Energy City Frederikshavn:
Public Participation and Sustainability Aspects

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A picture taken on the town of Frederikshavn, with the view of the four windmills in a distance (Taken by the author on April 2, 2011 at Frederikshavn).

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Abstract

In 2007, the city of Frederikshavn, which is situated in Denmark with a population of 25,000, adopted an ambitious plan called Energy City Frederikshavn to become 100% renewable in its district heating, electricity and transportation sectors by 2015. Frederikshavn was selected by Danish energy experts to examine the ongoing process of how a city becomes 100% renewable. The overall aims of this study were, firstly, to examine the various aspects of sustainability of the Energy City Project and the present condition of Frederikshavn based on the One Planet Living® Framework. Secondly, this study evaluates specifically the public participation process using normative criteria for public participation methods developed by Rowe and Frewer. The paper is based on data collected from observations, documents and interviews.

Results show that, in terms of sustainability, the Energy City Project showed dedicated efforts in the principles of zero carbon, zero waste, sustainable materials, natural habitats, culture and health and happiness, while more has to be done on sustainable transport, sustainable water and sustainable food. In regard to public participation, the project team of Energy City Frederikshavn achieved a high degree of acceptance criteria, including the criteria of independence, representation, early involvement and transparency, except on influence criterion, which may be a factor of resource constraints, resulted from the financial crisis. While on the process criteria, there is more room for improvement specifically in task definition. The study suggests that the influence criterion has a considerable impact on the overall effectiveness of the public participation process. Furthermore resources, notably financial ones, can be a strong limiting factor for more effective public participation. The One Planet Living framework can be a potential useful tool for public participation in sustainability efforts for cities.

Keywords: 100% renewable, public participation, sustainable urban development, One Planet Living framework, Denmark

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Now, I am guarded with my education, let the real work begins!

Flora Lim
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Energy City Frederikshavn: Public Participation and Sustainability Aspects

Imagine that there is a long way, imagine that the long way is the shortest,

Imagine the longest way is to keep staying where you are.

--Benny Andersen (Danish poet)[1]

1. Introduction

The year 2011 marks the 24th anniversary of the groundbreaking Brundland Report released in 1987, and also the 19th anniversary of the first World Summit of Sustainable Development held in Rio in 1992. If we were to say what happened to the world in respect of sustainable development in the past years, it is clear that the world has witnessed a widespread use for the term 'sustainable development'. A Google search for it yields 18.7 million hits (Google, 2001a), though it is still minimal comparing to 'economic growth', which yields 121 million hits (Google, 2011b). However, the important question goes, has the world become more sustainable? If the carbon dioxide emission levels can be a guide, it indicates that the world has experienced a rise of carbon dioxide emissions from 348.99 parts per million (ppm) in 1987 to 392.40 ppm in March 2011 (Tans, 2011; Keeling, 2011). Ironically, much effort has been done to respond the trend of environmental crisis. On international level, the United Nations has spearheaded numerous initiatives to address climate change and sustainable development, most notably, the convention of United Nations Framework Convention on Climate Change (UNFCCC), yet countries are still divided over the carbon reduction targets. Facing such frustrations, more scholars and practitioners in the fields of environmental sciences and political science are calling for a greater focus on regional sustainable development (see for example, Lafferty, 2001 on Europe; Ea Energy Analyses, 2009 on the Baltic Sea Region). Moreover, local sustainable initiatives at the city level in particular are gaining momentum (see C40 Cities Climate Leadership Group under the Clinton Climate Initiative, 2011a; ICLEI Global, 2011a, The World Future Council, 2010a).

Cities became a focus of sustainable development for a valid reason. The globalized urbanization trend makes cities increasingly crowded. It is estimated that, the urban population will reach five billion by 2030 (United Nations Population Division, 2004). The high concentration of population in cities raises the question of the ability of cities in providing food, goods and other services in a sustainable manner. In this paper, Frederikshavn in Northern Denmark is chosen as a case study to explore the city's initiative in sustainable development. The municipality adopted a plan called 'Energy City Frederikshavn' (thereafter 'Energy City') to become 100% renewable in the district heating, electricity and

[1] Text recalled by Thorkild Pedersen, personal communication, 4 April 2011

transportation sectors. The focus of this study is to evaluate the various aspects of sustainability and examine the process of public participation.

2. Research Methodology

2.1 The Research Question

Given the exploratory nature of the study, the aims of the study are, firstly, to have a broad overview of the various aspects of sustainability of the Energy City Frederikshvan project, secondly, to enhance the understanding of the ongoing public participation process with respect to different actors of the Energy City Project, using the framework developed by Rowe and Frewer (2000). To fulfill these two aims, there are two research questions:

1. How does the Energy City Project in Frederikshavn achieve the various aspects of sustainability?
2. How does the public participation process of the Frederikshavn Municipality in the Energy City Project perform?

2.2 Research strategy

Case study is chosen as the research strategy for this study. According to Yin (2003), a case study is 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). In this case, the ongoing Energy City project is the contemporary phenomenon, while the community and the municipality are the units of the analysis of which they are intertwined with the phenomenon (i.e. the Energy City project) and context (i.e. the city).

Triangulation will be adopted to strengthen the construct validity of the data (Yin, 2003, p. 99), for the multiple sources of evidence from documents, interviews and observations. The data collected from three sources will be analyzed in a joint manner, so that the events are supported by more than single evidence. The evidence will be used to answer the first research question to explore the concepts of sustainable city in the context of Frederikshavn, One Planet Living framework developed by BioRegional will be used. To answer this research question, the data collection aims to unveil the various aspects of the Energy City Project and Frederikshavn Municipality.

The second research question is about how Frederikshavn Municipality engages the

public during the course of the development of Energy City Project, and the obstacles it encountered. By using triangulation, the study aims to explore the process of public participation throughout the project development stage.

2.3 Data Collection

As triangulation is chosen as the research methodology of this paper, the three data collection methods for this study are observation, documents and interviews.

2.3.1 Documents

Documents related to the project are collected from the Energy City website, both from the English (www.energycity.dk) and Danish (www.energibyen.dk) websites, and the Frederikshavn municipality website (www.frederikshavn.dk). Other sources are obtained through personal communications, as well as publications issued by the municipality or other relevant parties. For information which is only available in Danish, the documents will be translated in English through Google Translate (http://translate.google.com) for online materials and DocTranslator (http://www.onlinedoctranslator.com/translator.html) for word or PDF files.

2.3.2 Interviews

The field work took place between 1-8 April, 2011 in Frederikshavn, when interviews were carried out. Initial interviewees were selected based on the contacts listed on the Energy City website (Danish version), e-mails were sent to invite participation in interviews. Bahram Dehghan, the project leader of the Energy City Frederikshavn, who was the major informant in the process as he suggested people to contact with. Snowball sampling was then used after each interviews in reaching out for interviewees. By snowball sampling it means that initial interviewees are used to connect to new informants (Bryman, 2003).

All the interviews were conducted on a face-to-face basis. They were recorded by MP3 to the consent of the interviewees, and notes were transcribed afterwards. A copy of the transcribed notes was sent to each of the interviewees for their record.

2.3.3 Observation

During the time of the field work, I took time walking around the town and photos were taken to capture the situation of the town. This is aiming to understand the way of living for the localities in Frederikshavn.

2.4 Data Analysis

Eight interviews were conducted to staffs or people directly related to the Energy City Project from the Frederikshavn municipality, as well as local residents in Frederikshavn in April. One earlier interview was conducted in February with the project leader Dehghan to understand more about the project. Consent form (Appendix 1) and participation information sheet (Appendix 2) were sent to staffs and people working in the Energy City project beforehand to obtain permission for interviews. Six interviews were scheduled with people directly involved in the project. Local residents were selected through convenient sampling, there were three local residents undertook short interviews. All of the interviews took place at the interviewees' workplace.

The data collected will be analyzed with the 10 principles of the One Planet Living Framework developed by the BioRegional and WWF and nine criteria for public participation methods by Rowe and Frewer (2000). Both the One Planet Living Framework and the criteria for public participation methods will be discussed in the section of Theoretical framework followed by the background on the Energy City Frederikshavn Project.

3. Energy City Frederishavn

3.1 The Danish case on energy

In 2007, the Danish Society of Engineers (thereafter, IDA) decided to bring in energy experts from Denmark to conduct a collected analyses of energy systems in Denmark, to investigate both the short term prospect at 2015, and the longer term prospect at 2050, with a vision of achieving 100% renewable energy system (Mathiesen, Lund, et al, 2009). The scenario stipulated that Denmark should reduce its primary energy supply[2] and increase the share of renewable energy. From the IDA report, it demonstrated that Denmark can achieve 100% renewable energy for the entire Danish energy system, including transport, with the energy system based on the initiatives of the IDA scenario in 2015 and 2030 (ibid).

At present, according to the report of Danish Energy Agency (ENS) in 2009, the share of renewable energy in Denmark is 19.7% of which wind energy accounts for 18.3%[3]. Waste is used for producing electricity and district heating and the trend is increasing. Denmark is still the only country in EU that was self-sufficient in energy as of 2009, though it is facing

[2] Production of electricity and heat for households, transport and industry, which amounts to 800 PJ (Mathiesen, Lund, et al, 2009)

[3] The six types of renewable energy are: wind, straw, wood, biogas, waste and heat pumps.

dwindling reserves in its oil and gas resources (Danish Energy Agency, 2009).

In 2010, an important document on future Danish climate policy was issued by the Danish Commission on Climate Change Policy (2010). The 'Green Energy' report states the vision of 'independence of fossil fuels' for Denmark as, 'no fossil energy is used/consumer in Denmark, and the average annual domestic production of electricity based on renewable must, as a minimum, be equal to Danish consumption (ibid, p. 18)'. The report outlines two main strategies to achieve the independence: by more efficient use of energy, and by building new energy systems with biofuels and electricity from renewable energy with 40 recommendations under six sub-categories:

- Cross-sectoral recommendations
- Consumption of energy-efficiency and conversion
- An intelligent energy system
- Transport based on electricity and biofuels
- International, including the EU
- Reducing greenhouse gas emissions in other sectors than energy

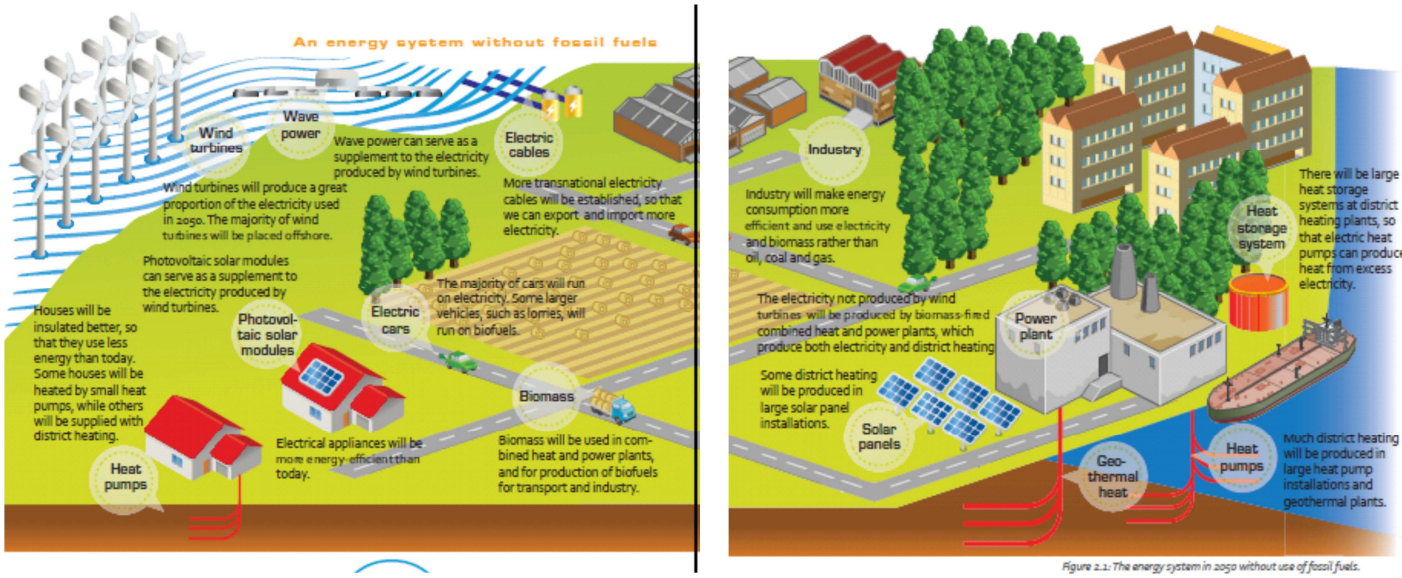

Figure 1: The Energy system in 2050 without the use of fossil fuels, Danish Commission on Climate Change Policy (2010).

3.2 The Background of Frederikshavn and the Energy City Project

Frederikshavn is located at the tip of Northern Jutland of Denmark, it is surrounded by farmlands in the surrounding areas. It used to be a naval base with ferry routes to Sweden and Norway and a major shipyard city. Followed by the closing down of Danyard Shipyard, the largest employer in the town, and the end of duty-free shopping on ferries to Norway and Sweden in 1999, there was a rapid loss of local jobs that the municipality had to step in to revitalize the local economy and create jobs (Therkildsen et al, 2009). As a result,

Frederikshavn has undergone rapid transformation in recent years, initiatives include renewal of the urban public spaces by the municipality, building of new cultural and recreational facilities, and hosting international festivals and events with the support of private sector sponsorships (ibid.).

The Energy City Project adopted by the municipality of Frederikshavn was a result of the initiative of the Danish Society of Engineers (IDA) in researching about the energy future of Denmark in 2006. Frederikshavn was proposed to be the renewable energy city to test upon the goal of 100% renewable for Denmark for three reasons: an acceptable size for commercial demonstration units, the ability and backing to carry out ambitious projects and finally, an existing research facility for marine wind-mills (Frederikshavn Municipality, 2007). Henrik Lund, Professor of the Department of Development and Planning in Aalborg University was in charge of drafting the energy plan for Frederikshavn to be 100% renewable by 2015, in the areas of district heating, electricity and transportation. The project was called the 'Energy City Frederikshavn'. The project area consists of the city of Frederikshavn, the three suburbs around: Strandby, Elling and Kilden, together with a couple of individual houses with a population of 25,000 (Lund and Østergaard, 2008).

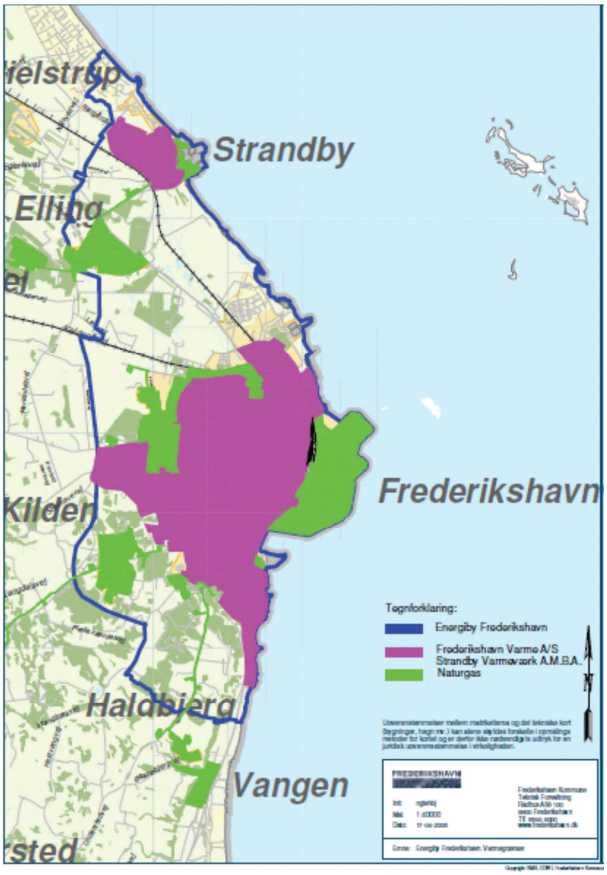

Figure 2: Map of the area of Energy City Frederikshavn. The blue line showing the entire project area, the purple area indicating the district heating area and the green area is supplied by natural gas (Lund and Østergaard, 2008).

By 2007, at the start of the project, renewable energy has a share of approximately 20% of total energy supply in Frederikshavn (Lund and Østergaard, 2008). Within the project area, most of it is supply with district heating with the rest in natural gas for heating purpose.

The Energy City project will transform the energy supply of the area in three development phases:

1. By 2009: To raise the share of renewable energy in Frederikshavn to around 40% when the UN Climate Summit COP15 was held in Copenhagen.
2. By 2015: Reach the 100% renewable energy system on an annual basis while allowing the exchange of energy with surrounding areas.
3. Thereafter: Further development of the 100% renewable energy system so as to create the transformation of 100% renewable throughout Denmark. (ibid, p. 3)

According to the business plan prepared by Energy City Frederikshavn (2008), the energy concepts adopted in the Energy City Frederikshavn project include, solar heating for the district and individual heating, expansion of the wind power capacity in Frederikshavn, heat pump technology based on waste heat from the wastewater treatment plant, geothermal heating and storage, biogas to transport in the natural gas system, methanol to vehicles, electric cars, biodiesel and bio-gasoline based on second generation technology. The technologies are included in the plan to support the district heating, electricity and transport use in the municipality (ibid).

The Energy City Frederikshavn is a business and development oriented project with the purposes of demonstrating renewable energy technologies to an entire city's energy consumption, marketing national, regional and local knowledge and competence in energy technologies, making renewable energy concepts visible and tangible for all stakeholders and finally, marketing and branding Frederikshavn as a city of knowledge-based development with energy supply, business, residence, settlement and education with effect on both tourism and culture in town (ibid).

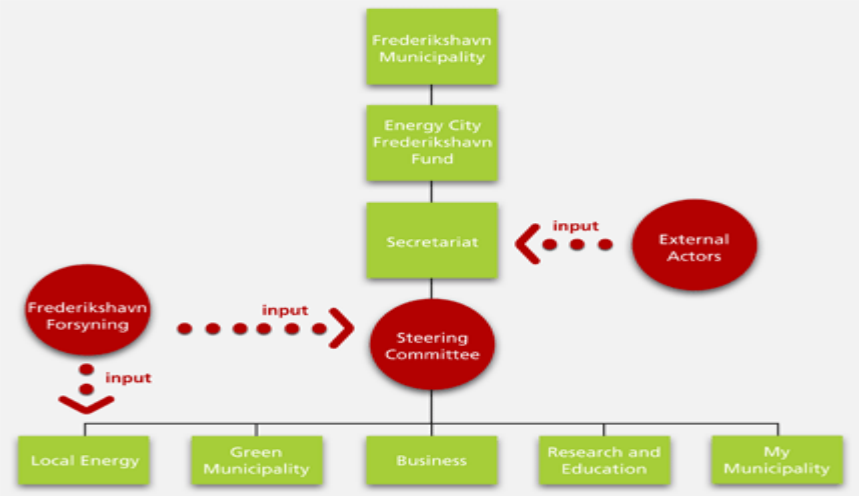

Figure 3: The organization chart of Energy City Frederikshavn (Energy City Frederikshavn, 2011a)

The organization structure of the Energy City project is composed of the Energy City

Frederikshavn Fund directly under the Frederikshavn Municipality, of which Mikael Jentsch, the Technical Director of the municipality, is responsible to oversee the programme (Jentsch, M. 2011, pers. comm., 6 April). The Energy City Frederikshavn Fund was formed at the fall of 2007, which is led by, Peter Høstgaard Jensen and Lars Møller, together with other seven board members (Energibyen Frederikshavn, 2011a). The Secretariat is responsible for the daily management of Energy City -that is serving trustee in daily communication on Energy City Frederikshavn and project management tasks in relation to work in theme groups 'Local Energy', 'My Municipality', 'Green Municipality', 'Business and Networking and Education', and 'Science and Training' (Energibyen Frederikshavn, 2011b). Poul Rask is the Energy City Project Director, Bahram Dehghan is the Project Leader and Lilly Pedersen as the Secretary (Energibyen Frederikshavn, 2011c).

4. 100% Renewable and sustainable urban development

4.1 100% Renewable—A challenging goal for our future

Renewable energy in the forms of sun, firewood or animal power has always been the dominant form of energy used throughout human history, except the recent 200 years with the discovery of coal and later oil and gas, which has powered the human civilization in an unprecedented pace, amid high costs to be paid. Indeed, sun remains, and will always be, the most important source of all lives on earth (Miller, 2007). Yet, the modern form of 100% renewable has been regarded as technically challenging or impractical. In recent few years, there are more studies presenting the vision of 100% renewable as the optimistic (World Future Council, 2010) and realistic (Droege, 2009).

The report '100% Renewable energy—and beyond-for Cities' produced by the World Future Council defines '100 percent renewable' as 'zero fossil or nuclear fuel content in operational or embodied energy, in stationary use or in transport' (World Future Council, 2010b). The report criticized the current approach adopted by EU and UN by stipulating a reduction percentage, for instance, the EU's 2020 target—by cutting greenhouse gases by 20%, reducing energy consumption by 20% through energy efficiency and meeting 20% of energy needs from renewables by 2020 (European Commission, 2011), as problematic as it does not cover the full spectrum of energy uses (World Future Council, 2010b). The report proposed changes in lifestyle and consumption patterns including measures like regionalization of food supplies, substitution of local and regional travels to international travels (ibid). On a city level, the report demands using the own bioregion of the city as its own carbon sink to ensure sound management and making an economic case for 100%

renewable city (ibid).

In the book '100% Renewable Energy Autonomy in Action', Moser, Kucharczak and Hoppenbrock (2009) cited DeNet (2009) to describe the future vision of an 'ideal region' as:

> 'A 100% renewable energy region "ideal region" covers its energy demand entirely with renewable energies, is based on very high levels of energy efficiency and includes the regional renewable potentials comprehensively. The energy supply is ecological, sustainable, and secure which increases the regional added value. The players in the renewable energy region will shift from the current national and international levels to regional players, who played a key role together with a high acceptance for such energy supply in the regional population. Regions will take the lead in engaging end users, producers and practitioners in the development process of a comprehensive energy supply with renewable energies, as well as networking with other regions for cost reduction and safeguarding the security of supply. Energy efficiency, sustainable energy production and regional activities for energy-conscious behaviours are integral elements in the region' (ibid, p.179).

The possibility of 100% renewable is further affirmed by a recent paper by Jacobson and Delucchi (2011), after analyzing the global energy use, the team states that it is technically possible and economically feasible for the world to produce all new energy with wind, water and sunlight (WWS) by 2030 and replace the pre-existing energy by 2050, while the main barriers remained at the societal and political levels. The WWS includes technologies like wind, wave, geothermal, hydroelectricity, tidal, solar photo-voltaic, concentrated solar power for electricity; together with battery-electric vehicles, hydrogen fuel-cell vehicles and hybrids for transportation; and finally, air- and ground-source heat pump water and air heaters and electric resistance water and air heaters for heating and cooling (ibid). The paper stirred a lot of favourable responses from the scientific community (see for example: Science Daily, 2011; Hoffman, 2011).

Clearly, consensus is gaining ground across expertise from various sectors on the possibility and necessity of going 100% renewable. To translate the vision of 100% renewable, it is necessary to start with cities, where the most population in the world is living.

4.2 Sustainable urban development

'What will our cities and suburban landscapes be like in fifty years' time? In a hundred? How can we plan and develop communities that will meet long-term human and environmental needs?

--Stephen M. Wheeler and Timothy Beatley

The above two questions were raised in the Introduction chapter of 'Sustainable Urban

Development Reader' (Wheeler and Beatley, 2004). They encapsulate the fundamental aims of sustainable urban development, which start off as responses to mounted problems with the modern urban development.

Cities being seen as a source of environmental pollution and problems are not recent phenomenon. Urban ecologists exude the view of people as part of the ecological system (Kinzig, 2011). Grimm, Faeth and colleagues (2008) pointed five major types of environmental challenges that influenced by urban ecosystems, including: land-use and land-cover change, altered biochemical cycles in cities and their regional-to-global effects, urbanization and climate change, human modifications of hydrological systems and finally biodiversity changes in cities. Thus, the role of sustainable urban development is indispensable in the grand agenda of sustainability, given the problems associated with urban living and urbanization trends.

The importance of sustainable urban development in the political agenda at both international and local levels was laid down by Chapter 7—Promoting sustainable human settlement development of Agenda 21, of which the overall objective is to 'improve the social, economic and environmental quality of human settlements and the living and working environments of all people' (Chapter 7.4). The programmes under Chapter 7.5 of Agenda 21 include:

- Providing adequate shelter for all;
- Improving human settlement management;
- Promoting sustainable land use planning and management;
- Promoting integrated provision of environmental infrastructure: water, sanitation, drainage, hazardous and solid waste management;
- Promoting human settlement planning and management in disaster-prone areas;
- Promoting sustainable construction industry activities; and
- Promoting human resource development and capacity-building for human settlement development (United Nations Department of Economic and Social Affairs, 2011).

In chapter 28 of Agenda 21, it specifies "Local authorities' initiatives in support of Agenda 21" (ibid). The Local Agenda 21 was then adopted by various local governments, and studies have been done in Australia (Mercer and Jotkowitz, 2000), Denmark (Agger, 2010), Germany (Lötscher, 2002), Norway (Aall, 2000), Spain (Carman, Jose, et al, 2004), Thailand (Aki and Akihisa, 2007) and UK (Dooris, 1999). Yet, studies showed mixed results of the implementation of Local Agenda 21, which are partly because of the lack of attention at the national government level, leaving little room for local implementation of sustainability plans (Wheeler and Beatley, 2004).

4.3 Global development of sustainable cities and communities

The mushrooming of sustainable cities, eco-cities, and sustainable communities is a global trend. The building of sustainable cities comes in different forms, with a mix of national and local initiatives, ranging from small communities to metropolitan cities. C40 Cities is a network of 40 big cities which works with the Clinton Climate Initiative to help cities consume energy in a sustainable manner. The focus areas consist of buildings, energy, lighting, ports, renewable, transport, waste and water (C40 Cities, 2011b). ICLEI-Local Governments for Sustainability has over 1,220 local governments from over 70 countries as members who are committed to sustainable development (ICLEI Global, 2011b). The Aalborg Charter is a declaration of local municipalities in Europe to achieve sustainability in European cities and towns started in 1994 of which around 2,500 towns and cities in Europe have signed (Sustainable Cities and Towns Campaign, 2011).

Other sustainable cities initiatives are usually taken up by city officials. Copenhagen in Denmark is well-known for being environmental conscious, for instance the efficient cycling infrastructure, the district heating and the waste management (Ministry of Foreign Affairs of Denmark, 2011). In 2007, the Copenhagen Agenda for Sustainable Cities was published in collaboration with the Ministry of the Environment of Denmark. The report outlines 10 principles for sustainable city governance covering urban planning and decision-making, corporate urban responsibility, an interrelated perspective to deal with multiple problems facing cities caused by climate change, extensive globalization and increasing urbanization (Strand, Kappelgaard et al, 2007).

Moreover, there are many examples of sustainable communities of smaller scales, ranging from a school community to a small city. In the book 'Sustainable Communities', Clark (2010) showcased a collection of sustainable communities and cities, like the Los Angeles Community College District (LACCD)[4], the San Francisco County, as well as other communities in Italy, Lithuania, China and Japan The author claimed that communities are 'entering a world that some authors have now labeled "The Third Industrial Revolution", as society moves from fossil fuels (the Second Industrial Revolution) to renewable energy generation, technologies in sustainable, smart communities' (ibid, p. 2). The book reiterates the view that sustainability is an achievable goal and which must be done at the community level as city blocks form the basis of our modern lives (ibid).

The Transition Movement is another initiative calling for communities to take action to reduce oil dependence in face of peak oil. Initiated by Rob Hopkins, Transition Town Brixton (TTB) was the first urban transition initiative started in 2007 (Hopkins, 2010). The initiative emphasized collective actions at the community level, starting from small groups engaging in

[4] LACCD Builds Green. Los Angeles Community College District, < http://www.laccdbuildsgreen.org/>

awareness raising to larger groups self-organizing to work on various key areas around lifestyle and local economy, for instance community supported agriculture, car clubs, local currencies (Transition Network, 2011a). At present, there are 376 official initiatives found on the Transition Network website (Transition Network, 2011b).

The above examples demonstrate a wide array of examples of all sizes and scopes of sustainable cities and communities. While this is an encouraging trend for sustainability ideas being taken into mainstream of the urban agenda, it is instrumental to evaluate the sustainability aspects of cities and communities to pave way for further development.

5. Analytical Framework

5.1 The One Planet Living framework

'If everyone lives like an average European, we need three planets to live on'

—One Planet Living

One Planet Living Framework is a global initiative based on 10 principles of sustainability developed by BioRegional from UK and WWF[5]. The One Planet Living framework started when BioRegional engaged in building sustainable communities, the experience led to the realization that a real reduction in the ecological impacts lies in an overall change in lifestyle. BioRegional starts developing communities that facilitate sustainable lifestyle choices by promoting sustainable transport like car-sharing scheme, sustainable food by offering local and seasonal produces, using recycled products and encouraging recycling, reducing water consumption with water-efficient appliances (Desai, 2009).

Eventually the experience of an overall lifestyle approach towards sustainability gradually led to the cooperation between BioRegional and WWF, to create the 10 guiding principles as a useful toolbox for organizations and communities to adopt (ibid). The One Planet Living framework has been applied on diverse projects internationally in property development setting, in retail sector, as well as in municipalities. The One Planet Communities Programme has been adopted by several communities so far: One Brighton in the UK, Sonomam Mountain Village in California, Mata de Sesibra in Portugal and Masdar City in Abu Dhabi (BioRegional Development Group, 2011a).

The scientific base of the One Planet Living is founded on the logic of ecological footprinting. It has been originated by Wackernagel and Rees (1996), and development of ecological footprint as a tool is being led internationally by the Global Footprint Network, of which BioRegional is a partner (Global Footprint Network, 2009). The advantages of using

[5] One Planet Living Website: http://www.oneplanetliving.org/index.html

ecological footprint for achieving sustainability are, firstly, ecological footprint acts as a common denominator to compare separate ecological impacts of different human activities. Secondly, it offers a holistic view of competing demand for resources by measuring the demands in terms of ecological space (Wackernagel and Rees, 1996). On a city level, Ecological Footprint refers to 'the total ecosystem area that is essential to the continued existence of the city is its de factor Ecological Footprint on the earth, it is a function of population and per capita material consumption (Wackernagel and Rees, 1996, p. 11).

With the basis on ecological footprint and the 10 principles, the One Planet Living framework highlights the links between an individual to the bigger picture of the planet earth, and how individuals and communities can make a difference, of which it underlies the necessity of a fair share of the earth's resources to lead happy and healthy lifestyle. On the spiritual front, this also calls for transcendence of purely material aspirations and create a world that is better for us all (Desai, 2009).

Principle	Meaning
1. Zero carbon	Making buildings more energy efficient and delivering all energy with renewable technologies.
2. Zero waste	Reducing waste arisings, reusing where possible, and ultimately zero waste to landfill.
3. Sustainable transport	Encouraging low carbon modes of transport to reduce emissions, reducing the need to travel.
4. Sustainable materials	Using sustainable products that have a low embodied energy.
5. Local & sustainable food	Choosing low impact, local, seasonal and organic diets and reducing food waste.
6. Sustainable water	Using water more efficiently in buildings and in the products we buy, tackling local flooding and water course pollution.
7. Land & wildlife	Protecting and expanding old habitats and creating new space for wildlife.
8. Culture & heritage	Reviewing local identity and wisdom; support for, and participation in, the arts.
9. Equity & local economy	Inclusive, empowering workplaces with equitable pay; support for local communities and fair trade.
10. Health & happiness	Encouraging active, sociable, meaningful lives to promote good health and well being.

Table 1: What is One Planet Living? The 10 principles. (BioRegional, 2011a)

5.3 Public participation and sustainable development in cities

Public participation is a widely discussed and researched concept in various disciplines. However, owing to the contested nature of the concepts, definitions of society, community, interested individuals or groups are used in one way or another, which has created confusion (Neverauskas and Tijunaitiene, 2007).

The rise of public participation in the sustainability agenda can possibly be the result of increasing challenges faced by institutions and governments in pursuing urban development agenda. There is a stark discrepancy between cities' policies and global environmental agenda in the understanding of climate change issues. The discrepancy exists on temporal, spatial and institutional levels, which hinders the effectiveness and capacity of municipal and

regional governments. Traditional and functional-based institutions at a city's level are at odds with the more complex problems facing every city (Bai, McAllister, et al, 2010). The problems for institutions are two-fold, firstly, with the interconnectedness of issues in our modern day world, even institutions created to serve specific purpose are not merely products of a single issue, but is rather nested in a complex net of various drivers. The complexity and interconnectedness of problems may pose more challenges in efficiency of institutions. Secondly, as drivers and issues evolve over time, institutions can at best be functional for a particular period. As a result, instead of improving 'institutions', enhancing the adaptive capacity of institutions by increasing public participation is crucial (ibid).

Alternatively, bottom-up process in the context of a city can yield powerful impact as showcased by Sorensen and Sagaris (2010) from cases in Chile, Japan and Canada. Cases showed how urban neighbourhoods' claims back 'the right to the city' by uniting and organizing its people to challenge the powerful and economic actors in the cities. Although the cases are hardly the norms of public participation, the cases highlight the potentials of people: a proper neighbourhood scale can foster effective communication space which forms strong basis for collective citizenship and autonomous political activism to engineer real change in societies (ibid).

Indeed, the importance of public participation in sustainable development had formally been recognized in the Agenda 21 and the subsequent Local Agenda 21 (LA21) as discussed in former sections. While results of implementation of LA21 are mixed, the positive results show the importance of genuine bottom-up process. Agger (2010) attributed the successful implementation of LA21 in Denmark as the process empowered locals and local NGOs to reach out in their neighbourhoods and to establish partnership and cooperation in an organic way. On the other hand, studies also indicated that the initiatives of LA21 can easily be swayed by the political agenda of the local and national contexts (Mercer and Jotkowitz, 2000).

Given that the role of public participation is taking a more prominent role in sustainable development of cities, it is pertinent to have tools to evaluate the process.

5.4 Evaluating public participation

With the limited scope of this paper and the study, this paper does not aim for a thorough theoretical review of existing literature on public participation, which is vast and it encompasses various disciplines. In the context of the ongoing Energy City project in Frederikshavn, the aim of this study is to evaluate the process of public participation which has been carried out by the municipality so far in engaging the public within the specific context of the Energy City Project.

While public participation is so well adopted in various decision-making process of

governments and institutions, there is relatively little empirical work done in this regard. Most of the existing studies are, as Rowe and Frewer (2000) points out, 'no more than suggestions from academics and practitioners (p10)'. With little objective criteria of public participation methods, there is a risk of a superficial engagement in public participation, resulted in little real interests in realizing genuine public participation by merely paying lip service to the public and popular demand of public participation 'gesture' (Rowe and Frewer, 2000).

Another pitfall with the past literature on evaluating public participation highlighted by Rowe and Frewer (2000) is that, rather than measuring effective outcomes of the process, most had instead chosen to explain the constituents of an effective process. In an effort to bridge the past literature on various criteria, two lists of criteria, acceptance and process were compiled, respectively referring to the aspects of public acceptance and good process which takes the sponsors' consideration into account.

Criteria for Public Participation Methods	**The sub-criteria**
Acceptance criteria	-Criterion of representativeness -Criterion of independence -Criterion of early involvement -Criterion of influence -Criterion of transparency
Process criteria	- Criterion of resource accessibility - Criterion of task definition - Criterion of structured decision making - Criterion of cost effectiveness

Table 2: The list of 9 criteria for evaluation of public participation developed by Rowe and Frewer (2000)

Firstly, on the criterion of representativeness, it specifies 'the public participation should comprise a broadly representative sample of the population of the affected public' (Rowe and Frewer, 2000, p. 12). This includes avoiding simple inclusion of self-represented individuals or groups, paying attention to the selected groups from poorer or lower social status groups or elite groups from the society and to the concerns on transboundary issues (ibid).

Secondly, on the criterion of independence, it refers to the process to be 'conducted in an independent, unbiased way' (ibid, p. 13). In essence, the public representatives should be independent of the affiliation to the sponsoring body. Independence can be realized, for example, by the appointment of a steering committee that takes in people from various

neutral organizations, like university academics (ibid).

The third is the criterion of early involvement, of which 'the public should be involved as early as possible in the process as soon as value judgments become salient' (ibid, p. 14). This is particularly important as public participation should be encouraged to question and debate on various assumptions and agenda setting (ibid), for instance, whether to have new development to replace the wetland.

The fourth criterion is influence, this refers to whether the outcome of the public participation procedure yields any genuine impact on the policy in debate, rather than being merely used as pretence to legitimize decisions made by the authority. To realize this criterion, planning should be made before the actual participation carried out to guide the use of respective outcome from the participation exercises (ibid).

Finally, it is the criterion of transparency, as it suggests, there should be transparency in the process and in the decisions made. Transparency can dissipate the public suspicion over vested interests of sponsors or powerful players in the process. In addition, withholding information on the basis of sensitivity and security should be done by offering explanations given to the public to ease concerns, rather than risking the outcry followed by accidental discovery (ibid).

As for the process criteria, the first criterion is resource accessibility, which refers to the 'access to the appropriate resources to enable them to successfully fulfill their brief' (ibid, p. 15). By resources here include information resources, human resources, material resources and time resources, while financial resources are clearly indispensable. While the various resource demands may be at conflict in times, for instance, the time and financial costs associated with more information from more experts, a trade-off should be communicated clearly to achieve a level of appropriate resources (ibid).

Secondly, the criterion of task definition defines the 'nature and scope of the participation tasks' (ibid, p. 16). Clear communication over matters of the scope, the expected outcome, and the procedure mechanisms are crucial to ensure s little confusion as possible. On the other hand, flexibility is needed to avoid over-prescription of a given set of criteria in times of changing situations and public sentiments (ibid).

Thirdly, the criterion of structured decision making is referring the use of 'appropriate mechanisms for structuring and displaying the decision-making process' (ibid, p. 16). It is similar to transparency in a way that, by letting the public understanding the underlying reasons for the decision-making. It concerns evidence, documenting, and organizing decision process (ibid).

Finally, the fourth criterion of the process criteria is the criterion of cost-effectiveness. Cost is an important factor to determine the scale of public participation exercise. Here, cost does not only refer to monetary cost, but also time cost. Cost implication of each type of alternative methods should be examined, together with other criteria. In reality, however,

given the infinite form of organizing public participation exercise, it is hard to achieve an objective standard of cost-effectiveness (ibid).

The above nine criteria are used to evaluate various practices and methods of public participation methods, including referenda, public hearings, public opinion survey, negotiated rule making, consensus conference, citizens panel, citizen advisory committee, and focus groups (ibid). The framework did not aim to determine the best method for public participation, rather, it is to offer a kind of normative model for a systematic comparison of various formalized public participation.(ibid).

In this study, the aim of using this framework to conduct a brief review of the effectiveness of public participation carried out by the Frederikshavn Municipality in regard to the Energy City Project, which has a significant local importance. However, instead of evaluating a particular participation exercise, the framework is used as a guide for evaluating the public participation process. This is an exploratory study in this regard in attempt to extend the use of the framework developed by Rowe and Frewer (2000) to a broader evaluation of public participation.

6. Results and Analysis

6.1 One Planet Living Framework

6.1.1 Zero Carbon

Zero carbon is the first criterion of the One Planet Living framework, for the role of carbon is critical in the path to sustainability. It underlies actions in energy use for all forms of modern activities, which relied heavily on fossil sources with high carbon content. The major strategies are energy efficiency and energy generation from renewable sources (WWF, 2010).

The Energy City Project set an ambitious target of 100% renewable energy in the areas of electricity, district heating and transportation by 2015. The calculation is based on an annual output basis, particularly in the supply of electricity. At present, Frederikshavn municipality obtains its electricity from its national grid in Denmark. Therefore the calculation for reaching 100% renewable energy is based on the fact that the production of the electricity from its local renewable sources equals to its supply from the national grid on an annual basis (Lund & Østergaard, 2008). Aalborg University is responsible for the energy audit of the Energy City project and the energy scenario plan, which has been issued for

three times. The team headed by Henrik Lund is now working on the fourth version (Dehghan, B., 2011, pers. comm., 10 Feb). At present, the municipality has achieved 24% of renewable energy in electricity, district heating and transportation (Energibyen Frederikshavn, 2011d).

At the initial stage, the municipality focused more on the supply side, i.e. to ensure that the energy feeding into the grid is produced from renewable sources (Jentsch, M 2011, pers. comm. 6 April). Strategies include establishing biogas plant from agricultural sources in the surrounding areas of Frederikshavn municipality; setting up solar-thermo systems in Frederikshavn; working with Aalborg University to develop wave energy along the coast of Frederikshavn (ibid). So far, the prospect of reaching 100% is mostly possible in electricity (Iversen, A 2011, pers. comm., 1 April). As of now, there are in total four offshore wind turbines erected on the coast of Frederikshavn City. The coast is used as a testing site for Dong Energy for shallow-water wind turbine installations, where Dong Energy is planning to install not more than six more wind turbines of capacity of 6 MW or lower (Andersen, 2010).

Energy storage systems are crucial to cater the fluctuating supply of renewable energies to ensure a stable supply of energy in all sectors. In order to make full use of the ample wind energy potential in Frederikshavn, a heat pump was built (Iversen, A 2011, pers. comm., April). However, owing to the existing regulations, the energy from the wind energy cannot be used by the heat pumps directly or there will be additional tax implications (Sperling, K 2011, pers. comm., 8 April). The development in energy storage facilities helps Frederikshavn to achieve the goal of zero carbon.

In early 2011, the focus of the Energy City had changed to the demand side (Iversen, A 2011, pers. comm., 1 April; Jentsch, M 2011, pers. comm. 6 April). The major strategy is to retrofit individual houses in Frederikshavn to improve the energy efficiency and reduce the energy demand from each household by initiatives like Energiprofferne (Energy Professional) and Husets web (Houses website). Moreover, the municipality collaborated with local banks to offer low-interest loans for retrofitting projects for individual homes, with a repayment equal to or lower than the existing energy bills (Jentsch, M 2011, pers. comm. 6 April).

Hejslet from the Frederikshavn Erhvervsråd (Frederikshavn Business Council) who participated in the Energiprofferne project alongside with the representatives from the municipality, said that the workers had completed training on retrofitting and they were ready to carry out retrofitting work in the community. This coincided with the Energy City Project team's initiative in developing 'Husets Web', it allows individual residents to check the energy consumption of their homes, seek advice for energy efficiency and book appointments with an energy consultants for detailed inspections. The Husets web (http://www.husetsweb.dk/) was launched in April 2011. It is predicted that as more houses undergo retrofitting, the energy demand for district heating and electricity would decrease.

Judging from the above, the Energy City project showed enormous efforts in reducing

carbon in its energy use through increasing the share of renewable energy and improving energy efficiency, the principle of zero carbon is largely met.

6.1.2 Zero waste

Zero waste refers to 'reducing the generation of waste by better design, and encouraging re-using, recycling and composting of waste…and using waste to generate clean energy.' (WWF, 2010, p.15).

Waste is not an immediate concern for the Energy City project, but waste is considered as a source of renewable energy in Frederikshavn (Iversen, AD 2011, pers. comm., 1 April), so the focus below is on its relation to energy supply. At present, the Frederikshavn Municipality is using waste to generate energy to feed into its district heating system, of which recyclable waste, like paper, glass, metal and electronic components are pre-selected for recycling. During summer, the waste is sufficient for providing central heating, while in winter, it covers around 60-70% for district heating and the remaining heat is supplemented by natural gas. To achieve 100% renewable in district heating, it requires getting natural gas out of the system by finding substitute like biogas, alongside with burning waste to generate heat (ibid).

The present waste management system in Frederikshavn contains waste recycling, waste incineration and dumping. There are two waste incinerators in Frederikshavn, Frederikshavn Waste CHP Plant and Skagen Combustion, respectively managed by Dong Energy and AVØ A/S, which are incinerating commercial and industrial waste, household waste, construction waste and bulky industrial waste. (Frederikshavn Kommune, 2011a). According to Jentsch, the technical director of the municipality, there is no serious environmental pollution resulted from burning waste (Jentsch, M 2011, pers. comm. 6 April).

Although waste is considered as a source of renewable energy in Frederikshavn, it is important to note that the municipality is aware of reducing the overall waste. In the new waste management plan for 2009 to 2012, it set up goals for waste management: 65% of all waste going to recycling, 29% of all waste going to incinerators, and finally, a maximum of 6% of all waste deposited in dumps (Frederikshavn Kommune, 2011c). The plan showed determination to reduce the waste and its reliance of waste as a source of renewable energy.

To conclude, the municipality has been doing a lot in reducing waste and increasing recycling. A life-cycle perspective has been adopted to tackle waste issue in engaging businesses to reduce waste in their production processes. Most importantly, despite the use of waste in district heating, the municipality did pursue further reduction in waste for its environmental benefits instead of relying solely on incineration to solve its waste issue.

6.1.3 Sustainable Transport

Sustainable transport includes reducing needs to travel, lowering dependence on private vehicles and achieving reductions in carbon emissions from transport. These necessitate well developed transport infrastructure to reduce reliance on fossil fuels and allow the use of alternative renewable fuels for vehicles. The existing business practices should be changed to decrease frequent face-to-face meetings to technology-assisted communications (WWF, 2010, p.16).

Among the various criteria of One Planet Living, interviewees from the municipality all agree that the 100% goal in transport is the hardest to achieve. Most interviewees emphasized the importance of personal transport as a crucial way of living in Frederikshavn, because residents commute to neighbouring towns and cities to work. Further, the population density in Frederikshavn and its surrounding areas is quite low that traffic condition is favourable for private cars while taking public transport will incur more time costs (Iversen, AD 2011, pers. comm., 1 April)

Among the three main strategies of sustainable transport, the Energy City project thus far mostly focused on achieving reductions of carbon emissions from transport by introducing electric car as well as developing the potential of using biogas as the fuel for vehicles. To facilitate the development of electric cars, a series of strategies have been adopted including replacing the existing municipal car fleets to electric cars, collaborating with Better Place[6], a global leading supplier of electric car infrastructure, to set up battery changing stations in Sæby. However, owing to the high costs of investing in electric car and the short travelling distance, the motivation of buying electric cars in Frederikshavn is not strong at present. Moreover, the municipality is not in a position to offer tax rebates and other financial incentives for buyers of electric cars (Jentsch, M 2011, pers. comm., 6 April). With regard to biogas, it is still at the planning stage as the project encountered obstacles on its scale and tax issues.

In lowering dependence on private vehicles, public transport is playing a crucial role. The municipality would like to change some local buses from using diesel to natural gas. The plan had not succeeded owing to a lack of financial support from the national government (ibid). At present, the municipality is renting buses from private companies, it is more difficult to motivate private companies to invest without government financial incentives (Iversen, AD 2011, pers. comm., 1 April). Car sharing can be an option but a formal scheme of car sharing may be difficult to implement due to the low volume of cars in Frederikshavn (Jentsch, M 2011, pers. comm., 6 April). Nevertheless, the municipality now aims for improving its cycling infrastructure. At present, one out of four trips within the municipality

[6] Better Place Danmark: http://danmark.betterplace.com/

was done by bike. The obstacle for biking is the lack of bike lanes. A consensus is now reached at the municipality level to improve the bike infrastructure (Nielsen, 2010c). To promote biking in Frederikshavn, the Tourism Bureau of Frederikshavn launched a programme offering free bikes to tourists in Frederikshavn City from Easter till October 2011 (Lysets Land, 2011a).

Among the three strategies, the Energy City Project showed little attempt on reducing the needs for travel. This is perhaps the most challenging of all as it involves fundamental lifestyle changes including work arrangement and consumption patterns.

In sum, sustainable transport is the hardest challenge, in reality it is more than an issue of infrastructure. As Iversen clearly points out, 'the car is not just some materials with four wheels, it's our freedom, there's a lot of feeling to our cars…there's none of us who is just having a practical car. We like it because we like its statement' (Iversen, AD 2011, pers. comm., 1 April). Transport is more of a personal lifestyle and a cultural issue, it takes longer time and more challenges to change.

6.1.4 Local and Sustainable Materials

This principle concerns about preserving natural resources by using materials in a sustainable way, it emphasizes the use of local, reclaimed, renewable, and recycled materials. It concerns transforming the supply chain of local economies to foster natural resource stocks (WWF, 2010, p.17).

In the first glance, this principle is not directly influenced by the Energy City project. However, discussion with Hejslet from Frederikshavn Erhvervsråd revealed a different picture in the project called 'Green Ship'. In face of more stringent demands for the maritime sector from EU Directives, the local maritime service industry launched a project to experiment various retrofitting technologies for cleansing particles and filtering, which involves demonstrating retrofitting solutions on an operating ferry passing through Frederikshavn and Læso, an island outside Frederikshavn. There are around 10 to 15 local companies from the maritime servicing sector involved in the project. The project will explore using light-weight materials for ferries so as to reduce the material use and the energy consumption (Hejslet, A 2011, pers. comm., 4 April). The new project can achieve both the principles of sustainable materials as well as zero carbon by reducing the fuel use.

Apart from recycling and reducing the use of resources, reuse is also a major strategy within the local and sustainable materials. At the consumer level, this can be achieved partly by going to second-hand stores for shopping, and giving unused items to second-hand stores as well. From the discussions with local residents, 'it's getting more common for people to go to second-hand shop nowadays. There were around 3 to 4 shops in Frederikshavn, one is Red Cross, one is with the church, and most people working there are volunteers' (Hust, O 2011,

pers. comm., 7 April).

The above shows a strong awareness of sustainable use of materials, with a high recycling rate of waste in various sectors of the municipality. To further improve in this aspect, the principle of local and sustainable materials use can be realized in various economic sectors in Frederikshavn.

For the remaining five principles of One Planet Living framework, the Energy City Project does not have specific strategies in those areas. However, it is out of deliberate efforts to include in the following sections to offer a holistic view of sustainability in Frederikshavn.

6.1.5 Local and sustainable food

This principle concerns about the pitfalls brought by modern industrialized agriculture which are energy intensive and very often ecosystem damaging. One of the solutions is to support local and low-impact production that ensures a health and quality supply of local food, as well as to bring benefits to local economy and environment (WWF, 2010, p. 18).

Frederikshavn presents an interesting case with this principle. On one hand, Frederikshavn and the surrounding areas consist of major agricultural land in Denmark. There are around 2 million pigs growing in the farms around Frederikshavn (Jentsch, M 2011, pers. comm., 6 April). Coincidentally, the largest employer of the Frederikshavn Municipality is Danish Crown, a major food processing company in Denmark. Food processing and agriculture is also one of the municipality's growth areas for the local economy (Hejslet, A 2011, pers. comm., 4 April). The meat production in the region is not only for local use, but mostly for national as well as international markets (Jentsch, M 2011, pers. comm., 6 April). In addition, like many other modern cities, the local food supply in the local supermarkets sources food products and groceries from all around the world. While there are more choices for organic vegetables and other groceries in the supermarket, it is undeniable that the current situation of food supply is far from locally self-sustained, just as most of the other modern cities in Europe and elsewhere in the world.

On the other hand, talking to local residents and walking around the city revealed a slightly different picture. Most of the residential areas in Frederikshavn are composed of individual houses with gardens, despite some apartment buildings in the city centre. Indeed local residents revealed that it is common for people to have gardens around Frederikshavn. As one gets a bit further out from the city centre, one can notice much richer wilderness with people living with big gardens or old farms which keep animals and grow various types of vegetables and flowers (Waehrens, C 2011, pers. comm., 6 April). There are also lots of gardening products, including seeds for flowers and vegetables, available in the local supermarkets. Nevertheless, community gardening is really rare in Frederikshavn, though there are some gardens inside schools (Jentsch, M 2011, pers. comm., 6 April). There is no

local farmers' market in the city as well (Hust, O 2011, pers. comm., 7 April). This indicated that the local food production in Frederikshavn at present is mostly on an individual and informal basis, it is unclear to know the proportion of locally produced food. It is considered that at present little has been done in the principle of local and sustainable food.

6.1.6 Sustainable water

Sustainable water refers to efforts on water efficiency, water re-use and water recycling strategies. It also includes minimizing water extraction and pollution, promoting sustainable water and sewage management and restoring water cycles (WWF, 2010, p. 19). An example can be found in the Masdar City project in United Arab Emirates, where all the waste water will be reused and water demand will thus be cut by 50% (WWF, 2010, p19).

Water is not part of the project of the Energy City Frederikshavn, however, it is undeniable that water is crucial in the efforts of sustainability. Water is handled by Forsyningen Frederikshavn[7]. Forsyningen is also responsible for the municipality's electricity grid, street lighting, heating, sewage and waste issues (ibid). All drinking water supply in Frederikshavn comes from groundwater reservoirs in Frederikshavn with no rainwater harvesting in the region. The water pumped from the underground goes through various stages of treatment before pumping to each household, including aeration, settlement of iron compounds and filtering (Forsyningen, 2011a). The water is pumped through pipelines of several hundred kilometers' long. At present, the water from the tap and water for flushing in toilets are from the same clean source, reuse of grey water is really rare as there is no existing infrastructure for grey water in addition to the concern of polluting clean water source (Iversen, AD 2011, pers. comm., 1 April). As for the public awareness on water resources, there are existing programmes from the Forsyningen to educate the general public and business about water conservation (Forsyningen, 2011b).

There are four types of sewage treatment in the Frederikshavn Municipality: the separate sewage, the common sewage, the waste water sewage, and the road-side sewage. Together, the sewage system in Frederikshavn consists of approximately 900 kilometers long pipeline. There are three wastewater treatment plants (WWTP) in the Frederikshavn Municipality, the Frederishavn WWTP, Skagen WWTP and the Sæby WWTP (Forsyningen, 2011c).

Generally speaking, the quality of drinking water is high in Denmark despite concerns in late 80s on the levels of nitrogen and phosphorus (European Environment Agency, 2011). In addition, there is a high awareness of water saving among the Danish population since the last oil crisis (Iversen, AD 2011, pers. comm., 1 April). However, it should be noted that the current water supply in Frederikshavn is heavily dependent on pumping, which is quite

[7] Frederikshavn Forsyningen: <http://www.forsyningen.dk/>

energy-intensive. There are more studies on energy footprints of water supply in recent years (see Hackett and Gray, 2009). To further reduce the energy demand, the energy consumption for water supply should be considered. Reusing grey water for flushing toilets can be one option. To conclude, while the population enjoy high water quality, the pumping process is energy-intensive, which will become an increasing concern with the rising energy prices. There is more room for Frederikshavn to reduce the energy use of its water infrastructure, and to encourage more efficient use of water. The perspective of energy footprint of water can also be adopted in the municipal planning to manage water-related issues in a sustainable manner.

6.1.7 Natural habitats and wildlife

This principle concerns preserving natural habitats for the flourish of plants and animals, in particular with the local indigenous species, as well as creating new ones to provide habitats for plants and animals (WWF, 2010).

Although Frederikshavn has a long industrial history with its shipyard industry, the city preserves luxurious wildlife habitats. Frederikshavn municipality is ranked the 6th place for having the most areas covering the areas under the National Conservation Act 3 (Miljøministeriet Nturstyrelsen, 2011). In the south-western part of the city, where the Bangsbo is found, the area contains a botanical garden, covering a total of 17,500 square metres, a forest and a deer park of 100 acres[8]. The Bangsbo area was designated a national natural reserve in 1944. There are 72 species reported in the area from the biodiversity data from the Global Biodiversity Information Facility GBIF (2011). There is also a nature guide who can offer advice in organizing outdoor activities for schools and institutions (Frederikshavn Kommune, 2011e).

It can be concluded that the Frederikshavn Municipality is blessed with rich natural habitats, and there has been great efforts to protect the natural habitats by designating them as natural reserves and other public education campaigns. Within the city centre area, there are also abundant greenery areas to be found for local birds and plants. The municipality should maintain the current strategies in protecting natural habitats, both for its residents and the wildlife.

6.1.8 Culture and heritage

This principle refers to efforts in reviving local history and identity, and fostering a new culture of sustainability (WWF, 2010, p. 21). Given the diverse physical and social landscapes of the world, there will be no panacea for every city or country to achieve sustainability.

[8] Bangsbo Natural Reserve: www.bangsbo.com

Maintaining local identity and wisdom thus forms solid basis for sustainability suited to local context.

Frederikshavn has a colourful history. Its influence is still felt today and its heritage is well preserved. The Bangsbo area is the place where important fort facilities dated back several hundred years are to be found, it is now open as a museum for public (Bangsbo, 2011). In the city centre, the old city is lined with historical buildings dated back in the 17th century[9]. New installed art pieces and sculptures are set up to highlight the city's maritime history.

There are various cultural institutions in Frederikshavn to create a flourishing cultural life. The Music House hosts various concerts throughout the year, it also offers good music training for children (Bang, AM 2011, pers. comm., 6 April). The Arena Nord is a big stadium for concerts and sports event like the annual youth handball cup of Denmark (Hust, O 2011, pers. comm., 7 April). The Frederikshavn Art museum exhibits local and national artists' works (Lysets Land, 2011b). However, talking to a local artist revealed that the cultural facilities are under stress in times of financial crisis, for example funding cuts in the music schools for children, limited funding opportunities for artists (Bang, AM 2011, pers. comm., 6 April).

Comparing to the historical heritage and cultural infrastructures, the local identity of Frederikshavn has undergone important transformations in recent years, which attribute to the richness of local identity in Frederikshavn. Back in 2007, Denmark went through a municipal reform which combined existing municipalities to form larger ones. Frederi shavn Municipality today actually consists of three former municipalities: Frederikshavn, Skagen and Sæby, which differ a lot from each other. Frederikshavn had a long history of an industrial city with paramount military importance; Skagen is a traditional fisherman town with increasing popularity as a tourist attraction; while Sæby is mostly an agricultural town. The merge of the three municipalities certainly posed challenges by the Frederikshavn Municipality (Pedersen, T 2011, pers. comm., 4 April). In particular, the merge also complicated the Energy City project as the project was initially planned and started before the municipal reform. While the project area (for the calculation of 100% renewable energy) remained in the Frederikshavn City and a part of Strandby, initiatives from the Energy City extend to the new municipal areas, for instance, in the areas of retrofitting houses.

Overall speaking, Frederikshavn offers a wide range of cultural experience. Especially its local history is well preserved and maintained. The merge of municipalities is bringing new elements to its local identity, which should create more synergy for the municipality in a long run.

[9] See for example, Krudttårnet, built in 1686-90, <http://www.skagen-tourist.dk/danmark/da-dk/menu/turist/omraade/frederikshavn/attraktioner/bygningsvaerker/produktside/gdk014541/krudttaarnet.htm?CallerUrl=1>.

6.1.9 Equity and Fairtrade

This principle refers to the 'equitable and fair trading relationships that have a beneficial effect on communities locally and globally' (WWF, 2010, p. 22). While the labour conditions in Denmark are of high standard, this principle can also be translated into supporting fair trade and ethical practices in production and in consumption. Also, benefitting local economy plays a key role.

Frederikshavn has led a long way in this regard, the town has a long history in industrial production, especially in the ship-building industry. The local economy and employment suffered serious blows when the shipyard, employing around a quarter of the population, was closed down. That led to the subsequent shutdown of the factory of Man Diesel. Given its long distance from Copenhagen (5.5 hours from Copenhagen by train), Frederikshavn has been struggling to find a new way to revive its local economy and offer employment (Jentsch, M 2011, pers. comm., 6 April). Indeed, as both Iversen and Jentsch emphasized, one of the goals of the Energy City Frederikshavn is to create jobs for the locals. The new initiative is the Energiprofferne and the Husets Web, which the municipality encourages residents to retrofit their houses to save energy, thereby creating jobs for the local workers in the construction industry. If 5% of the houses in Frederikshavn Municipality are renovated every year, there will be 300 jobs created for that year alone (Jentsch, M 2011, pers. comm., 6 April).

In addition, the municipality also engages local business through the establishment of Frederikshavn Erhvervråd (Frederikshavn Business Council)[10]. While being an independent organization from the municipality, Frederikshavn Erhvervråd earns 90% of its revenue from the municipality. Its main role is to offer business advice for local businesses. Hejslet is the leader of the Business group of the Energy City project, who works as a Business Consultant for Frederikshavn Erhvervråd (Hejslet, A 2011, pers. comm., 4 April). Moreover, being the main consumer for goods and services, the municipality set a high standard for procurement to support best practices in the municipality. For instance, the municipality gives contracts to local businesses where the local expertise is; in areas with a lack of local expertise, a partnership is formed between professional companies and local businesses to support the local economy (Jentsch, M 2011, pers. comm., 6 April). The four targeting sectors of the municipality are: the maritime industry, the energy sector (includes the retrofitting for houses), the experience and tourism industry and finally the food processing industry (ibid).

At a local community level, interview with local resident suggested that there were more awareness about fair trade and organic food nowadays. Though there still isn't any local farmers' market available in Frederikshavn despite being close to major agricultural regions (Hust, O 2011, pers. comm., 7 April).

[10] Frederikshavn Erhvervråd, see website < http://www.frederikshavn-erhvervsraad.dk/>.

To conclude, the municipality has done a lot in supporting local small businesses, particularly in the energy sector with the new initiatives from the Energy City project; while more has to be done in support a wider form of local business, including small scale local farmers and local artists.

6.1.10 Health and happiness

The One Planet Living framework describes this principle as 'promoting healthy lifestyles, vibrant communities, and physical, mental and spiritual well-being' (WWF, 2010, p. 23). While the principle seems broad and not clearly defined, it encompasses various efforts to make communities more livable, which go beyond the existing physical and economic infrastructures. For instance, one action under this category is done by Mata de Sesimbra in Portugal to monitor the satisfaction and stress levels of its residents and visitors (WWF, 2010, p. 23).

In this respect, interviewing with various residents and employees of the Frederikshavn Municipality revealed a high level of satisfaction. The sense of satisfaction is rooted from various reasons. A local resident said that there are excellent sports facilities in Frederikshavn for a city of the size of Frederikshavn, including a swimming pool, several big sports halls are found in the Arena Nord, where the annual Danish youth handball competition is held. Bike tracks are in good condition linking through the city (Hust, O 2011, pers. comm., 7 April). Others mentioned the beautiful nature in the surrounding areas which give much life satisfaction (Pedersen, T 2011, pers. comm., 4 April; Bang, AM 2011, pers. comm., 6 April).

Frederikshavn is also considered as a vibrant community. The owner of a jewelry workshop in town, mentioned about the close community ties in Frederikshavn where people know each other (Waehrens, C 2011, pers. comm., 6 April). In terms of community activities, people in Frederikshavn, like other parts of Denmark, like taking part in voluntary activities or are members of local interest clubs (Hust, O 2011, pers. comm., 7 April). It is not common for new people to settle in Frederikshavn, but once they moved in, people tend to stay and like the place (ibid).

On the aspects of mental well-being, Pedersen further mentioned the'pulse' in the city, he refers to the flow of people from all over the world brought in by the ferries in Frederikshavn, which creates a distinct atmosphere and life for the city (Pedersen, T 2011, pers. comm., 4 Apri). The view is also shared by others (Bang, AM 2011, pers. comm., 6 April).

On spiritual well-being, interestingly, when being asked what made them like living in Frederikshavn, both Pedersen and Jentsch mentioned that there was a 'spirit' in Frederikshavn, a spirit that the locals are ready to fight up against the struggles, as in the case of Frederikshavn after the closure of shipyard (Pedersen, T 2011, pers. comm., 4 April;

Jentsch, M 2011, pers. comm., 6 April).

In sum, it seems that Frederikshavn as a whole offers a wholesome living experience for its community members. It is a small but close community with a dynamic flow of tourists and visitors which constantly delights the local scene. The city is also blessed with beautiful nature with sufficient infrastructure for both physical and mental health.

6.2 Evaluating the public participation

6.2.1 Acceptance criteria—Criterion of representativeness

This criterion refers to the sampling of the affected public in the public participation exercise, whether the representative can truly speak the voice of the wider public, in particular with reference to different social class (Rowe and Frewer, 2000).

There are five theme groups under the Energy City Project to engage the public in the project process: Local Energy, Green Municipality, Education, research & Training, Business, and finally My Municipality. Specifically, the 'My municipality' group is a major effort in engaging the general public, and the group was finally coined 'My Municipality' in early 2009, as Mikael Kau, the former director of Energy City Frederikshavn mentioned, 'we've now been in contact with more people who are passionate about the project…until now, we just lacked a forum where we can collaborate with them' ("vi har efterhånden været I kontakt med flere borgere…indtil nu har vi bare manglet et forum, hvor vi kan samarbejde med dem") (Energibyen Frederikshavn, 2009a).

The group is headed by Pedersen, the Chief Librarian of the Frederikshavn Municipality Library. Pedersen took part in one of the initial public meetings organized by the municipality after its decision to take up the Energy City Project (Pedersen, TH 2011, pers. comm., 4 April). The first Energy City Public meeting was held in January 2009, of which 111 ideas were generated and 31 people signed up to join the activists' group (Energibyen Frederikshavn, 2009b). Pedersen was invited to be the theme group leader for the 'My Municipality' group (Nielsen, 2009a). Clearly, 'My municipality' group is the major effort of the municipality to engage general public. The process let local citizens participate, it demonstrates the willingness of the municipality to engage wider audience. At the same time, the appointment of Pedersen as the theme leader among the participating local citizens showed a high degree of representation.

For the other four theme groups, the team leader for 'Local Energy' is Iversen, an Energy Advisor for Forsyningen Frederikhsavn (Energibyen Frederikshavn, 2011b). She said, 'we see the goal (of 'Energy City Frederikshavn') as part of our goal as we are the supply company' (Iverson, AD, pers. comm., 1 April). Forsyningen is the major member and

secretariat of the 'Local Energy' group. The group consists of local district heating suppliers in Frederikshavn. The team meets up to discuss matters about various solutions to feed in renewable energy into the district heating systems and the electricity grid (ibid).

As for the business group, the team leader is Hejslet, the Business Consultant of Frederikshavn Erhvervsråd. Its members include Frederikshavn Business Association, Skagen Business Association and Sæby Business Association (Frederikshavn Erhvervsråd, 2011). Despite being an independent organization, 90% of the revenue of Frederikshavn Erhvervsråd comes from Frederikshavn Municipality. The Council is only serving companies in Frederikshavn Municipality, while the consulting services to its members are for free (Hejslet, A 2011, pers. comm., 4 April). Frederikshavn Erhvervsråd could strengthen the communication between the municipality and the business community, as he said, 'it is easier for companies to talk to us because we try to think on the business side' (ibid).

Table 3 shows the various projects carried out by the Frederikshavn Erhvervsråd with local businesses, these projects are incorporated into Energy City Project. In a word, the local business, though not directly communicating with the municipality on the project, they are participating through the medium of Frederikshavn Erhvervsråd.

Project Name	**Project Details**	**Involved parties**	**Involvement of Energy City**
The Green House	Built a family house in Frederikshavn which is energy efficient and affordable	Local companies of carpenters, construction workers	Publicity over the 'Green House' project over website and newspaper
Energiprofferne	A network for local construction sectors which received training on retrofitting for houses and can now carry out projects on retrofitting local houses	22 companies from the local construction sector	Together with Frederikshavn Erhvervsråd to participate in the board meeting
The Green Ship	Retrofit an existing ferry to Læso to showcase and experiment new technology for cleaner fuels and higher environmental standards	10-15 local maritime service industry companies	A new project at the moment

Table 3: The projects Frederikshavn Erhvervsråd are involved in relation to the Energy city Frederikshavn project (source: Hejslet, A 2011, pers. comm., 4 April).

Through the five theme groups, Dehghan, the Project Leader of Energy City

Frederikshavn, believed that they could represent the general public and interests group in Frederikshavn (Dehghan, B 2011, pers. comm., 10 February).

6.2.2 Acceptance criteria-criterion of independence

The criterion of independence is realized when 'the managers and facilitators are not only independent in actuality but are seen to be independent' and 'public representatives should be independent of any affiliation to the sponsoring body' (Rowe and Frewer, 2000, p. 13).

Energy City Frederikshavn is a project initiated by the Frederikshavn Municipality. A foundation was formed with seven board members from professional backgrounds to assure neutrality (refer to section 2.2). In this regard, the Energy City Frederikshavn project strengthened its independence.

Independence can also be seen in the interactions between business sectors and the project team. 'We are to get business involved in different projects, but only when we can see the perspective in myself. We don't' want to go out if we see it is a waste of their time. When the Energibyen project started, the municipality invited the group to be part of the team to bring the businesses on board' (Hejslet, A 2011, pers. comm., 4 April). This indicates a high level of independence of the role of Frederikshavn Erhvervsråd in the work with the Energy City Frederikshavn project.

In addition, to ensure that the '100% renewable' goal will be achieved, the whole energy plan for the Energy City Frederikshavn was drafted by Henrik Lund, the professor of the Planning Department in the Aalborg University. Right from the start, Henrik Lund and his team were involved in drafting up the plan and auditing the consumption and production of energy within the project area of Frederikshavn (Lund & Østergaard, 2008). The engagement of university to carry out the energy plan and energy audit enhances the independence of the project by being a neutral and professional partner to the project.

As a whole, the Energy City Frederikshavn has demonstrated great efforts to ensure the independence of the process and the engagement of the public and professional bodies in various ways.

6.2.3 Acceptance criteria-criterion of early involvement

One of the key in early involvement is, as Rowe and Frewer (2000) put it, 'as early as possible in the process as soon as value judgments become salient' (ibid, p14). It also suggests that public participation in highly technical matters may not be practical and effective (ibid).

To evaluate whether the participation was started early enough for the Energy City

Frederikshavn Project, it is crucial to understand how Frederikshavn came to the idea of Energy City. According to Sperling, the Assistant Professor at Aalborg University, who is also part of the team of Henrik Lund, the idea of Energy City came as early as 2006, when Henrik Lund and other energy experts from the Danish Association of Engineers attended a conference named Energy Camp. With the working group, Henrik Lund prepared a paper called 'Next City Frederikshavn—Denmark Renewable Energy City' (Sperling, K 2011, pers. comm., 8 April) which formed the basis of the energy plan for the Energy City Project. By 2007, the idea was brought up to the municipality for voting. The voting result was a unanimous one, 31 votes to zero in support for the Energy City project (Jentsch, M 2011, pers. comm., 6 April). By mid-2007, the Energy City Frederikshavn Project was officially launched. In addition to the engagement of university, the municipality invited COWI, a leading Danish consulting firm, to prepare its business plan at the beginning of the project in 2008 (COWI A/S, 2008). In the report, it laid down the five theme groups of engaging the public of the Energy City Frederikshavn project.

After establishing the fund and forming the initial project team, a website was set up in early 2008 to communicate the project information to the public. Subsequently, the first public meeting aiming to collect ideas from the general public was held in January 29, 2009 (Energibyen Frederikshavn, 2009b). The theme group 'My Municipality' group was formed, with 'activists' recruited from the general public after participating in the public meetings (ibid). Pedersen, the theme group leader of 'My Municipality' recalled about the first meetings, 'I don't think anybody in this meeting and people I talked to have a feeling that they are not informed early enough. That was my impression' (Pedersen, TH, pers. comm., 4 April).

Overall speaking, the municipality and the project team of Energy City Frederikshavn did get the public input from various stakeholders early on in the stage. During the initial stage of the project, the municipality had a public participation officer for the Energy City Frederikshavn project (Pedersen, TH 2011, pers. comm., 4 April). However, when the financial crisis hit Denmark as well as the municipality, the team size had to be reduced. This will be further discussed in the section on the 'Criterion of resource accessibility'.

6.2.4 Acceptance criteria-criterion of influence

This criterion emphasizes a genuine impact of public input on policy and decision making (Rowe and Frewer, 2000). The obvious indicator would be whether public input eventually became taken as a policy or implemented for real.

Pedersen recalled that the group 'My Municipality' was really active after the initial formation of the group. Activists were eager to offer different ideas, but the momentum failed to continue after two years (Pedersen, TH 2011, pers. comm., 4 April). He shared the

difficulty he came across, 'you can't keep on asking people for ideas, you have to do something concrete, you have to give people an impression that now we are doing something about something' (ibid). The situation indicates problems in evolving the role of the activists group in the later stage of the project. It also suggests problems of turning public inputs into reality, indicating insufficient influence as perceived from the public.

On the other hand, discussion with Hejslet from the Frederikshavn Erhvervsråd shared a different story with his experience on the Energiprofferne project. The original idea of Energiprofferne came from a local carpenter to form a network of construction workers, eventually Frederikshavn Erhvervsråd and Energy City Project team joined the board of directors to assist the group, including obtaining EU funding for training on retrofitting (Hejslet, A 2011, pers. comm., 4 April). The group matched well with the Energy City's initiative on 'Husets Web' (ibid). In this case, it can be seen that the influence of public inputs was strengthened with the help of the Frederikshavn Erhvervsråd. Additionally, the similarity of the goals and objectives between the public and the municipality also plays a role.

The other main actor of the Energy City project is Aalborg University. Sperling recalled occasional challenges, as what made sense from a technical perspective did not always work in reality. That was the case for the suggestion of building more onshore wind turbines. The idea was opposed by the municipality on the ground of opposition from local residents. Nevertheless, he considered the cooperation was positive in a sense that the ideas were accepted and turned into a reality. There were frequent inputs from the municipality as well (Sperling, K 2011, pers. comm., 8 April). Generally speaking, he perceived that the team's ideas were well considered at the municipality.

Clearly, determining the criterion of influence is not easy. It is relevant to ask who has more influence. In this case, it seems that ideas from business and university are more integrated into the project. This may due to the professional expertise from the university and business. On the other hand, it implies that further resources are needed to support a more meaningful public engagement, so a fair share of participation from various stakeholder groups can be obtained. In the context of Energy City, the project team needs to strengthen the influence from the general public. While there is a structure to engage public, there is a lack of resources for ongoing engagement. It is also necessary to refine the pathways of influence from public inputs. This is also related to the task definition with the public participation process which will be discussed in later section.

6.2.5 Acceptance criteria-criterion of transparency

The criterion of transparency concerns whether the public can see 'what is going on and how decisions are being made' (Rowe and Frewer, 2000, p15). It involves releasing information on selection and decision-making procedures (ibid).

This criterion concerns the availability of information to the public. The Energy City team has been using various ways to share the information in this regard. A website (www.energibyen.dk for Danish and www.energycity.dk for English) is established early on in the project to offer updates, though the Danish website is more updated and informative than the English one. The names and contact information of the project team and the theme leaders of the five theme groups are available on the Danish website. There are frequent updates of activities and happenings in relation to the Energy City project, including the latest status of the proportion of renewable energy produced in Frederikshavn and the update of the energy scenario plan prepared by the university. Apart from websites, a Facebook group[11] named Energibyen Frederikshavn was created managed by the secretary Pedersen of the Energy City project to provide updates and activities. The group has 191 members at present. Articles are published in local newspaper and municipality's publications distributed in the town hall and library.

Discussion with various people revealed more finesse of communicating with the public. Iversen from Forsyningen expressed the legal, financial and technical challenges of the project, of which she considered that it might not be too appropriate to communicate those to the public, 'it will be much easier for me to know about the good stories' (Iversen, AD 2011, pers. comm., 1 April). Pedersen also emphasized the importance of 'good stories' to tell the public, 'you have a story that you have something, where people can see' (Pedersen, TH 2011, pers. comm., 4 April). While Jentsch revealed the difficulty to communicate work that was done behind public's eyes, like getting political consensus or smoothing out the legal procedures as in this project, 'we have tried to communicate with the public, it's difficult. It is because here, like everywhere, people tend to believe what they can see....we had the wind turbines, people can see' (Jentsch, M 2011, pers. comm., 6 April). This reveals a dilemma often faced by the public authority, on how to communicate with the public when a lot of work is actually being done behind public's eyes.

Indeed, talking with a few local residents suggested that, while they were aware of the Energy City project, and were generally welcomed for the decision made by the municipality, they did not notice the details of it or feel motivated to seek more information about it. As a local resident said, 'to be quite honest, most people, they just couldn't be bothered, so that is probably one of the reasons why they (the municipality) don't communicate that much. Some people definitely are interested in, and also of course industries in the area, depending on what they are doing, they are possibly interested' (Hust, O 2011, pers. comm., 7 April).

Reviewing the criterion of transparency brings to mind the multi-faceted nature of transparency itself. It involves not only the supply of information from the authority, it also concerns the way of communication, whether it is easy for the public to understand, and how to motivate the public, who find the issue to complicated to understand. Interviews with

[11] Energibyen Frederikhavn Facebook: http://www.facebook.com/group.php?gid=108900393144&v=wall

both the municipality and the local residents indicate that the reality is more complex. In terms of the transparency of data, the project team had sought to convey information through various channels. It can be concluded the project team and municipality have achieved a relatively high level of transparency in sharing the information to the public.

6.2.6 Process criteria-criterion of resource accessibility

This is the first criterion of the process criteria. This criterion concerns whether public participants, should they be engaged in the public participation exercises, be provided with sufficient resources to fulfill their tasks (Rowe and Frewer, 2000).

There are five main types of resources: information resources, human resources, material resources, time resources, last but not least, the financial resources (ibid). Regarding to the information resources, as mentioned in the last section on transparency, the project team has made information easily available for the public. As for human resources, it is intimately linked with financial resources, of which the Energy City Frederikshavn did go through a tough period of shrinking financial resources due to the financial crisis in 2008 (Pedersen, TH 2011, pers. comm., 4 April). 'If you had to cut the costs as we talked about, how shall we get this engagement from the public, that demands a structure and organization that can handle it, but two people (Rask and Dehghan) they can't handle it' (ibid). Indeed, the project team of Energy City has reduced much in number of staffs after the crisis. There was originally a public participation officer with the Energy City project, who left the team after the crisis (Halgaard, M 2010, pers. comm, 9 Mar). There are at present Rask, the Project Director, and Dehghan, the Project Leader, together with Pedersen, the secretary in the team of Energy City, together with the five theme groups. With limited human resources constrained by the financial resources, these may limit the scope of public participation.

Alternatively, there are some good signs happening. Iversen from Forsyningen said that since January 2011, she was placed in Energy City Frederikshavn for two days a week, which extended her working time with Energy City Project. With the new arrangement, she mentioned the closer relationship with the Energy City project team facilitating more understanding with each other, which is crucial to her work at both Forsyningen and Energy City project (Iversen, AD 2011, pers. comm., 1 April).

It is undeniable that resources, notably financial ones, are influencing the quality of the public participation. Sadly, at the aftermath of the financial crisis in 2008, a lot of municipalities are still suffering from the budget cuts that will carry on for some years. The report of AKF Danish Institute of Governmental Research measured municipality's earnings and its cash flow, Frederikshavn Municipality belonged to the group of 'liquidity pressure', indicating a relatively good operating result with a limited cash budget (Houlberg & Jensen,

2010). The budget stress at the municipality level did influence on the financial and human resources of the Energy City project, despite information resource is still largely available for the public.

6.2.7 Process criteria-criterion of task definition

The criterion highlights the importance of well-defined nature and scope of the participation task to prevent confusion and dispute during the participation exercise (Rowe and Frewer, 2000). On the other hand, it can avoid rigid definitions and procedures which hamper the flexibility and creativity in the process (ibid).

Pedersen recalled the excitement when he participated in the first meeting organized by the Energy City project team in January 27, 2009 (Energibyen Frederikshavn, 20 January 2009). 'At that meeting, everybody has the possibility and opportunity to come with ideas about how could we manage about energy, how could we lower the use of traditional type of energy, so on so on, there came lots of ideas. They were grouped into different themes, wind, sun, transport, and there was a group about ordinary people participating this. And after that, there were lots of ideas. It was a very exciting and very inspiring meeting' (Pedersen, T 2011, pers. comm., 4 April). Indeed this coincided with the objective of the first 'energy activists' meeting, as excerpted from the press release for the first meeting, 'the idea that one activist gives something of its energy to town and get something to happen-alone or with others, and with Energy City's help (Energibyen Frederikshavn, 2009a). The first meeting fulfilled its objective in getting 111 ideas from the public and with 31 people signing up as energy activists working under the group of 'My Municipality', along with the four other thematic groups of the Energy City (Energibyen Frederikshavn, 2009b). At that point, it can be said that the task definition of the participation is clearly defined.

However, as seen in the previous sections on the criterion of influence, the theme group 'My Municipality' had not met up for a whole year. When he was asked if the group can still be involved in the Energy City in some ways, Pedersen replied, 'As I see it, I only talk for myself, as I see it, the group of ordinary people engaging in this project is not existing (now), as I see it. If they want to make a group, okay, I have to start from the beginning. So I have been asked what shall I do, well, I haven't got a clear answer' (Pedersen, T. 2011, pers comm., 4 April). Evidently, the initial energy activists' group failed to continue its momentum after one and a half year of its existence, and based on what Pedersen said, the task he was supposed to carry on was not clearly defined. Pederson pointed out the frustration of the problem of poor task definition, although he understood that the problem was also due to resources constraint.

To conclude for this section, there are problems in task definition of the public participation process of the Energy City Project, despite a very good start at the initial stage

of the project. The problem with task definition affects the motivation of participation and the outcome of participation. As Pedersen described the process of public participation, 'they come and you open the door, but after a while, they seek the open door and seek other way, or maybe it's good. Because there are different phases, it's like a natural process' (Pedersen, T. 2011, pers. comm., 4 April). The learning lesson in respect to task definition of public participation is, the task definition evolves with project, it is important to lay down the objectives for participation activities at different stages of a project.

6.2.8 Process criteria-criterion of structured decision

The criterion is related to the use of appropriate mechanisms for decision making process, which encompasses explanation of rationale behind decision making, documentation of the process and adoption of various decision-making tools to make the process more organized and efficient (Rowe and Frewer, 2000).

There are examples showing that the project team attempting to structure the decision-making process. The first activists' meeting was organized by the Energy City project team on 27 January 2009. It was jointly led by the former director of Energy City project, Mikael Kau, Kaj Christiansen from the Frederikshavn Business Council and a mediator, Ole Amstrup, who was 'known for doing creative processes' (Energibyen Frederikshavn, 2009a). The account from Pedersen and the press release show that the participants were engaged in a clear and systematic process to share their ideas in regard to energy and Energy City, indicating a good structured decision making in using tools for group processes with the help of a mediator.

In dealing with the business sector, the project team also demonstrated a highly structured decision making process. To show the support towards the initiative of retrofitting individual homes, Poul Rask, the Project Director of Energy City Frederikshavn attends the board meetings of Energiprofferne, the network of construction workers, together with Hejslet, who takes up the secretariat post for the group (Hejslet, 2011, pers. comm., 4 April). This results in good structure in communication and documentation of the project process.

The above examples imply that there is a general high degree of structured decision making throughout the process of public participation in the Energy City project.

6.2.9 Process criteria-criterion of cost-effectiveness

This criterion should not be considered as the most important one, but undeniably the role of cost is crucial in any public participation exercise, and it can be used as an indicative parameter to compare various alternative methods in participation exercises (Rowe and Frewer, 2000).

Given that the project is still in process, and this study does not aim for a comprehensive review of costs and benefits of the ongoing public participation process, so a definite answer of cost-effectiveness is not pursued. It is perhaps pertinent to have an overview of what types of public participation exercises have been carried out so far. Based on the news entries from the Energibyen (Danish) website, the news entries from 2008 to 2011 as of 8 May 2011 totaled 107 entries (Energibyen Frederikshavn, 2011e). To roughly categorize the entries, four categories are devised, based on the nature of actors in the activities or event reported: external partners except business dealings, business, education institutions and schools from the locality or external ones, and finally, those with general public except from schools and education institutions. The counting result is in Table 4.

Year	Total Entries of the year	External Partners	Business	Education institutions	General Public
2008	19	4	3	2	10
2009	48	13	8	8	19
2010	25	13	4	1	7
2011	15	5	3	5	2
Total	**107**	**35**	**18**	**16**	**38**

Table 4: The news entries at the Energibyen Frederikshavn website

It is worth noting that the municipality and the project team have engaged in various kinds of activities with external partners, ranging from Danish Climate Commission at the national level to the Nordic Energy Municipality at a regional level. The project also attracted visitors from over the world, particularly during the time of the UN climate conference COP15 being held in Copenhagen at the end of 2009 (For instance, see Nielsen, 2009b).

On the other hand, there is also a range of activities and events in engaging the public, from retrofitting local schools and meetings with school children on the education front, to connecting local business, notably from the construction and renewable energy sectors, as well as the general public through various initiatives on energy efficiency, biking and public hearing on windmills (Energibyen Frederikshavn, 2011e).

For the three interviews I conducted with local residents, all of them showed limited knowledge about the actual happenings on the project. Nevertheless, they showed great appreciation for the municipality to take up this initiative, despite their own limited interest in the particular details of the project (for example: Hust, O 2011, pers. comm. 8 April).

As mentioned in the previous section on resource accessibility, the project faced a substantial pressure on financial resources, given the amount of activities and effort in public communication achieved by the municipality and the project team, perhaps a brief conclusion can be drawn that the project team of Energy City Frederikshavn achieved a

considerable degree of cost effectiveness.

7. Conclusion

'Every time man makes a new experiment he always learns more. He cannot learn less[12].'

-- Buckmister Fuller

7.1 On the sustainability aspects of Energy City Frederikshavn

The study aims to offer a real-time review of the ongoing Energy City Project in Frederikshavn, I hope by now this aim is fulfilled. To answer the first research question, "how does the Energy City Project in Frederikshavn achieve the various aspects of sustainability based on the One Planet Living framework", the project showed dedicated efforts in the areas of zero carbon and zero waste. The Frederikshavn Municipality in general performs well in the areas of sustainable materials, natural habitats, culture and heritage, as well as health and happiness. With regard to zero carbon in electricity, most likely the project will fulfill this goal when all the offshore wind turbines are installed. On district heating, the project team is still working on biogas plant which can supply biogas into the grid. This is partly beyond the municipality's control as changes in existing legislation are necessary to be done on a national level. Nevertheless there is a higher chance now, as the 'Green Energy' report published by the Danish Ministry on Climate Commission by the end of 2010, which strongly supported biogas as one crucial renewable resource for Denmark (Danish Commission on Climate Change Policy, 2010).

The project also resulted in new business initiatives like 'Green Ship' and 'Green House'. These initiatives start new form of business by encouraging the use of sustainable materials and resources reduction.

Sustainable transport is considered the most difficult goal due to the dominant car-driving culture in Frederikshavn. Initiatives on improving the cycling infrastructure within the municipality should help to reduce inner-city driving. At the same time, electric cars are promoted with cooperation with Better Place to build battery-exchange stations in the municipality may help people changing to electric cars. However, given the lack of instruments available (like tax rebate) at the municipality to encourage individuals buying electric cars, the prospect of reaching the 100% goal in transport is still an unknown one.

There are also some areas that can be improved. For instance, in the areas of local and sustainable food, as well as sustainable water, these can be long term goals for the city on its journey to sustainability. Although these areas are not part of the Energy City project, the

[12] Quotes from Buckminster Fuller: <http://en.wikiquote.org/wiki/Buckminster_Fuller>

project is served as an engine for further sustainable practices in the municipality.

All in all, the first research question on the sustainability aspects is answered. With the use of the One Planet Living framework, a systematic review of various area of sustainability in the Energy City Frederikshavn Project is achieved. The results are encouraging as both the project team and Frederikshavn Municipality show considerable efforts in various aspects of sustainability.

7.2 On public participation of the Energy City Frederikshavn

For the second research question, "how does the public participation process of the Frederikshavn Municipality in the Energy City Project perform in accord to the normative criteria listed in Rowe and Frewer (2000)", results indicate a high degree of acceptance criteria, which includes several sub-criteria like independence, representation, early involvement and transparency. However, the review reflects signs of weaker influence, which may be a result of constraints in resources (Houlberg and Jensen, 2010).

It seems logical for projects to suffer in their public participation efforts should they be constrained by resources, especially when the public participation exercises involve big public hearing, or lengthy consensus conferences (Rowe and Frewer, 2000). However, the emerging trend of using internet for public participation should not be underestimated. As Jennifer and Justin (2010) wrote on using internet as a tool, 'as we launch into the second decade of the 21st century, the increasing pervasiveness of high-speed Internet access and the proliferation of social networking…have meant that new forms and processes of public participation can truly change the way planning works' (p. 405). Some studies also explored the use of community mapping on internet as a participation tool (Fahy and Cinneide, 2008). Indeed, the Energy City project team has just launched the programme of Husets Web, which allows citizens to check the energy consumption of their houses and seek professional advice through the web interface (Dorthe, A. 2011, pers. comm., 1 Apr). There are still costs incurred during the development of web-based programmes, yet, if they are used properly, they can reach a larger potential audience than traditional participation methods, which are more confined by time and place. Indeed, Jennifer and Justin (2010) expressed the need for more systematic academic research on how to utilize internet-based participation tools which at now is largely absent.

On the process criteria, the project can improve more on the criteria of task definition. However, given the high expectation from the municipality at the initial stage of the project, the problem with the My Municipality group may reflect a deeper issue of the project. As Denghan, the project leader mentioned (Danish Architecture Centre, 2010), the biggest challenge of the project does not lie in its local residents, rather it is the national policies. Given the limited resources by the project team, considerable resources may have to be

diverted towards working at the national level.

This in fact proves to be an irony of many local sustainability initiatives, while local participation is crucial to come up with sustainability initiatives suitable in the local environmental and social contexts, very often the real battle lies beyond the local municipality at the national arena. This results in a skewed resources allocation towards high level communication with the national government which is not visible to its local stakeholders. It is a good sign that the municipality has now shifted its project focus to the demand side, it is expected that the participation will take a different form as the project moves on to another stage.

To conclude, the Energy City Frederikshavn has achieved a high degree of acceptance criteria but lower one in the process criteria. The use of the criteria by Rowe and Frewer (2000) offered a multi-facet view of the participation process.

8. Further Studies

8.1 On the One Planet Living Framework

It is an exploration of using One Planet Living framework for this study, it is a relatively new framework which is developed outside the academia, though there are some academic research done using this framework (see Chance, 2009) and it has been used by various organizations and cities (see OnePlanetSutton[13]). The framework is useful for an overview of various sustainability aspects of cities.

As the basis of the One Planet Living Framework is founded on ecological footprint, further research is needed with a comprehensive calculation of ecological footprint in various areas to strengthen the brief review of the Energy City Project and the city of Frederikshavn. Given the scope of the present paper, no information on ecological footprint is collected, though the municipality has already conducted its carbon dioxide mapping, showing a total of 782,596 tonnes of carbon dioxide, or 12 tonnes per capita in Frederikshavn Municipality (Nielsen, 2010b). Carbon footprint represents roughly 54% of humanity's overall ecological footprint (Global Footprint Network, 2010b), Frederikshavn Municipality may further extend its calculation and to keep track its sustainability efforts in the future.

Further, one characteristic with the One Planet Living framework is that, the basis in ecological footprint allows calculations to be made on an individual as well as an organization and municipality level. From the perspective of public participation, the

[13] OnePlanetSutton, http://www.oneplanetsutton.org/

calculations have a powerful effect in linking individual efforts to municipality's goals. As most research show that, a common obstacle in achieving sustainability in communities is that the general public tend to perceive sustainability as a local government and national agenda with a low sense of individual responsibility (Lindström and Küller, 2008). In the OnePlanetSutton project, a Sutton Footprint calculator for individuals to understand their own footprint based on their lifestyle choices, and the results will show in which principles more action is needed (BioRegional, 2011b). Therefore, it is considered that using the One Planet Living Framework can facilitate public education and participation on sustainability issues.

8.2 On public participation

It is another new attempt to use the Rowe and Frewer (2000) criterion for the context in this study. As mentioned in previous section, the criterion was developed for evaluating particular public participation exercise, like public hearing, or public opinion survey, while the current study uses it as a framework to review the overall process of public participation. The results show that the two criteria, acceptance and process, are compelling criteria for evaluating the process of public participation, except for the criterion of cost effectiveness, which may be difficult to review.

The importance of the study in evaluating public participation is that, past research tended to focus more on individual participation exercise, which allow detailed analysis of the process and a more objective assessment of its impact. However, as in this study shows, despite the Energy City Project team had achieved a successful public participation exercise and formed a team of activists at the early stage of the project, subsequent development of the project cannot carry on the initial momentum. Focusing only on individual participation exercise may lose track of the overall process of public participation. Indeed, we cannot assume success of individual participation exercises being added up to a satisfactory public participation process throughout an extended period. More research needs to be done on how to evaluate the process of public participation to obtain a holistic view of it.

9. Final words

As of now, there are still four more years to go for the Energy City Project. Yet, the path to sustainability is a much longer one. Just as I asked at the beginning of the paper, has the world become more sustainable? While the world is at the midst of all forms of environmental crisis, the sustainability initiatives are also growing exponentially throughout the world. If sustainability is a battle worth fighting for, we should enroll more to fight for its

cause. I would like to conclude the study by quoting Holden's (2006) writing on her project in Canada,

> "sustainability as a struggle to learn more, to learn better, and to learn in a more contextualized fashion within the communities of our lived experience, reprioritizes the first principles of sustainability to include adaptability, negotiability and flexibility (p. 172)."

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Appendices

Appendix 1 Participation Information Sheet

Appendix 2: Consent Form