemäß auch für gelieferte Zeichnungen, Skizzen und bildliche Darstellungen und dergleichen.

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Würzburg, 15. August 2017