



# Climate Change Mitigation in Residential Real Estate Development

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# Climate Change Mitigation in Residential Real Estate Development

Madison Area | Randstad Region

by

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(Cover illustration: Zhou, July 2015)



## ABSTRACT

With climate change well underway, cities are struggling how to reduce the change and mitigate the built environment for the possible and already visible effects. Especially for the residential real estate sector, climate change is a hot topic. This is not surprising, giving the fact that residential buildings are responsible for a large amount of energy use and greenhouse gas emissions. However, in many cases, there are several barriers that can hinder the capacity of the developer to mitigate, the incentives for action, and the perspectives towards the need to mitigate. Though, it is possible that governments may be able to use approaches, tools and policies to encourage mitigation and help companies overcome barriers (Argwala, 2011).

*This thesis will shed light on what encourages climate mitigation measures in Residential Real Estate in Madison area, and how to understand this in the context of climate mitigation policies in the United States, with a Dutch perspective.*

In recent years, environmental changes have become more important as government and development actors have prioritized sustainability (Adams & Tiesdell, 2013). This change can be a driver for development. These drivers for development: economic, political, social and demographic, technological, cultural and environmental change, can 'guide' the decision environment, ensure sustainable development pressure and opportunities; ones it becomes clear that the existing building-space/building-stock cannot fully satisfy the need or demand (Adams & Tiesdell, 2013). Planning is primarily a form of governmental intervention that tries to effect the decision environment of key development actors. According to Adams (2017), planning can be defined as deployment of four types of policy instruments to aim to shape, regulate or stimulate behavior of market actors or build capacity to do so.

The influential factors for climate mitigation of the showcases in the Netherlands, are non-market based, while the influential factors in the U.S. are market-based. This can be understood in the context of the United States' market-based approach, versus the Dutch non-market-based approach. Where the Dutch approach is characterized by a high level of public involvement and regulation, is the core value of the US being market-oriented, with a lack of direct financial support, 'sustainable' requirements and integral approaches to a certain area, from the government.

This lack of support, is mainly the barrier for the developers: no pressure or encouragement from the government, no market competition and a lack of resources: financial feasibility and knowledge. Therefore, residential real estate developers in Madison can get encouraged to invest in climate mitigation measures, by taking away the barriers that hinder the capacity of the developer to mitigate. Opportunities to take away these barriers are financial encouragement and support from the government and creating marketed competition and standardization of sustainable products. Next to these opportunities, the developers can get enforced by governmental control, sustainable requirements and policies.



## PREFACE

This thesis is the graduation report for my master Spatial Planning - Land and Real Estate Markets, at the Radboud University of Nijmegen. This report is meant for the ones interested in the climate mitigation in the private residential real estate sector. It gives background information on climate mitigation in general, climate change policies in Madison (WI) and the Randstad (NL) and the investment decisions and barriers of residential real estate developers in Madison.

The last year has been an incredible journey, which has brought me in contact with various real estate professionals from the private and public sector in Madison (WI). They challenged me in understanding and applying lessons learned, has given me the opportunity to study what exactly encourages private developers to invest in climate change mitigation technologies, and has given me a fascinating insight into the real estate development sector in Madison (WI).

First of all, I want to thank prof. dr. Erwin van der Krabben, for supervising my master thesis, all the feedback and all the help that made it possible to do my research in the United States. Next to that, I want to thank prof. dr. Harvey M. Jacobs for the warm welcome, good advice and help, during my stay in Madison. And a special thank you to Richard Arnesen, Helen Bradbury and Kasie Setterlund, who all has been an enormous support and expert throughout my internship and research, but also gave me the opportunity to get to know every aspect of their developments, and the real estate sector in Madison.

Finally, I want to thank my parents, for the infinite support and loving, during my studies and this thesis and given me the strength I sometimes needed to carry on.

I hope this report will be entertaining, instructing and most of all interesting, to you.

*Pia Klein  
Venlo, March 2018*



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## GLOSSARY

Barrier	<i>‘Factor(s) that hinder the capacity of developers to invest in climate change mitigation (technologies).’</i>
(Climate) mitigation	<i>‘The aim of mitigation is to reduce climate changes.’ (Andersson-Sköld et al, 2015)</i>
Climate Change	<i>‘A change is the state of climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer.’ (Field, et al., 2012)</i>
Governmental policy	<i>‘Any course of action which intends to change a certain situation. Think of policies as a starting point for government to take a course of action that makes a real life change.’ (Ni Direct Government Services, n.d.)</i>
Governmental interventions	<i>Actions the government may take to reduce the impact of climate change and encourage more sustainability within the real estate development sector: often by shaping, regulation, stimulation or capacity building tools.’</i>
Greenhouse Gas	<i>‘Any of the gases whose absorption of solar radiation is responsible for the greenhouse effect, including carbon dioxide, methane, ozone, and the fluorocarbons.’</i>
Impacts	<i>‘Detrimental and beneficial consequences of climate change in natural and human systems.’ (Field, et al., 2012)</i>
Real Estate Developers	<i>‘Real estate developers refer to private actors that are developing (residential) real estate. Two different kind of developers can be identified: developers who are also end-owners or developers who sell the building after realization. For this thesis, developers are the end-owners.’</i>
Spatial planning	<i>‘The planning and regulation of building, development, reconstruction, etc., in an urban area.’ (Spatial planning, n.d.)</i>
Sustainability	<i>‘Being sustainable is the quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance.’ (Sustainability, n.d.)</i>
Sustainable development	<i>‘Development that meets the needs of the present without compromising the ability of future generations to meet their own need’ (Butlin, 1989)</i>
Sustainable technologies	<i>Technologies that are not harmful to the environment or deplete natural resources and help reduce the use of energy and its costs.’</i>
Vulnerability	<i>‘The propensity of predisposition to be adversely affected.’ (IPCC, 2014)</i>

## ABBREVIATIONS

BEG	<b>NL</b>	Besluit Energieprestaties van Gebouwen
	<b>USA</b>	<i>Energy Performance of Buildings Decree</i>
EPA	<b>USA</b>	Environmental Protection Agency
	<b>NL</b>	<i>Federale agentschap voor bescherming milieu &amp; volksgezondheid</i>
EPBD	<b>USA</b>	Europese Energy Performance of Buildings Directive
	<b>NL</b>	<i>Europese richtlijn energieprestatie van gebouwen</i>
EPC	<b>NL</b>	De Energieprestatiecoëfficiënt
	<b>USA</b>	<i>Energy performance coefficient</i>
EPG	<b>NL</b>	Energie Prestatie Gebouwen
	<b>USA</b>	<i>Energy Performance of Buildings</i>
CHV	<b>NL</b>	Concept House Village
	<b>USA</b>	<i>Concept House Village</i>
REG	<b>USA</b>	Regulation on Energy Performance of Buildings
	<b>NL</b>	<i>Regeling energieprestatie gebouwen</i>



(Climate Cold Glacier Iceberg: Mantri, n.d.)



# 1 Introduction

*'I believe, in the words of Dr. Martin Luther King Jr., that there is such a thing as being too late, and when it comes to climate change, that hour is almost upon us.'*  
(Obama, 2017)

## 1.0.1 Background

The climate is changing and will keep changing in the future as a result of greenhouse gas emissions. Greenhouse gases causing an increase in temperature, which is one of the biggest effects of the changing climate. Buildings, locations and cities can be vulnerable to these effects of climate change. Cause for concern lies in possible increases in the risk of collapse, significant loss of value as a result of more storms, snow or subsidence damage, water encroachment, deterioration of indoor climate and reduced building lifetimes (Climate Change Adaptation, sd). Scientific literature provides plain evidence that *'Climate change will continue for many decades, and even centuries, regardless of the success of global initiatives to reduce greenhouse gas emissions'* (Lemmen, Warren and Lacroix, 2008, p4). Even with mitigation and adaptation of climate change in the next few years, a part of the climate change cannot be turned back, due to past emissions. Yet, it is not purposeless to mitigate buildings for climate change.

There are different definitions of mitigation, in this research: climate mitigation measures focus on tackling the causes of climate change. Included are measures to reduce, prevent the emission of, or capture the greenhouse gases that cause climate change (Bienert, 2016).

Climate mitigation is a hot topic in the real estate sector. This is not surprising given the fact that the building sector consumes around 40% of the world's energy and contributes up to 30% of global annual Green House Gas emissions (UNEP Finance Initiative, 2015). Stimulating and supporting the real estate sector to scale up climate related investments - climate mitigation of developments - is a key factor in ensuring a limited increase of 2°C of the global temperature (UNEP Finance Initiative, 2015). Over long-term, climate mitigation investments will result in reduced operating costs of commercial and residential buildings. According to UNEP Finance Initiative (2015), new buildings can readily be built to use 30-50% less energy than required by most energy codes dating back to 2005, and in growing instances can achieve zero net energy consumption.

To influence the residential real estate developer to mitigate their buildings for climate change, governmental 'planning' interventions can play an important role. In many cases, there are several factors that can hinder the capacity of the developer to mitigate, the incentives for action, and the perspectives towards the need to mitigate. It is possible that the decision for no mitigation can be rational responses to the operating context of the company.

Though, it is possible that governments may be able to use approaches, tools and policies to encourage mitigation and help companies overcome barriers (Argwala, 2011).

### 1.0.2 Tightly Coupled System

According to Buitelaar, Sorel, Verwest, Dongen & Bregman (2013), figure 1 shows the tightly coupled system between spatial planning and real estate markets.

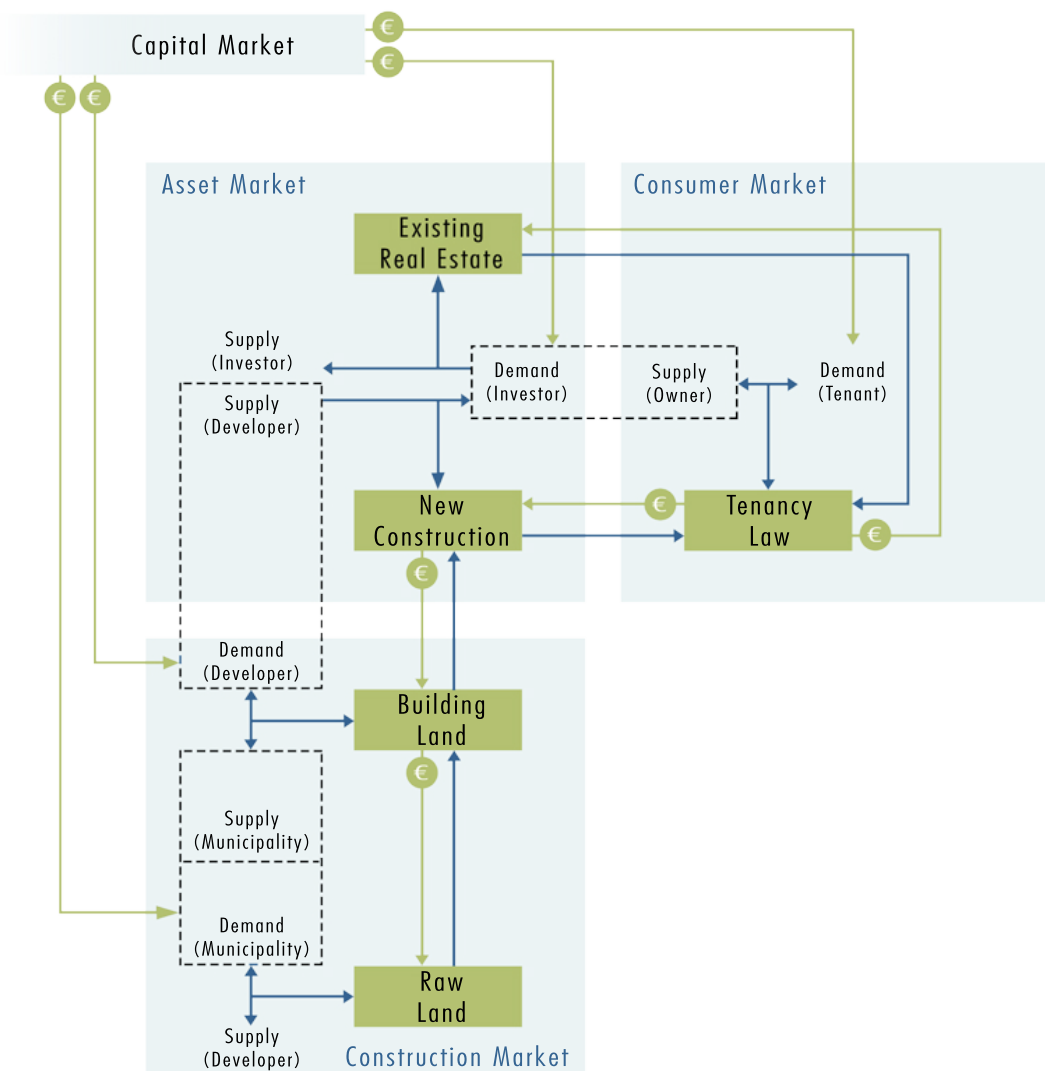


Figure 1: Tightly coupled system (Based on: Buitelaar, et al., 2013) (Own ill.)

The real estate market consists of three submarkets: the consumer market for e.g. office or housing space, the asset market for real estate property and the construction market. The difference between real estate as space and real estate as an asset is clearest when buildings are not in use by their owners. In the market for housing space, the need of tenants, the type and quality of properties available, determine the rent for real estate space in the housing market. At the same time, these properties may be bought, sold or exchanged between investors (Di Pasquale & Wheaton, 1992). These transactions occur in the asset market for real estate property and determine the asset price of space. When space is owned by its occupant, the conception of two separate markets is no longer suitable. Purchasing an asset and purchasing the use of space become one combined decision. The investment motive of the homeowner is the same as that which motivates an investor in rental property (Di Pasquale & Wheaton, 1992). The third market, the construction market consists of institutions concerting spatial planning, for example (governmental) climate policy (Buitelaar, et al., 2013). In this research, all residential real estate developments have a distinction in ownership and use and are owned by the investor.

### 1.0.3 Governmental Interventions

There are several ways to encourage residential real estate developers to mitigate their developments and properties. One way to influence residential real estate developers to mitigate their developments and properties, is by governmental interventions within these three submarkets.

Planning is primarily a form of governmental intervention in production and reproduction of the built environment. This means, planning tries to effect the decision environment of key development actors; *'What planning does is neither overrides nor fully controls this process, but aims instead to influence it'* (Adams, 2017). According to Adams (2017), planning can be defined as deployment of four types of policy instruments to aim to shape, regulate or stimulate behavior of market actors or build capacity to do so.

Since the late 1990, climate change adaptation has become a policy objective in addition to mitigation. Climate adaptation is defined by Dutch Environmental Assessment Agency as: *'Climate adaptation is a process whereby society adapts to the actual or expected climate and its impacts, to limit the damage that can be associated with climate change and the opportunities to exploit the climate change opportunities. Natural systems adapt themselves solely to the current climate and its effects; human intervention can facilitate changes in natural systems'* (Ligtvoet, van Bree & van Dorland, 2013).

In Europe, climate change adaptation policy is directed to an increase of the understanding of climate change, the possible mitigation measures, the need for a mechanism for the exchange of information about consequences of climate change and the best practices in the area, proposals in the area of subsidizing measures and the need for solidarity between member states and regions (Klimaat adaptatie beleid, sd). In the United States, the impact of climate change is not completely clear for everybody.



Donald Trump, the president of the United States, believes that *'The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive'* (Trump, 2012). For this thesis, I rely on the scientific literature and assume that climate change is real.

#### 1.0.4 Hypothesis

The hypothesis of this thesis is that the interventions and the elaborations hereof in the Netherlands and in the U.S will differ. This because, the government exercises much influence in the Netherlands within the real estate market and less in the United States. The Dutch planning tradition is characterized by a high level of public involvement, an integral planning system and a culture of direct subsidizing and financing, where the United States has a long experience with a market-based planning system (Spaans, Janssen-Jansen, & van der Veen, 2011).

The main aspect of the Dutch planning tradition history – Active land policy – is the fact that municipalities actively purchased agricultural land, in order to develop those lands for housing. The incentive for municipalities to act this actively in urban development, was first of all the profit they could make, by selling these housing plots to developers or investors (Jókövi, Boon, Filius & Egmond, 2006). The second reason has to do with control over urban planning. The current development approach in the Netherlands, is that municipalities shifted from active land policy, to conducting a facilitating land policy: municipalities operate more in a framework setting and create a vision with conditions for a certain area.

What can be noted from the information above, is that the Dutch approach is primarily based on land level, not on building level. This is contrary to the United States approach and vision of spatial planning. Related to the core values of the U.S., the American planning system is mostly a market-oriented system. According to Backus, Bruil, Bavel, Luijt & Van der Hamsvoort (2005), *'In the United States, the regional planning legislation which imposes possibilities and limitations of public instruments to private parties is much less far-reaching than in the Netherlands'*. Land in the U.S. has historically been seen as a replaceable good that could and should be parceled out for individual control and development; and *'if one person saw fit to destroy the environment of his valley in pursuit of profit, well, why not'* (Cullingworth & Caves, 2013)?

## 1.2 Problem statement

The problem of the changing climate and the necessity of climate mitigation, have become clear over the last years. However, there are several factors that can hinder the capacity of the developer to mitigate, the incentives for action, and the perspectives towards the need to mitigate. In order to achieve this goal, it is possible that governments may be able to use approaches, tools and policies to encourage mitigation and help companies overcome barriers (Argwala, 2011).

With a preponderance in research about the role of the government within climate mitigation and the need of climate mitigation within the built environment, research about the relation between the real estate submarkets and the governmental strategies which can encourage climate mitigation, plotted against the incentives of the private sector to mitigate, is still substandard. As already mentioned in the introduction, residential real estate has a lot potential to mitigate and reduce their energy use and greenhouse gas emissions. Therefore, it is important to find out what and how to encourage this sector to mitigate their buildings and contribute to combating climate change.

### 1.3 Research aim

The aim of this research is to provide insight in what encourages developers to implement climate mitigation measures in residential real estate developments in the Madison area, and how to understand this in the context of Climate Mitigation Policies in the U.S., with a Dutch perspective. This in particular is very interesting, given the fact that Climate mitigation is high on the Dutch agenda.

Climate mitigation measures can be the improvement of energy efficiency of equipment or buildings, changing practices of behavior to reduce energy use or switching from fossil fuels to renewable energies.

By discussing the real estate market and the development process itself, the internal and external features influencing the climate mitigation can be found. Examples of mitigation measures are: replacing fossil fuel by renewable energy such as solar and wind power or applying insulation measures in buildings. In theory, the study contributes in mapping out possible governmental interventions which can be used to encourage climate mitigation measures and possible market changes which can create an attractive climate for mitigation investments. In practice, the study provides insight in what particular factors did encourage the residential real estate developers to mitigate their developments for climate change. By combining the study and practice, possible recommendations can be done about what the Randstad region can learn from the way of encouraging climate mitigation in Madison and visa versa.

## 1.4 Research questions

The research questions narrow the topic area to a meaningful and manageable size, as well as it gives the research a focus (Edmondson & McManus, 2007).

The main research question is:

*What encourages climate mitigation measures in Residential Real Estate in Madison area, and how to understand this in the context of climate mitigation policies in the U.S., with a Dutch perspective?*

The main question will be answered through the following sub questions:

1. What particular factors can influence the real estate developers to mitigate their developments for climate change? (Theory)
2. What are the most significant factors to have influenced the Residential Real Estate sector in Madison area to implement climate change mitigation? (Case study)
3. What are the most significant factors to have influenced the Residential Real Estate sector in the Randstad area to implement climate change mitigation? (Theory)
4. What are the main similarities and differences in the context of climate mitigation in Madison area and the Randstad Region? (Comparison)

The relationship between the main variables in this research will be presented in the conceptual model on the next page

## 1.5 Societal relevance

Climate change continues to grow in severity with consequences being evident in the real estate sector. Society cannot function without real estate and the real estate market cannot function without society. Since the residential real estate sector is contributing to the emission of greenhouse gases for 30%, they can reduce it significantly by climate mitigation.

According to Rebuild by Design (2017): '*Cities were built in response to yesterday's problems*'. As the climate changes rapidly, the real estate sector cannot afford to wait until after the next hurricane or flood. Rebuild By Design convenes a mix of sectors - government, developers, communities, et cetera -, to gain a better understanding of how climate change leave buildings, cities and regions at risk. They believe that through a collaboration of these several sectors, societies will be better prepared to the challenges, posed by the changing climate. Based on the successful model, developed from the Hurricane Sandy Design Competition, Rebuild By Design is working with 100 Resilient Cities to bring its collaborative research and design approach to cities around the world (Rebuild By Design, 2017). This model can be applied to cities/buildings of any scale and scope of challenge, to help create the collaborative solutions cities greatly need. An example of a city initiative, is the program: Climate ready city in Boston, USA. Together with the City of Boston and the Green Ribbon Commission,

Rebuild By Design created a plan to address five specific elements, which will prioritize places of intervention.

1. Resilience standards
2. Climate preparedness governance
3. Place-based design interventions
4. Vulnerability assessment
5. Climate forecast consensus.

The societal relevance of this study is to provide an insight in the need for climate mitigation, how the real estate markets influence each other and what particular factors, e.g., governmental interventions can stimulate residential real estate developers to implement climate change mitigation in their developments.

In general, Americans are wary of government and government approaches to problems. In the U.S., there is a high dependency on private initiative, which is quite different from the Netherlands. In the Netherlands, there is a history-culture of strong planning with a respect for experts and expertise and a tradition of public land development (Jacobs & Vos, 2017). According to Heurkens (2012), *'The traditional autonomy of the private sector in the former (property rights) versus the traditional autonomy of the public sector in the latter. The USA and continental Europe represents the two extremes, with the UK as an intermediate case'*. The autonomy of the U.S. is mostly private, while the autonomy in Europe is mostly public. The public sector influence in the U.S. is weak, while the influence in Europe is strong (Bult-Spiering & Dewulf, 2016).

This arises a few questions regarding the subject of this thesis: What encourage the residential real estate sector to mitigate buildings for climate change? Is there something to say about the effectiveness of these interventions/measures in Madison area, compared to the Randstad region?

## 1.6 Scientific relevance

The scientific underlay of this thesis will be based on the planning theory (Adams & Tiesdell, 2013). Planning is primarily a form of governmental intervention in production and reproduction of the built environment. Without planning, the development process would be driven by key development actors, mainly by the private sector. What planning does, is 'trying' to effect the 'decision environments' of these key development actors. To understand the residential real estate development sector, the development process and the relation between the several markets of the real estate sector will be explained, where after the relation and meaning of planning, economics and markets will give insight in what particular factors can encourage the residential real estate developers to implement mitigation measures.

By providing insight into the development process and the impacts of planning which can influence the real estate sector, it may be possible to create a link between residential real estate sector, the private market and the governmental interventions.

This link can provide insight within the public/private sector, whereby the question about what particular factors are used to encourage climate mitigation within the residential real estate sector, can be answered. The differences and similarities between the real estate market and governmental interventions in Madison area and the Randstad region, can function as guidance or recommendation for both, regarding encouraging climate mitigation. This research can contribute to this, because this research focusses on interventions within a planning system that fundamentally differs from each other: The Dutch regulatory approach versus a market oriented approach in the United States.

Spatial Planning in the Netherlands is characterized by binding land use plans within a limited-imperative system based on legal certainty. Dutch spatial planning can be labelled as 'permitted planning' (Dühr et al., 2010) which involves hierarchically coordinated and related public sector spatial plans (Heurkens, 2012). *'The spatial visions of the government, provinces and municipalities describe the spatial developments they expect as well as how these developments will be directed or implemented'* (Ministry of Infrastructure and the Environment, 2013). In contrast to the United States, the most common type of market oriented planning in the USA is *'planning to protect the interest of the current property owners'* (Lind, 2002). But, there is a tendency towards *'Planning to stimulate a market situation with no transaction costs'* and *'Planning in co-operation to increase the competitiveness of the city'* (Heurkens, 2012). The lack of comprehensive state of regional planning in the United States is often associated to an anti-government ideology. *'Structural comparisons cite the greater availability of land and lower settlement densities, or the relationship between planning and the market, as explanations of why planning is different in the US'* (Schmidt & Buehler, 2007). There is a greater dependence on the private sector in determining land use policies at local level: the reliance on the private sector often leaves the planner to serve a double role, as developers and land-assemblers. Consequently, *'justifications for planning intervention frequently rely on economic efficiency arguments, rather than appeals to 'the public interest' or 'social justice'* (Klosterman, 2003).





(Construction Building: Gaida, 2016)

## 2 Theoretical framework

*'Real estate development process is a production process which shapes and reshapes, the built environment'. (Adams & Tiesdell, 2013)*

### 2.1 Planning theory

This chapter will address the planning theory of Adams and Tiesdell (2013). To understand the residential real estate development sector, the process of development will briefly be explained. After the development process is set out, the relation and meaning of planning, economics and markets will give insight in the impact of planning, externalities and public goods. To find out how governmental interventions can encourage climate mitigation in commercial real estate, four policy interventions will be discussed.

#### 2.1.1 The normal process of urban change and development

In order to explain the process of urban change and development, two figures will be used. Figure 2 explores how pressure for new development builds up, how development feasibility is tested and how implementation is subsequently managed (Adams & Tiesdell, 2013). This will be done by setting sets out the events or stages of the development process and linking them to drivers of development. Figure 3 will present a framework of development roles in relation to their specific market involvement by setting out the relation between actors in the real estate development process.



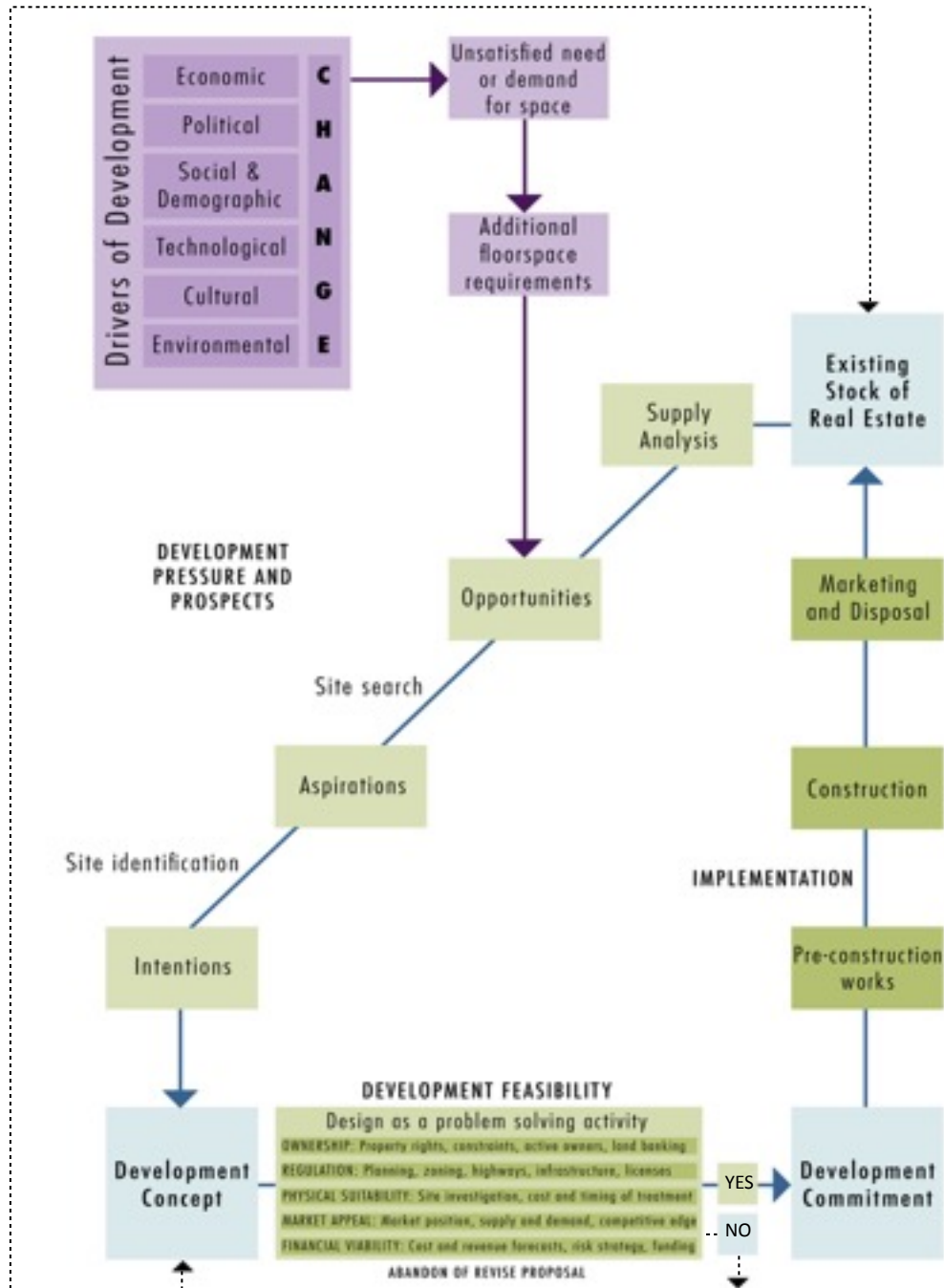


Figure 2: An event-based model of the real estate development process (Based on: Adams & Tiesdell, 2013) (Own ill.)

### Development pressure and prospects

As the first site of figure 2 demonstrates, a development can be driven by economic, political, social and demographic, technological, cultural and environmental change. These drivers ensure for development pressure and can operate independent but also in combination with each other. In recent years, environmental changes have become more important as government and development actors have prioritized sustainability (Adams & Tiesdell, 2013). These drivers of development stimulate the development activity and opportunity; ones it becomes clear that the existing building-space / building-stock cannot fully satisfy the need or demand. Once a site for a development has been identified, a development concept can be articulated which will take this triangle to the second site, development feasibility.

### Development feasibility

At the start of this second site, a design of the development concept will be made, which translates the concept into an appealing vision of the future. According to Adams & Tiesdell (2013), a design is a problem-solving activity, because it seeks to minimize and resolve the development constrains, while maximize development potential. This is useful, because 'development concepts must be tested and refined to determine whether or not they are feasible' (Adams & Tiesdell, 2017). The concepts have to be pass the five specific tests:

Ownership:	Property rights, constraints, active owners, land banking
Regulation:	Planning, zoning, highways, infrastructure, licenses, et cetera
Physical suitability:	Site investigations, cost and timing of treatment
Market appeal:	Market position, supply and demand, competitive edge
Financial viability:	Cost and revenue forecasts, risk strategy, funding

All of the streams have to be negotiated successfully before and if development is to occur.

### Implementation

One all of the five streams are achieved, a development commitment can be made and implementation can begin. The third site consists of three main components: pre-constructions works, construction and marketing/disposal. Once this phase starts, the maneuver freedom of the developers is reduced and must concentrate on managing risk and balancing speed, cost and quality in delivery. After the completion of the property, the development process cycle is completed. In due time, after the property might be demolished, the first site of the development process triangle will be entered again.

## Actor and market relations

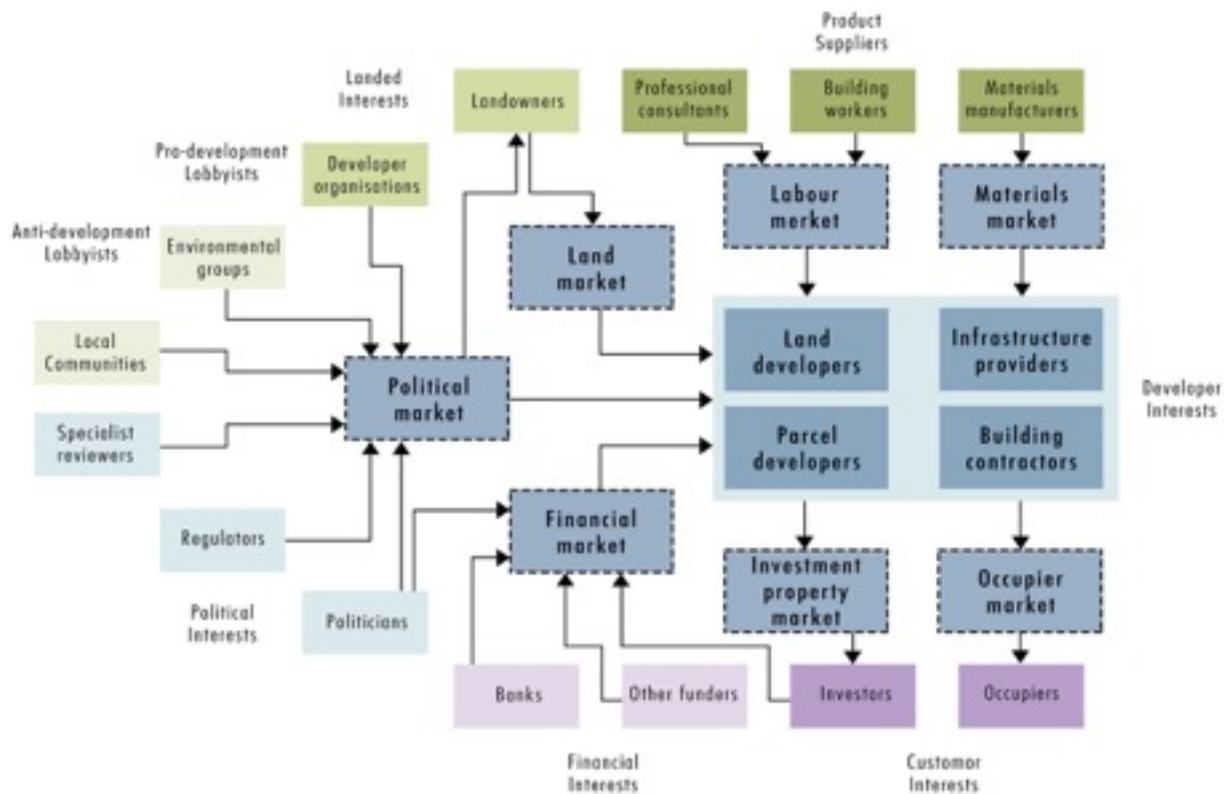


Figure 3: A role-based model of the real estate development process. (Based on: Adams & Tiesdell, 2013) (Own ill.)

According to Adams & Tiesdell (2013), a successful development depends on cooperation between roles which involves networks of trust between actors.

**Actor:** Named individuals and organizations, such as specific development companies, financial institutions or local authorities

**Role:** The parts that actors play in the development process, such as those of landowner, regulator, occupier, investor or developer

**Market:** Socially constructed networks of rules, conventions and relationships (Adams & Tiesdell, 2013)

Figure 3 shows seven essential markets for real estate development: materials market, labour market, land market, political market, financial markets, investment property market and occupier market. Five of these markets are 'input' markets, which means they create opportunity for development interest: materials, labour, land, financial and political support. The two remaining markets trade the 'output' of the development process, namely complete buildings ready for habitation/business or investment. These markets together function as network nodes for development interests.

In Figure 3, four types of development interest are defined: land developers, infrastructure providers, parcel developers and building contractors. These four different development roles are not necessarily taken by four different actors, therefore they are merged within one single box. Whether and how the roles are combined, varies from development type and country (Adams & Tiesdell, 2013).

Alongside of the development interest, seven different interests in the development process are defined in categories: product suppliers, landed interests, pro-development lobbyists, anti-development lobbyists, political interests, financial interests and customer interests. In figure 3, the connection between these categories, actors and markets are illustrated. An interest which needs to be highlighted is the political interest. As already demonstrated in Figure 2, regulatory consent is a crucial development input (Adams & Tiesdell, 2013). As Figure 3 shows, the political market is complex and consists of a variety of roles and scales that seek to influence decisions. In the political- and financial market, there is an opportunity to influence the real estate development interests to mitigate for climate change. Besides the complexity and influence of the political market, the developers greatly depend on the financial markets to provide debt and equity capital for their development. The political market can influence the financial market through politicians. Politicians are portrayed in the model as an important potential contributor to the financial markets (Adams & Tiesdell, 2013).

### 2.1.2 Planning, economics and markets

*‘Developers seek to minimize development costs and maximize development revenues in order to maximize development returns or profits. They look to the user market to determine rental values and the investment market to set yields’* (Adams & Tiesdell, 2013).

In Figure 1 and 2, the development process, markets and actors have been set out. This paragraph will discuss the economic impact of planning, externalities and public goods. Economics *‘a study of how society decides what, how and for whom to produce’* (Begg et al., 2003, p.3).

How do the real estate markets actually work? According to Adams and Tiesdell (2013), five alternative economic perspectives can be identified, which each have different things to say about the economic impact of planning:

Neo-classical economics:	How planning effects the overall quantity of market supply and demand.
Welfare economics:	How planning can overcome market failure.
New institutional economics:	How planning reduces market transaction costs.
Behavioral economics:	How planning can nudge markets towards more beneficial outcomes.
Social construction of markets:	How planning can transform market cultures and practices.

The specific focus of welfare economic lies on market failure, which occurs as a result of distortions that arise externally (Adams & Tiesdell, 2013). In order to focus on the subject of this thesis, a welfare economics perspective will be discussed.

Some markets are more sensitive for failure than others, with externalities, under-supply of public goods and lost opportunities within real estate markets. This means 'creating better places may necessitate government intervention to make real estate markets more efficient (let alone more equitable or sustainable)' (Adams & Tiesdell, 2013).

### Externalities

When the production of a 'property' - in case of this thesis: climate mitigation of commercial real estate - creates social costs or benefits which market mechanism are unable to transit into private costs ore benefits, an externality arises. Developers do normally not interest in socials costs that their project may inflict on community, nor social benefits that it may create. The development process on itself focusses on production of the individual developments, rather than on the broader environment to which they contribute and from which they potentially benefit (Adams, 2017).

### Public goods

*'A public good can be enjoyed by more than one consumer at the same time, without diminishing the utility of any other consumer'* (Adams & Tiesdell, 2013). Because not one single consumer in particular can be excluded from the benefits of a public good, the classic problem of 'free riders' shall occur in some cases. This because access to public goods cannot be charges, nor controlled, which makes it impossible to organize the supply through normal market mechanisms. A typical example of public good is infrastructure, but also mitigation of greenhouse gases can be viewed as a public good (Hasson, Löfgren & Visser, 2010). According to Hasson et al. (2010), mitigation to climate change is a private good, benefiting only the country or the individual that invests in mitigation. However, climate mitigation can reduce the use of energy or decrease the gashouse emissions, which will help to combat climate change.

### Lost opportunities

According to Adams (2017), opportunities to use property more efficiently many be lost if individual action is dependent upon common agreement. For example, no-one wants to be the first to start, unless the guarantee that others will follow suit. The 'prisoners's dilemma' may occur, since each is unable to act in their own best interests, without knowing the intentions of others.

For the understanding of the governmental interventions, a conceptual and rigorous approach to define planning will be discussed. Planning is primarily a form of governmental intervention in production and reproduction of the built environment. Without planning, the development process would be driven by key development actors, mainly by the private sector. What planning does, is 'trying' to effect the 'decision environments' of these key development actors.

Shaping instruments:                      Broad context for market actions and transactions

Regulatory instruments:	Regulate or control market actions and transactions
Stimulus instruments:	Open up opportunities by facilitating market actions and transactions
Capacity building instruments:	Enable shaping, regulatory and stimulus instruments to be used more effectively

(Adams, 2017)

### 2.1.3 Policy instruments

To create more successful places, an evaluation of the extent to which ‘specific policies might shape, compel, constrain or inspire the behavior, choices and actions of those key decision-makers closest to the problem’ (Adams & Tiesdell, 2013).

#### Planning as shaping markets

Shaping instruments include spatial visions, strategies, plans, frameworks, et cetera, which can involve strategic transformation of whole areas and can promote integrated thinking and enable collective action. Successful strategies can achieve a change in what people think (Adams, 2017).

#### Planning as regulating markets

Regulatory instruments restrict choices by regulating what people can and cannot do. These instruments are the most effective when they persuade people to follow policy intent, rather than just give up on their plans and require consistent application and effective enforcement. (Adams, 2017)

#### Planning as market stimulus

Stimulus instruments open up development opportunities through direct state interventions: taking ownership constraints through public land acquisition and subsequent disposal. Price-adjusting actions: development grants, taxation incentives, et cetera. Risk-reducing actions: accurate market information, policy certainty and stability, holistic place management, et cetera and capital-raising actions: public-private partnerships (Adams, 2017)

#### Planning as capacity building

Planning as capacity building can encourage people to think afresh and learn from other best practices. It consists of gaining knowledge and information, especially about real estate markets and development actors. Building networks, trust and relationships across public, private and voluntary sectors and developing skills and capabilities in leadership, finance, project management, et cetera. (Adams, 2017)

Whether these policy instruments used effectively or not depends on how well governments are able to provide place leadership, engage with stakeholders and deploy appropriate powers, resources and expertise (Adams, 2017). Power implies the ability to persuade, cajole and require development actors to participate in collective action. Resources cover both extent of finance and the quality of knowledge and information

about real estate markets. Expertise includes creative professional knowledge and sound political judgment.

## 2.2 Conceptual framework

The conceptual framework illustrates which problem and which links will be studied. This conceptual model is a visual display of the research question of this thesis and planning theory.

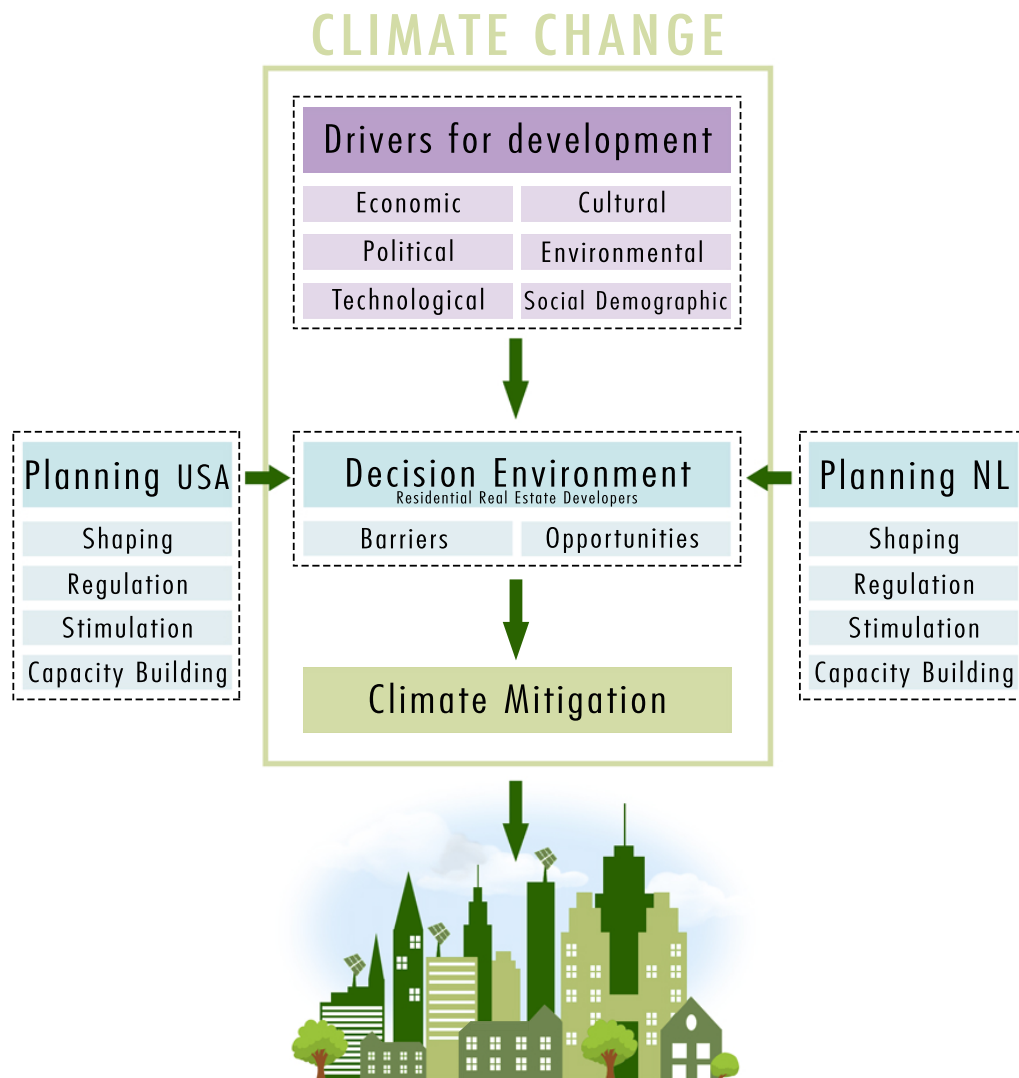


Figure 4: Conceptual framework (Own ill.)





(The Rotterdam: Reginar, 2017)

### 3 Methodology

The methodological framework describes how the research will be conducted, the way of how the information is gathered to answer the research question and sub questions.

#### 3.1 Research strategy

The research strategy which will be used, depends on three key decisions which needs to be taken. A choice must be made between: width versus in-depth research, qualitative versus quantitative research and empirical versus non-empirical research. (Verschuren en Doorewaard, 2015)

The first step of shaping the research strategy is to choose between width versus in-depth research. The subject of this research requires an in-depth approach, which means a carefully worked out, detailed and thorough. This research requires an in-depth study because there is not much knowledge and research done about the engagement between the climate mitigation interventions, residential real estate investors and the residential real estate development. Furthermore, it is impossible to examine every mitigation strategy ever used, conduct interviews with over 100 developers and study cases of every residential real estate project in Madison and the Randstad. By selecting a limited number of cases and examine these in depth, it is possible to obtain a detailed understanding of the drivers, challenges and barriers, which experienced by the residential real estate developers regarding climate mitigation. The same applies for particular factors and governmental mitigation strategies which can encourage developers to mitigate their developments. This research will investigate these particular factors, the climate mitigation policy, law- and regulation and governmental strategies in Madison and the Randstad.

The second step is to determine if the research will be qualitative or quantitative. Qualitative research is descriptive in nature while quantitative research shows the results in numbers, graphics and tables. The aim of this research is to find out what encourage residential real estate developers to mitigate their projects by analyzes, interviews and case studies. This means that the research describes the decisions and actions of the private sector, so the research will be qualitative.

The third and last step is to determine the way of gathering information. Verschuren and Doorewaard (2015), distinguishes five research strategies, of which four empirical (survey, experiment, case study and funded theory approach) and one theoretical (desk research). The main difference is that empirical research is based on observations in practice and non-empirical research is based on literature and knowledge (Verschuren & Doorewaard, 2015). The sub-questions require both empirical- and theoretical research. The first research question requires a theoretical approach because literary study is needed to answer this question. The theoretical research is explained in the theoretical framework which describes the two theories which will be used. Because of the case studies which will be used to find out what encourages residential real estate

developers in Madison and what their drivers, challenges and barriers of residential regarding climate mitigation are, empirical research is needed.

According to Verschueren en Doorewaard (2015), a case study is helpful to gather an integral overview of the research subject and to effectuate a change in a particular situation. An additional benefit of case studies is the so called maneuverability and of it, which is necessary with a differentiation of residential real estate firms with different challenges, barriers and drivers.

### 3.2 Research design

The research design provides a framework for the collected, and analyzed data.

To get an understanding of what encourages residential real estate developers in Madison, Utrecht and Rotterdam to mitigate their properties, a case study approach is selected.

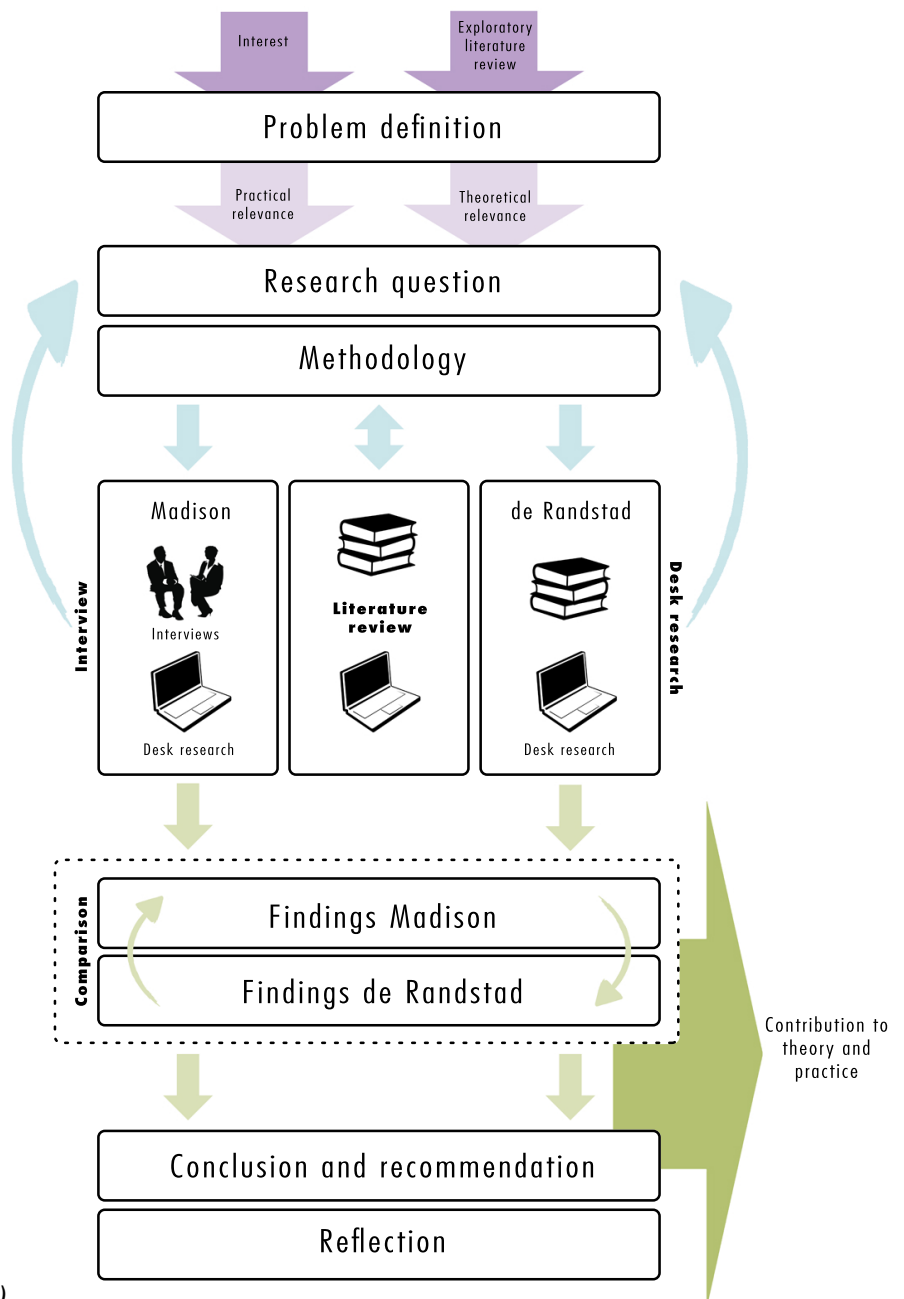


Figure 5: Research design (Own ill.)

### 3.3 Research method

The research method is the technique for the collection of data. The data within this research is collected through desk research, document analysis, expert interviews - structured and unstructured - and show cases. The desk research and document analysis should provide insight in governmental interventions, climate change policies and what should encourage the real estate development sector in general. The expert interviews should provide insight into the incentives for mitigation, challenges and barriers, experienced by residential real estate developers and the current encouragement from the government.

The research can be divided into four phases. In the **first phase** of this research, climate change and mitigation within the residential real estate sector in general, incentives for climate mitigation - governmental- and non governmental encouragement - and the barriers and opportunities will be studied, by desk research and document analysis. In connection with the selected case studies in the third phase, the incentives of green building certifications will be set out in more detail. For the selection of the case studies, see paragraph 3.5.1 case studies. The knowledge which will be gained in this first phase will serve as a base to understand the further research and decisions within the residential real estate market and the government.

In the **second phase**, the differences in regulation/encouragement by governmental policies in the Madison area and the Randstad will be set out. This research will be done through desk research, document analyses and show cases. The showcases will consist out of two examples in the Netherlands: Utrecht and Rotterdam. For the selection of the two show cases, see paragraph 3.5.2 show cases.

In the **third phase**, through expert interviews - structured and unstructured -, and document analysis, data for the case studies will be obtained, analyzed and processed. The interviews will be transcribed with Atlas.ti. The documents from Stone House Development, Inc. case studies will consist out of 'in house' documentation. The used documents for the case studies from Madison Property management, will be available on the internet. The results thereof, are more complete case studies from Stone House Development, and less complete case studies from Madison Property Management. For the validity of the case studies, see paragraph 3.4 Validity and Credibility.

The **fourth phase** and last phase, will show an analysis of obtained results of the main differences and similarities regarding climate mitigation in Madison area and the Randstad Region, and how to understand these results in context of climate mitigation policies in the U.S. with a Dutch perspective. After this analysis, there will be assessed what encourages residential real estate developers to mitigate their developments.



### 3.4 Case studies and show cases

In this paragraph, briefly will be presented what the choice has been to compare Madison and the Randstad, and what the parameters are. With this knowledge, the selection of the case studies, the selection of the show cases and the data collection are presented.

#### 3.4.1 Madison I the Randstad

Madison is a typical American City, located in the state of Wisconsin. The city has about 249.000 inhabitants (2017), an area of 243.5 km<sup>2</sup>, and the ratio between occupier owned housing and rental housing is about 49/54% (Madison Population 2017, 2017). Due to the moderate attention for the changing climate in America - according to Trump: *'I believe in clean air. Immaculate air... But I don't believe in climate change'* (Monyak, 2016) - and the fact that the United States is very privately (market) driven in general, there is less attention for climate mitigation and adaptation of buildings and the built environment.

Utrecht and Rotterdam - 'the Randstad' -, are two cities in the Netherlands, where a lot of attention is being paid for the changing climate. Utrecht is a city with about 343.000 inhabitants (2017), an area of 99.21 km<sup>2</sup> and the ratio of occupier owned housing and rental housing is about 44/56% (Centraal Bureau voor de Statistiek, 2017). Rotterdam 'the Skyscraper City' is a larger city with about 634.600 (2017) inhabitants, an area of 319,4 km<sup>2</sup> and an occupier owned housing and rental housing ratio of approximately 35/64% (Centraal Bureau voor de Statistiek, 2017).

The major difference between the Netherlands and the United States, with regard to urban development and climate change, is responding before or responding after a climate disaster. The Dutch Government provides and sends on climate mitigation and adaptation to minimize the impact of the changing climate. Due to this Dutch 'upfront' approach, *'the reaction to changes in the climate are not such a big step, for the Netherlands'* (Ovink, 2017). This is not the case in America, getting prepared for the impacts of climate change is not their manner of operating. The U.S. responds to the effects and disasters of climate change. According to Ovink (2017), first of all, there has to be evidence that there is a lot of misery after a climate change disaster, for example hurricane Sandy and Katrina. As soon as the catastrophe is there, it will respond to the effects of climate change. *'If this respond happened soon enough, we did well. If we did it to slowly, there is something to point the finger'* (Ovink, 2017). So, the biggest difference between America and the Netherlands in terms of responding to climate change are the pre-reaction of the Netherlands, and the post-reaction of America.

After Hurricane Sandy, President Obama created 'The Hurricane Sandy Rebuilding Task Force', with as key component 'Rebuild by Design', led by Henk Ovink, a Dutch water management expert. Rebuild by Design began as a new kind of design competition to

rebuild the built environment after Hurricane Sandy - launched by the U.S. Department of Housing and Urban Development (HUD) - but grew into *'an innovative process that places local communities and civic leaders at the heart of a robust, interdisciplinary, creative process to rebuild a more resilient region'* (Rebuild by Design, n.d.).

The inclusive process of Rebuild by Design has caused a shift in how spatial planner and governments approach disaster response and emergency preparedness (Hurricane Sandy Design Competition, n.d.). By a collaboration between designers, government officials, researchers and community members, the Hurricane Sandy Competition became *'a model to help governments create research-based, collaborative processes that prepare communities and regions for future challenges'* (Hurricane Sandy Design Competition, n.d.). Especially preparing communities and regions for future challenges, will be a challenge, now that the mister president of the United States does not believe in climate change. Therefore, for this thesis, it is interesting to find out how a typical American City like Madison reacts to climate change, what encourages real estate developers in Madison to mitigate their properties, and what the governmental interventions regarding climate change are, with a Dutch perspective.

### 3.4.2 Case studies - Madison

#### Selection

In Madison, the selected case study area is downtown Madison. To be able to select four case studies in downtown Madison, a framework of parameters had to be determined. The four case studies were selected due to the following parameters:

- All cases have to be located in downtown Madison.
- All cases have to be residential, rental real estate.
- All cases have to be developed in the private sector.
- Two of the four cases must have implemented sustainable technologies or labeled with a sustainable certification.
- Two of the four cases must not have implemented sustainable technologies or labeled with a sustainable certification.
- Two of the four cases, one which did implement sustainable technologies and one which did not implement sustainable technologies, had to be built during the recession.
- Two of the four cases, one which did implement sustainable technologies and one which did not implement sustainable technologies, had to be built after the recession.

Four cases were selected due to the parameters, two properties of Stone House Development Inc., and two properties of Madison Property Management Inc. The four cases will be further elaborated in Chapter 6: Case Studies.

#### Data collection

The data is collected through explorative interviews, expert interviews and document analysis. The explorative interviews were conducted at the beginning of the research and were used to get a general perspective of the situation in Madison. The expert

interviews - semi structured and unstructured - were conducted right after the explorative interviews, with Stone House Development, Inc., and Madison Property Management, Inc. The document analysis includes grey literature and governmental policies, programs and regulations from the city of Madison.

### 3.4.3 Show cases - Utrecht | Rotterdam

#### Selection

In the Netherlands, the selected case study area is the Randstad: Utrecht and Rotterdam. To be able to select two show cases in Utrecht and Rotterdam, a framework of parameters had to be determined. The two show cases were selected due to the following parameters:

- The show cases have to have sustainable ambitions: zero-energy/climate-neutral.
- The show cases must have implemented sustainable technologies or labeled with a sustainable certification.
- The show cases have to consist out of residential real estate.
- The show cases have to be developed in the private sector.

#### Data collection

The data is collected through document analysis. The document analysis includes national and local government policies, programs and regulations.

## 3.5 Validity and Credibility

'Validity encompasses the entire experimental concept and establishes whether the results obtained meet all of the requirements of the scientific research method. The idea behind reliability is that any significant results must be more than a one-off finding and be inherently repeatable' (Shuttleworth, 2013). Validity can be divided into internal- and external validity. According to Creswell (2012), internal validity consists of the research design and to what extent the results/conclusions of the research are valid. The external validity consists of to what extent the research is generalizable and to what extent the results of the research can be applied on a bigger scale.

This thesis approach will be qualitative: desk research and case studies.

#### Desk research

According to Flick (2009), it is important to use several forms of literature in a qualitative study: theoretical-, empirical- and methodological literature. Theoretical- and empirical literature to conceptualize, compare and generalize the findings, methodological literature to find out for to do the research and how to use the chosen research methods.

#### Expert interview

An expert interview is often used to study and map out the orientation process or decision behavior of a particular group/individual. Through an expert-interview, it is possible to define the proper market segmentation. Therefore, this kind of interview is

often used by company which want to introduce or practice a new innovation within their product or process. According to Flick (2009), by an expert-interview you have to select the relevant people for your case, do enough interviews in a sufficient variety and analyze them.

According to Riege (2003), to improve the internal validity of the research, is it necessary to use multiple forms of data collection and provide the possibility for the interviewees to review the data analysis of the researcher and to make changes to the findings of the researcher. An important method to improve the external validity of the case study, is to link the research findings to the existing literature (Yin, 2013). This makes it more easy to explain the input of the researcher in words and the research will be put in perspective, compared to the other existing studies.

During gathering the data by expert interviews (semi-structured), with private property developers, the willingness to share information differed between Stone House Development, Inc., and Madison Property Management, Inc. Private real estate developers are driven by profit-making objectives, and since 2 case studies are based on properties of Stone House Development, Inc. (my internship firm), Madison Property Management, Inc., was not as willing as Stone House Development, Inc., to give a lot of information about their decisions, processes and documentation, in detail. Due to this fact, the case studies about The Lyric Apartments and City Row Apartments are more comprehensive and detailed than Equinox Apartments and Venture Apartments. Next to the willingness to share data and information during the interview, I had access to all of the data of Stone House Development, was able to attend meetings and to observe what their motives were and I could ask questions, all the time. This was not the case at Madison Property Management. Therefore, a more in-depth understanding of the motives of Stone House Development, Inc. is gained. However, the starting point of the research was what influences and encourages residential real estate developers in Madison to mitigate their properties, and how to understand this in the context of climate mitigation policies in the U.S., with a Dutch perspective. Therefore, documentation studies have been done about climate change programs in the U.S. and Madison, which are compared to the Dutch Climate Change policies, and two show cases in the Randstad: Utrecht and Rotterdam. Next to this comparison, there is a difference in the two properties of Stone House Development. One property is 100% affordable, while the other one consists of mostly market-rate apartments. Because of this, it is possible to compare these two properties because one has the incentives of market-rate apartments and one of affordable apartments.

According to Yin (2013), a method to improve the reliability of the research, is to record all of the observations within an interview. In addition to Yin (2013), Eisenhardt (1989) discloses the importance to test the targeted questionnaire (semi-structured or structured), multiple times, so that these questionnaires can be further refined. The questionnaires are further refined, along with Dr. Harvey Jacobs, University of Wisconsin. According to Stake (1995), it is advisable to record at the interviews which will improve the reliability of the research itself. The aim of this research is to record the interview itself and record the observation during the interview.





(The Climate Reality Project, 2017)

## 4 Climate Mitigation

*‘A core objective for real estate professionals is to create and maintain, if not increase, asset value over the duration of a holding period’* (Bienert, 2016).

As already mentioned in chapter 1, climate change can have major consequences, such as rising temperatures and sea level rise. In order to deal with the consequences of climate change, climate adaptation: to adapt to the consequences, or climate mitigation: to mitigate climate change, can be used to reduce the impacts of climate change. For real estate developers, climate mitigation is more common than climate adaptation and most of their decisions to mitigate their buildings for climate change is based on cost. Mitigation costs are costs to reduce green house gas emissions, for example: additional costs of renewable energy versus fossil fuels. Adaptation costs are costs of adapting the future climate change, for example: construction of climate-resistant buildings or the erection of dikes. The benefits of mitigation consist of reducing damage on real estate due to less warming of the earth, while the benefits of adaptation are reducing damage because the environment is adapted to climate change. (Hof, Boot, van Vuren & van Minnen, 2014)

The changing climate can affect the value of real estate in several ways. According to Bienert (2016), The demand to reduce carbon emissions from buildings can result in new regulations and market expectations. Likewise, unavoidable impacts from climate change can cause damage to real estate. According to Stigge (2015), prevention is a far more cost-effective approach to sustainability than recovery after a disaster. A rapport of the National Institute for Building Sciences (2015), showed that every 1\$ spent on prevention, saves \$4 in recovery costs (Stigge, 2015). Even though prevention is cheaper than recovery, it is not always clear for residential real estate developers why they should implement expensive sustainable technologies and mitigate their developments. (Hof, Et al., 2014)

This chapter will set out how developers can get encouraged, or forced, to mitigate their developments, and what the opportunities and barriers are, with a focus on the costs and benefits of climate mitigation. Green Building Certificates will be set out in-depth, because this is the main parameter for selecting the four case studies, in chapter 6.

### 4.1 Climate mitigation and development

In the Netherlands, the government exercises much influence within the real estate market and development sector, in contradiction to the United States.

The main aspect of the Dutch planning tradition history – Active land policy – is the fact that municipalities actively purchased agricultural land, in order to develop those lands for housing: the municipality bought land for the price of agriculture land, changed the designation to housing and eventually sold the ‘prepared’ plots for the price of housing

plots. This process is called land utilizations. The incentive for municipalities to act this actively in urban development, was first of all the profit they could make, by selling these housing plots to developers or investors (Jókövi, Boon, Filius & Egmond, 2006).

The second reason for municipalities to be this actively, has to do with control over urban planning. According to Vos (2017): *'If the authorities were the ones who decided where to develop housing and then bought and prepared the plots, they would be in control of the whole process, which gave them a sort of certainty'*. Overtime, the role of municipalities changed and so did the market, especially after the crisis on the housing market. Municipalities and developers lost a lot of money, mainly because the demand for owning a property decreased dramatically. Among other things, this caused a shift from a supply led approach to a demand led approach (Vos, 2017). The current development approach in the Netherlands, is that municipalities shifted from active land policy, to conducting a facilitating land policy. There are different thoughts about what a facilitating land policy means. However, there are two key point of what a facilitating role from municipalities is:

- Municipalities operate more in a framework setting
  - Municipalities create a vision with conditions for a certain area
- (Vos, 2017)

What can be noted from the information above, is that the Dutch approach is based on land level, not so much on building level. This is contrary to the United States approach and vision, regarding spatial planning. According to Backus, Bruil, Bavel, Luijt & Van der Hamsvoort (2005), *'In the United States, the regional planning legislation which imposes possibilities and limitations of public instruments to private parties is much less far-reaching than in the Netherlands'*. Land in the U.S. has historically been seen as a replaceable good that could and should be parceled out for individual control and development; and if one person saw fit to destroy the environment of his valley in pursuit of profit, well, why not (Cullingworth & Caves, 2013)? According to Spaans (2011), there are four features of the American planning system of importance as they differ from the Dutch planning tradition that is, as already mentioned above, characterized by a high level of public involvement.

- As-of-right approach: A development may trust that when he acts in line with a zoning plan, he will not be confronted with new or other requirements than those mentioned in the plan.
- No culture of direct subsidizing of new developments: Incentive zoning systems are used that allow for a reduction of real estate taxes or a system that created additional square meters in a building if certain requirements are met.
- Market-oriented system: The core value of the US is being market-oriented, and the fact that most states and municipalities lack significant funds for large-scale public projects.
- Integral approaches to a certain area are rarely found: The land use plan holds functional requirements but does not envisage a coherent plan for the area in which all buildings and open spaces are dealt with as if they were created by one arty with one vision.

An example of American planning is the Privately Owned Public Space Program in New York City. This program allows developers a bonus in Floor Air Ratio if they create a public space in front of their development. However, the City of New York did not set extra requirements to the quality of that public space. According to Spaans (2011) *‘The as-of-right system of the instrument provides no incentive for developers to invest in the quality of the public space that, therefore, mostly lack the features of a real public space facility. This example of the risks of these types of bonus systems, which are totally dependent for their success on the willingness of the market to use them in a manner that benefits the public.’*

## 4.2 Planning related interventions

Real estate markets are socially ‘constructed’, for that reason, they can be shaped by human intent. This can make it possible to shape real estate markets to make them more economically efficient, environmentally sustainable and socially righteous, then they might otherwise be. (Adams, Watkins & White, 2008)

As already introduced in Chapter 2: *‘Planning can be defined as deployment of four types of policy instruments to aim to shape, regulate or stimulate behavior of market actors or build capacity to do so’* (Adams, 2017). In order to understand climate mitigation incentives for developers, and the specific environmental policy instruments - market-based instruments and non-market-based instruments -, this paragraph will set out globally four types of spatial planning tools and their planning related interventions. For a more detailed explanation of these four planning tools and their Intended market effect, see appendix A.

<b>Shaping</b>	Shaping the decision environment or context
<b>Regulation</b>	Defining the parameters of the decision environment
<b>Stimulation</b>	Restructuring the contours of the decision environment
<b>Capacity building</b>	Developing actor’s ability to identify and/or develop more effective/desirable strategies

(Adams, Watkins & White, 2008)

### 4.2.1 Shaping

Shaping planning tools, seek to *'rewrite the rules of the game'* (Adams & Tiesdell, 2013). By rewriting the rules of the game, integration between market actors can be ensured, while transforming the behavior of these actors to create better places. Market shaping instruments do not force any decisions upon market actors. Instead, *'it sets a context within which market actors can see benefit in meeting policy aspirations – it becomes 'worth it' for them to move in the direction intended by shaping instruments'* (Adams & Tiesdell, 2013). Shaping instruments can improve outcomes of developments, in relation to: location, products, sustainability, efficiency, time horizons, perceived consumers and scale of production.

Adams & Tiesdell (2013), identify three 'leading' types of market shaping instruments. The first two instruments work more indirect, these are publication of plans, strategies, visions, et cetera, and reshaping the institutional environment for property development, mainly by making adjustments to property rights and taxation systems. They set out how the state thinks places should change over time and provide a broader framework for development.

A more direct intervention strategy within shaping real estate markets, is a strategy in which the state is able to take the lead in transforming what market actors consider achievable at specific places: shaping markets by strategic transformation.

*'Strategic market transformation requires an institutional framework to promote and manage collective action'* (Adams & Tiesdell, 2013). The benefits of this transformation arise from what outdo individual developments, for example more efficient spatial arrangements, better transport connections and improved public realm. Although strategic market transformation (can) make use of stimulus instruments - Appendix A -, the goal is not to *'entice market actors to venture into particular locations or forms of development beyond their normal ambit'* (Adams & Tiesdell, 2013).

*In short: Strategic place transformation works by promotion, preparation and/or implementation.* Strategic market transformation is driven forward and coordinated by a 'place promotor', with a clear vision for creating places that function as a well-integrated and quality place. It offers better value for money as quality places mature, while delivering more sustainable forms of development (Adams & Tiesdell, 2013).



### 4.2.2 Regulation

*'Defining the parameters of the decision environment'* (Adams, Watkins & White, 2008).

There are several form of regulation. According to Adams & Tiesdell (2013): *'Regulation of real estate markets is one of four matching policy instruments and is best deployed alongside market shaping, market stimulus or capacity building.'* For this reason, it may be hard to separate the results of regulation from those of these other policy tools.

Nevertheless, the goal of market regulation is to manage, eradicate or compel certain aspects of activities, in other words: regulation of real estate affects its ownership, use management and development. It limits individual actors' opportunities for independent action, on the basis that *'collective gains more than outweigh any individual losses'* (Adams & Tiesdell, 2017). An example of regulation regarding climate change, are the EPA Regulations in the United States.

The United States Environmental Protection Agency, quotes Regulation as: *'Regulations are mandatory requirements that can apply to individuals, businesses, state or local governments, non-profit institutions, or others'* (EPA United States Environmental Protection Agency, n.d.). An example of a regulation, issued by EPA is the Clean Air Act. The Clean Air Act is the extensive federal law that regulates emissions from stationary and mobile sources (EPA United States Environmental Protection Agency. (n.d.). Regulation by the Clean Air Act, sets out what levels of a pollutant adequately protect human health and the environment. It regulates industries by how much, for example sulfur dioxide, they can legally emit into the air, and what the penalty will be if they emit too much. (EPA United States Environmental Protection Agency, n.d.).

### 4.2.3 Stimulation

*'Restructuring the contours of the decision environment.'* (Adams, Watkins & White, 2008)

Real estate market can be stimulated by direct state actions, price-adjusting actions, risk-reducing actions and capital-raising actions. In locations where there is not any problem with development and the development is lucrative for developers, stimulation tools often, are not necessary. All there needs to be done is shape and regulate real estate markets to achieve its preferred development pattern. In locations where development is not lucrative and unproblematic, the state may need to stimulate developments, instead of controlling it: market stimulus.

According to Adams & Tiesdell (2013), there are four 'main' types of market stimulus tools that can be uses to stimulate the desired development. The first type entails 'direct intervention', the other three interventions are more in-direct. Direct intervention can 'kick-start' a development process, while indirect interventions cheek to change the pattern of incentives: *'influencing whether market actors decide to undertake*



*development at all*' (Adams & Tiesdell, 2017). Market stimulus tools work by modifying the outcome of financial estimations, through impacting on development costs and revenues, risk and access to fundings/grants (Appendix A). Stimulus instruments are therefore 'lubricate' markets and popular by stimulating climate change measures, by making climate mitigation more attractive to market actors.

#### 4.2.4 Capacity building

*'Developing actor's ability to identify and/or develop more effective/desirable strategies'* (Adams, Watkins & White, 2008). Capacity building focuses on building planners' 'capacity' in four essential areas: market-shaping cultures: mindsets and ideas, market-rich information and knowledge, market-rooted networks, and market-relevant skills and capabilities. The goal of capacity building, is to support market shaping, market regulation and market stimulus. What capacity building does is, *'it enables actors to operate more effectively within their own opportunity space, while influencing the opportunities space of other actors to wider advantage'* (Adams & Tiesdell, 2017).

One aspect of capacity building, is overcoming distrust between the public and private sector. An example hereof is illustrated by Tait (2009), particular development conflict between local planners and a developer. In this case, he assigned the 'deficiency' of trust to the developers perception of spatial planners as unreliable and incompetent, and the spatial planners' view of developers as aggressive, *'prone to cutting corners and unconcerned for wider values'* (Tait 2009). The distrust in these cases was not necessarily based on previous experiences from both parties, but also on perception of what they represented. Höppner (2009), did research about the amount of trust in the institution of regulatory planning, by looking at whether participants, e.g. developers, in the planning process trust planning committees, or not. Her research showed that this found to be dependent on the amount to which participants believed members of the planning committee to be *'competent, honest, open, fair reliable, reciprocation, respectful and committed'* (Höppner, 2009). When these qualities are central to behavior and decision-making, trust will be built.

#### 4.3 Climate mitigation incentives

The private real estate sector, in this thesis residential real estate developers, are 'market driven'. In order to run their business, they need to be successful and thereby make profit. Due to the fact that this sector is profit based, (roughly) there are two types of instruments which can encourage or enforce developers/investors to invest in sustainable technologies en mitigate their properties: market-based instruments and non-market-based instruments.

### Environmental policy instruments

Market-based instruments	Non-market-based instruments
Taxes	Command-and-control regulation
Emissions Trading	Reporting requirements
Removal of perverse incentives	Active (green) technology support
Liability rules	Removal of green tech financial barriers
Deposit-refund	Information and voluntary approaches

#### 4.3.1 Market-based instruments

Market-based instruments, MIBs, and also known as financial instruments/incentives, typically use market mechanisms to create economic incentives for companies to behave in a certain way. MIBs are indirect regulatory instruments, which influence companies behavior by changing their economic incentive structure (Görlach, 2013). *When MIBs work as intended, they drive market actors to accomplish the result desired by society in the most cost-efficient way'* (Orrling, 2013). Costs from environmental externalities, for example Green House Gas emissions, are usually not reflected in investments or consumption decisions. Market-based policy instruments work by reflecting these environmental externalities/impacts of a certain action, by attaching a costs to it. This will provide an incentive to the polluter - in this thesis, the developer/ investor - to reduce this impact. (Hofmann & Prah, 2016)

#### Market-based instruments

<b>Taxes</b>	Taxes directly applied to the pollution source
	Taxes on inputs or outputs of a production process
	Financial support mechanism for climate-friendly products and activities
<b>Emissions trading</b>	Cap-and-trade
	Baseline-And-Credit systems
<b>Removal of perverse incentives</b>	Removal of perverse incentives
	Correction of other incentives
<b>Liability rules</b>	General liability rules
	Adapting liability rules in dependence of environmental impact
<b>Deposit-refund</b>	Deposit-refund systems

### 4.3.2 Non-market-based instrument

Non-market-based instruments, are all instruments that do not work through changing prices, but by command-and-control or by encouraging/discouraging certain behavior through non-monetary incentives (Görlach, 2013).

Non-market-based instruments	
<b>Command-and-control regulation</b>	Framework standards
	Performance standards
	Technology standards
	Prohibition or mandating of certain products or practices
	Building codes and standards
	Land use planning, zoning
<b>Stand alone Reporting requirements</b>	First step to a future regulation
<b>Active technology support policies</b>	Public and private RD&D funding
	Public procurement
	Green certificates
	Renewable portfolio standard
	Feed-in tariffs
	Public investment in underpinning infrastructure for new technologies
<b>Financial measures (subsidies)</b>	Policies to remove financial barriers to acquiring green technology
<b>Information and voluntary approaches</b>	Information and voluntary approaches Education and training
<b>Product certification and labelling</b>	Environmental labelling programs
	Award schemes
	Public information campaigns
	Voluntary agreements
	Unilateral commitments
	Public voluntary schemes

### 4.3.3 Green building certifications

‘The construction industry is one of the major economic players in the world and it is also has one of the biggest negative impacts on our environment’. (Brendtsen, 2016)

Everyday, the real estate industry is spending and squandering resources on poorly planned developments, which are made with sub-optimal materials and solutions. The results of these poorly planned developments have a huge financial impact on all parties involved in the long term, as well as a needlessly big impact on the environment. Green Buildings Certifications are voluntary assessment methods that score new and existing buildings against a series of set criteria/requirements and can be used to optimize a development: to not only perform better in several aspects, but also to reduce the carbon footprint while saving money in the long term. Optimized projects will save money because poor planning and feeble concerns about construction, functional and sustainable design frequently lead to bad quality, high operation and maintenance costs and budget overrun. (Brendtsen, 2016)

#### Economic effects of green building certification

*‘Green building certification systems today are inspired by their predecessors; they build up on each other as they go. This way the knowledge is passed on and at the same time, improvements can be made’.* (Brendtsen, 2016)

There are several kind of green building certifications. Frequently used certifications around the globe are BREEAM (Building Research Establishment Environmental Assessment Methodology), LEED (Leadership in Energy and Environmental Design) and USGBC (United States Green Building Council).

The catch-all term sustainability, does not only mean how climate proof/less harmful the development is to his environment or how pleasant it is for people to live/work inside the building. The economic aspect of sustainability plays a big role too. To put it even more strongly, the economic part is often decisive of the development whether it gets built or not.

To get an idea of these economic values, an example of an existing office building. An existing office building which has a good social and cultural quality, has shown that the amount of sick-days of the workers has decreased, their attendance has increased and the efficiency and the general wellbeing of the workers has improved, while at work. These positive effects are beneficial to the company owner, because he/she would earn more money from a more efficient and higher amount of work hours. Next to the positive effects for the company owner and his/her employees, it is also attractive for investors. According to Brendtsen (2016), Investors also pay a higher price for sustainability because they expect a building that runs more effectively in terms of operations and management.

The assessments are described above, are normal assessments made by certification systems. However, there are also certification systems – like DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen) – which focus on the economic aspect of the

development. 'A thorough life cycle analysis gives the client a clear idea of what the capital cost will be of the building, but also what the cost will be to operate it for the next 50 years' (Brendtsen, 2016). By using this system, a comparison can be made between a development without sustainable certification and a building with certification aimed at longevity and quality.

Type Building	Residential	Office	Hospital
Operation costs*	20-50	12	4

\* The amount of years the operation costs will exceed the initial cost after construction.

A research has shown that LEED certified buildings have an energy use of 25-30% less than traditionally build developments, which becomes a substantial cost saving over 50 years (Ebert, Eßig & Hauser, 2011). Next to the energy saving costs, life cycle costing is also an important factor for the owner of the building. Life cycle cost takes into account how much an owner will profit from the development. A research from the Burnham-Moores Center for Real Estate showed that tenants are willing to pay 10 to 30% more for an Energy Star and LEED certified building and a higher occupancy (Miller, Spivey & Florance, 2008). Another aspect to use green certification is the increase in value of the development and how well it retains that value (Ebert, et al., 2011).

A study in the U.S. market shows that Energy Star certified developments, compared to conventional developments have an average value of 19% higher than the conventional buildings. This is very similar to the statistics in other counties. For example, in Europe, green classified developments added an average of 6,5% to the building and in Australia an increase of 12% in building value (Institute for Building Technologies, 2016). According to Ebert (2011), 'the general indication is that certified buildings can be quite profitable in the long term perspective, with some buildings being little or no more expensive than they would have been otherwise had they not been certified'. Bienert (2016) states that market-trends have a great effect on the real estate values and on practices throughout the industry. Users preferences may shift because of an increased awareness of the effects of climate change and investors may included new expectations and requirements in due diligence processes. The table below shows the numbers of positive effects that energy efficient buildings with green attributes have. (Institute for Building Technologies, 2016)

<b>Increased resale value</b>	2 - 17%	<b>Higher net operating income</b>	6%
<b>Increased rental rates</b>	5.8 - 35%	<b>Lower capitalization rates</b>	50 - 55 basis points
<b>Higher occupancy rates</b>	0.9 - 18%	<b>Productivity gains</b>	5%
<b>Lower operating expenses</b>	30%		

Next to the above mentioned benefits from Green Buildings Certification, an other economic effect can be achieved, namely standardization. Standardization of the several sustainable certifications at an international level is not yet within sight due to the prevailing regional differences. On regional, or even national level standardization can be achieved. According to Ebert (2011), If this standardization were achieved, the result would not only be considerable synergies and cost saving, but also maximum degree of transparency and comparability of sustainability in buildings. An other economic effect would be market competition. If Green Building Certifications are the standard and transparent, real estate developers want to develop buildings with the highest sustainability standards. In this case, it is not attractive for developers to develop bad quality buildings without sustainable materials/technologies, because they have to compete with other sustainable and high quality developments. As already mentioned above, tenants are willing to pay more rent for sustainable and high quality buildings, and that is one of the reasons what makes sustainable investments attractive for developers.

### Benefits for the client

When a developer/investor is looking for a new development, the advantages are very different dependent on the type of building being constructed. However, the part of financial investment seems always the disadvantage. Without feeling the pressure to implement sustainable technologies and develop a sustainable building, the financial part will play a big role in the decision making (Stoppole, 2017). By raising the knowledge of sustainable technologies and the benefits of sustainable developments, it may become more attractive to invest in sustainable technologies, buildings with sustainable certifications.

‘By making a sustainable project in accordance to any of the certifications systems, it is quite clear that the quality of the building will be significantly higher than the average building’ (Bendsten, 2016). As already mentioned in the previous paragraph, sustainable developments come with long term economic benefits. But next to the economic benefits, they give an enormous boost to the credibility of the company. (Brendsten, 2016). It is very easy for developers to get a reputation as either cheap: getting the job done nonetheless with a poor quality, or expensive: perfect planned with integrated sustainability and great quality. Ones a developer or construction company gets a poor reputation from any kind of reason, they will spend great amounts of their annual budget to level up their reputation by marketing and advertisement.

By using a trusted and known sustainable certification, the company can level up their reputation, which is an important factor in the case of market competition. But also, developers and investors will prefer a sustainable building with a long life cycle and low operating and maintaining costs. According to Brendsten (2016), in terms of finance alone it makes sense for companies to certify their buildings since they clearly get a long term return from it and, ones a client gets a project with higher quality and the certification gets more recognition, there is a clear mutual gain. Especially when it



comes to construction companies, since the ventures are so costly, the certifications will need to be highly renowned before investors will want to use them.

### Benefits for the industry

Not only for the company itself, but also for the entire real estate industry is it good as more individual companies start to use green house certifications. This because as more companies will use sustainable certifications, it will add a competitive element to achieving the highest ratings, as already noticed in paragraph 4.2.1. This in turn will boost the need for innovation and will further improve the general advancement of new technological solutions and ways of planning projects.

The reason that it is difficult for the real estate sector to standardize green house certification and sustainable technologies, is because the real estate/construction industry is by nature a very traditional industry and trusted solutions often need several years of testing before achieving their status and familiarity (Brendsten, 2016). Nevertheless, one example of a sustainable material is Rockwool. Rockwool is probably the most well-known insulation material and company in the world, even though better and more sustainable materials exists. Rockwool is known for their stone wool products and it accounts for almost 25% of the European market (Brendsten, 2016)

According to Brendsten (2016), when talking to people in the real estate industry about insulation, they will most of the talk about stone wool, Rockwool. This is quite noteworthy since stone wool was introduced to the market in 1937 (Brendsten, 2016). The construction/real estate industry knows that there are different kinds of insulation, but they use most of the time stone wool, simply because it works. It would be an enormous step forward regarding climate mitigation and high quality developments if green house certifications could achieve a similar status as stone wool: that sustainable building methods are simply preferable to conventional building methods. 'Getting green building certificates to be used on a regular basis would also create a hefty amount of work places in its respective country, which could prove very beneficial for the certificate system itself, in that more people are experts at it and thus they're in a good position to improve upon it' (Brendsten, 2016).

The greater amount of developments will be designed and built with green house certification, the more standardized the choices will get (Brendsten, 2016). To make it more clear: if a sustainable material or technology is a good option for a specific green house certification, but the demand is low and therefore the material or technology is quite expensive to make. By increasing demand, these materials or technologies can go into higher mass production and the costs will be lower as a result: standardization. This is why Rockwool is so much used nowadays. The Rockwool company has become so big, that it can afford to keep the prices down.

## 4.4 Barriers and opportunities

The biggest challenge for the real estate and construction sector is to come up with cost-effective mitigation concepts that are worth it to implement and that can be developed and tested, together with an actor who has 'space' for experiments and budget. A client with space in his budget for mitigation experiments, can be the government.

### 4.4.1 Barriers

Even though a rapport of the National Institute for Building Sciences (2015), showed that every 1\$ spent on prevention, saves \$4 in recovery costs, mitigation is not a priority for the building owners and users' (Hoogvliet, 2015). For developers, there are several barriers to mitigate their developments for climate change. They do not see the urgency why they should do something about climate change right and there no clarity about the 'problem ownership'.

The private sector is still struggling with why they should do something about climate change, and can other parties no solve that problem much better? This barrier is due to the lack of knowledge of the opportunities and benefits created by climate mitigation. In addition of the lack of knowledge and urgency, there is also lack of pressure from the government. There is no legislation and or regulation for climate mitigation of buildings to increase the pressure for developers to mitigate.

According to Bienert (2016), developers identify several barriers to more expansive building improvement programs: 94% split incentives, 85% high transaction costs for sustainable-related investments and technologies, 83% insufficient information and 83% lack of awareness.

As mentioned in paragraph 4.3, climate mitigation can be enforced or controlled, for example, by command-and-control regulation. However, command-and-control regulation implies only standards, like technology, performance or technology standards, and the Building Code sets requirements for energy efficient design and construction of new developments/renovation of existing buildings. But, only an adjustment of the existing building codes cannot meet the requirements which are set up by the 2010 EPBD. Mitigation of new developments and the reduction of CO<sub>2</sub> emissions, need more support.

In addition, climate resistance/mitigated buildings are not often seen as a value within tenders. Climate resistance is almost never used as an argument between competing markets, while the customer (and owner) benefits from a more sustainable and climate proof design (R. Arnessen, personal communication, May, 2017). Also, the adaptability of the design to long-term changes is not often considered as a competitive element and argument. Construction companies mention that clients (developers/investors) do not often ask for climate proof designs and solutions, and construction companies and

advisors cannot proof the return on investment of a sustainable design. (Hoogvliet, 2015)

A social cultural and political problem is that the private sector is barely involved in the development of knowledge of mitigation and adaptation of buildings and cities. For the realization of more sustainable cities, the entire real estate sector has to get more sustainable, including the buildings itself. Without recognition of the problem, the urgency of developing more sustainable building is not there which means, less pressure to invest in mitigation measures.

Other obstacles for mitigation of buildings lie in governance. The main obstacle is unclear in sense of ownership of the problem: who is responsible for the problem and who has to solve the problem. For the government, the main barrier is the lack of structural budget and the lack of capacity. In addition to the lack of budget, municipalities experience limited attention from the political board for climate adaptation and mitigation.

Category	Barriers
Knowledge and information from stakeholders	No sense of urgency
	Not capable to quantify the risks of climate change and/or benefits from mitigation measures
	Lack of knowledge about weak spots on local scale
	Perception of too big insecurities about what exactly to expect regarding the effects of climate change
	Being climate proof is not a criteria within the design or appreciation of construction companies
	Tenders
Technologies	Uncertainty about compensating effect of mitigation measures e.g. time till yield
	Costs and benefits on local scale still not clear in the quantitative way
Capacity related	Lack of financial resources from developers/ investors/owners
	Lack of professional expertise and capacity
	Insufficient attention for mitigation in the sector
Social cultural	Lack of local support
	Lack of urgency
	Lack of recognition of the problem

<b>Politically and institutional</b>	Lack of effective instruments e.g. legislation and standardization, certification of sustainability, et cetera
	Lack of political support and interest
	No attention and financial support for short term issues
	Lack of motivation for implementing mitigation measures
	Lack of collaboration between governments
	Institutional fragmentation: lack of clearness about responsibilities between governments

(Hoogvliet, 2015)

#### 4.4.2 Promising interventions

*‘The government does not try and make it a benefit. If there were grants, it would be something we would definitely consider.’ (Stopple, 2017)*

*‘If the government would encourage us, than, for sure! That would be a great opportunity, and they should do that.’ (Stopple, 2017)*

As already mentioned in Chapter 3, there are several governmental interventions to encourage or obligate real estate developers to mitigate their developments for climate change. According to Stopple (2017), Manager of Operations at Madison Property Management, the biggest opportunity to obligate and encourage developers is by subsidizing and taxes, and by governmental control.

According to Hoogvliet (2015), the most promising interventions are: governmental control by law and regulation policies, subsidizing and taxes and stimulation for innovation of sustainable technologies. Next to these interventions - which meet the ‘requirements and preferences of the developers -, the government can also play an important role in sense of creating and providing knowledge and playing the ‘Exemplary role’.

This paragraph will set-out promising interventions to stimulate real estate developers to mitigate their properties, briefly.

##### Governmental control by law and regulation policies

It is possible for governments - as a public, non commercial actor - to encourage or force private property owners to invest in climate mitigation and adaptation.

The government can stimulate or force real estate developers to develop sustainable by: the national government and by municipalities. The national government can set requirements for e.g. energy performance of developments, water storage or heat, by

the Building Code. See paragraph 5.2. Municipalities can influence and control, e.g. transformation or areas, real estate developments and architecture, by spatial planning and urban design. Urban design can set requirements for buildings, regarding heat and water storage, so that buildings and their 'outdoor' space can/will be an integral part of a climate-proof neighborhood.

The Clean Power Plan is the first national limitation and regulation on carbon pollution from power plants in the U.S. (Chon, 2017). The plan is meant to set boundaries and help reduce carbon dioxide emissions from existing U.S. power plants, 30% below 2005 levels by 2030, as well as increasing the use of renewable energy and energy conservation (Club, 2014). However, the Plan was killed by an Executive Order signed by President Donald Trump at the Environmental Protection Agency (EPA) On March 28<sup>th</sup>.

### Governmental control by subsidizing and taxes

Both, subsidies and taxes require financial resources, in order to comply and execute. This means, municipalities need to find financial space. For example: a municipality can grant a subsidy for water storage on your own plot and levy tax on the amount of paved garden. Revision of the system of sewerage tax and water board costs, can be the next step. In Germany, there is a tax for the amount of water that you discharge from your parcel. This has created a market for water storage products. In Denmark, the government rewards the rainwater drainage on your own site, with a refund- and a rebate on tax. (Hoogvliet, et al., 2015)

### Stimulation by the government for innovation and sustainable technologies

When the demand for climate change and mitigation gets enough volume, a market will be created which is interesting enough to invest in. New sustainable products and services have not been proven enough in practice, yet. Governments can allow, and can create space for experiments to monitor the performance of new products. This validation process reduces the risks for clients, investors, developers and construction companies and allows new products to be accepted and applied more quickly. At the same time, the government may impose harsher climate requirements for project owners in public spaces and buildings owned by the government. (Hoogvliet, et al., 2015)

### Creating a sense of urgency by owners and users

Different actors within the real estate sector can ensure that building owners will be informed about climate mitigation and the benefits of a mitigated building and mitigated outdoor space for the user. Knowledge institutions can help to express those benefits in terms of comfort and, or avoided damage. According to Hoogvliet (2015), it is necessary that the real estate sector itself is aware of the relevance of a sustainable building, and that the conventional construction traditions have to be released.

Weather incidents offer a chance to address mitigation of developments and the awareness of climate change in the real estate sector. The construction industry can outline what kind of opportunities there are to prevent incidents caused by, for example

the weather. At the same time, the construction industry can use innovations regarding saving energy in buildings, to encourage mitigation of developments. They can emphasize that energy-efficiency and comfortable buildings will maintain their value, even in case of heat extrusion. (Hoogvliet, et al., 2015)

#### Start climate proof designing for buildings with vulnerable features

Owners and investors of buildings are in the position to ask for sustainable and mitigated designs of their development in the market of designers, construction companies and developers. However, they often experience climate mitigation as not important enough to invest. To start the mitigation flywheel, the buildings with the most vulnerable functions can be first addressed, such as hospital, nursing homes, affordable dwellings, et cetera. These buildings are often owned by the government who can require sustainable design and development (Hoogvliet, et al., 2015). It is possible for the government to start this 'mitigation flywheel' by taking the 'exemplary role'.

#### Make investors aware of climate risks for real estate and the impact on the value

The vulnerability of buildings by climate change is hardly reflected in the price of real estate. Nevertheless, when climate change is expected, a situation arises in which types of buildings, streets and neighborhoods are more vulnerable to the effects of climate change, which result in a lower value of the neighborhood. This means, the maintenance costs will be higher, both for the municipality as for the building owner. The chance of water pollution, pile rot, soil weakening and heat, will occur and increase. Expected is that the effects of climate change, will be taken into account when buying real estate, more often. Partly because of the risks associated with the financiers, banks. At the moment, the financiers' world does not pay enough attention to this aspect. The expectation is that this will change within 15 years as more problems will arise, especially linked to the end of the life time of buildings, built in the post-war. (Hoogvliet, et al., 2015)

By making investors, developers and users aware of the risks of climate change, providing them knowledge about this subject and show them what kind of mitigation strategies/technologies are possible and cost effective to use, the government can stimulate these actors to mitigate their properties and in the end, help them to save money and the global planet.

### 4.4.3 Opportunities

*'Green buildings are better for the environment, better for business and better for the people within them'* (Lyons Hardcastle, 2015).

Even though the government can and should, control and encourage residential real estate developers to mitigate their properties, it is not only the environment that benefits from mitigation. Developers can experience opportunities of mitigation, too, for example: lower maintenance- and operating costs, a higher yield, technological improvement, more attention for climate change, et cetera. This paragraph will outline the primary opportunities for developers to mitigate.



### Flexible construction for longer lifecycle

When taking into account the increasing uncertainties, the world and climate may have changed in 30 years, so there is a need to setting up areas differently. Not only climate change creates dynamism and uncertainty, as well the ever evolving technological innovations and changes in energy management, contribute to this. One chance could be to design and built buildings flexible and or demountable. A building can be built for a long lifetime, a long life cycle, which means, the design will take into account the ability to make adjustments in the future. This idea, for example, corresponds to that of the LEGOization of construction. Hereby, buildings do not need to get demolished in case of long term vacancy. They can get adjusted very easily, to get ready for a new function. By developing buildings demountable, owners do not need to get stuck with vacant buildings and the building does not need to get demolished, which means: no waste. (Hoogvliet, et al., 2015)

### Benefits for owners in lower insurance premiums

An effect of climate change is the increase of extremes, which increases the risks of damage of buildings. Recently, the 'Verbond van Verzekeraars' (an association of insurance companies in the Netherlands) announced a planned increase in premiums for water insurance. When these premiums are linked to the degree of vulnerability of buildings, the financial incentive creates a market for preventive measures of existing buildings, and mitigation measures for new developments which are positively reflected in lower premiums. (Hoogvliet, et al., 2015)

### Lower operating and maintaining costs for owner

Lower openings and maintaining costs for owners and tenants, appears to be the primary reason for real estate developers to invest in climate mitigation measures. Arnesen (2017), explained in our interview: 'In addition to the general societal benefits, we feel that anything that will keep our long term operating costs down will protect us against flat revenue streams.'

According to 'green building trends report', about 70% of survey respondents cite lower operating costs as the greatest benefit of green building (Lyons Hardcastle, 2015). Next to keeping the operating and maintenance costs down, LEED-certified buildings wit later operating and maintaining costs, and a better indoor and environmental quality, are more attractive to public, and private buyers. *'High performing building features will increasingly enter into tenants' decisions about leasing space and into buyers' decisions about purchasing properties and homes.'* (USBGC, 2015)

According to Fowler, Rauch, Henderson & Kora (2010), *'LEED-certified buildings have been proven to use 25% less energy and a 19% reduction in aggregate operational costs in comparison to non-certified buildings.'* Next to keeping operating and maintenance costs down, there are other benefits and incentives to for sustainable developments. Examples of these benefits and incentives are: tax credits, grants, expedited building permits, and reductions/waivers in fees. (Fowler, et al., 2010)

For more market and non market based incentives, see appendix A



(PowerPlant: Nigdabike, 2016)

## 5 Incentives and Climate Change in practice USAINL

### 5.1 Incentives and Climate Change in the USA

On April 22<sup>nd</sup>, 2016 – also known as Earth Day – 175 nations including the United States and the Netherlands, signed the Paris Agreement. This agreement is a non-binding treaty and meant to move towards a more sustainable future while addressing climate change by reducing emissions of Greenhouse Gasses. Every party who have committed to this agreement, should prepare mitigation measures to reach two goals: increasing the global temperature to below 2 degrees Celsius and lower Green House Gas emissions. (Chon, 2017)

Earlier, in 2014, the Environmental Protection Agency proposed the Clean Power Plan, in an effort to reduce Greenhouse Gas emissions. On August 3<sup>th</sup>, 2015, the Clean Power Plan was signed. This plan requires each state to meet the emission goals from 2022 to 2029. To further the states efforts and commitment to reduce the threats of climate change, after signing the Paris Agreement, President Obama's had been pushing forward the Clean Power Plan. (Chon, 2017)

Even though the Clean Power Plan is the most important part of Obama's policy to fight against climate change, the Supreme Court voted with 5 to 4 votes for a request from 27 states and several large companies to stop the plan. According to States and Companies, this plan is illegal. (NOS, 2016)

Many states and businesses are economically dependent on fossil fuels like oil, coal or gas and they believe that, the federal government is not about winning these fuels and these they do not want to start with expensive adjustments if it is not certain that legislation will come. (NOS, 2016)

In August this year, the U.S. Court of Appeals for the District of Columbia Circuit granted the EPA and additional 60 days to review the Clean Power Plan and submit their position to the court, before continuing the process to settle the case about the legality of the Clean Power Plan (Bebon, 2017). Even before the District of Columbia Circuit issued a decision in the case, the Trump administration filled request for indefinite abeyance while it considered whether to kill the Clean Power Plan. (Bebon, 2017)

After a short life Clean Power Plan, the Plan was killed by an Executive Order signed by President Donald Trump at the Environmental Protection Agency (EPA) On March 28<sup>th</sup>, for unwinding Obama Climate Policies (Davenport & Rubin, 2017). According to the Grantham Research Institute on Climate Change and the Environment: *'Killing Clean Power Plan will make it 'virtually impossible' for US to meet Paris Agreement Pledges'*. An analysis by the US Government's Energy Information Administration (Grantham Research Institute on Climate Change and the Environment, 2017), express' that, without the Clean Power Plan, the annual emissions of GHG from the US, will not decline any further, unless there are strong actions to cut emissions. (Wallach, 2017)

Because of the possible impact of this Clean Power Plan and its relevance for this thesis, the Clean Power Plan will be briefly set out in the next paragraph.

### 5.1.1 Clean Power Plan

The Clean Power Plan was the first national limitation and regulation on carbon pollution from power plants in the U.S. (Chon, 2017). The plan is meant to set boundaries and help reduce carbon dioxide emissions from existing U.S. power plants, 30% below 2005 levels by 2030, as well as increasing the use of renewable energy and energy conservation. (Club, 2014)

Every individual state has to meet specific standards to reduce CO<sub>2</sub> emissions, but they are free to reduce these emissions by various means, and must submit emissions reductions plans by September 2016 with an extension approval by September 2018. (Plumer, 2015)

The EPA divided the U.S. into three regions, based on connected regional electricity grids to determine a state's goal. States have to implement their plans by focussing on three building blocks: 1. Increasing the generation efficiency of existing fuel plants, 2. Substituting lower CO<sub>2</sub> emitting natural gas generation for coal powered generation, and 3. Substituting generation from new zero CO<sub>2</sub> emitting renewable sources for fossil fuel powered generation. (EPA United States Environmental Protection Agency, n.d.)

#### How the Clean Power Plan works

The Clean Air Act (section 111d), creates a partnership between the United States Environmental Protection Agency, states, tribes and U.S. territories. The EPA sets a goal and states and tribes can choose how they will meet this goal.

The final Clean Power Plan (CCP) will follow that approach, the United States Environmental Protection Agency establish interim and final CO<sub>2</sub> emission performance rates for two subcategories of fossil fuel-fired electric generating units: 1. Fossil fuel-fired electric steam generating units and 2. Natural gas-fired combined cycle generating units.

To maximize the variety of choices which are available to states in implementing the standards and to utilities in meeting them, United States Environmental Protection Agency establish interim and final statewide goals in three ways: 1. A rate-based state goal measured in pounds per megawatt hour, 2. A mass-based state goal measured in total short tons, and 3. A mass-based state goal with a new source complement measured in total short tons of CO<sub>2</sub>.

The states then develop and implement Clean Power Plans that will guarantee that power plants achieve the final CO<sub>2</sub> emission performance rates, rate-based goals or mass-based goals by 2030. (EPA United States Environmental Protection Agency, n.d.)



## State plans

The Final version of the Clean Power Plan provides guidelines for development and implementation of states plans that set up standards of performance or other measures in order to implement the interim and final CO<sub>2</sub> emission performance rates.

The states must develop and implement Clean Power Plans that guarantee that the power plants achieve the interim CO<sub>2</sub> performance rates between 2022 and 2029, and the final CO<sub>2</sub> emission performance rates for their state by 2030.

In order to meet their goals, states may choose between two plan types: 1. The emission standards plan, and 2. The State measures plan. States can develop the emission standards plan, wherein all emission reductions are the responsibility of affected power plants: 'source-specific requirements ensuring all affected power plants within the state meet their required emissions performance rates or state-specific rate-based or mass-based goal' (EPA United States Environmental Protection Agency, n.d.). The State measures plan relies on a mixture of measures implemented by the state, such as renewable energy standards, improvements in residential energy efficiency and programs to improve residential energy efficiency, that are not included as federally enforceable components of the plan.

There is also a final rule which states may use. This final rule gives states the option to work with other states on multi-state approaches, including emissions trading, that allows their power plants to integrate their interconnected operations within their operating systems and their opportunities to address carbon pollutions.

By relying on a diverse set of energy recourses, protecting electric system liability, providing affordable electricity and recognizing investments that states and power companies are already making, states can modify their plans to meet their goals and those of their local communities. (EPA United States Environmental Protection Agency, n.d.).

## Emissions trading

By emission trading, states can meet their goals in a cost-effective way: affected power plant scan meet their emission standards via emission rate credits (rate-based standard) or allowances (mass-based standard). Emission trading is a market-based policy tool that creates a financial incentive to reduce emissions. By creating tradable pollution permits it attempts to add the profit as an incentive for good performance, unlike the traditional environmental regulation based solely on the threat of penalties. (The Guardian, 2011)

According to the Clean Power Plan overview of EPA United States Environmental Protection Agency (n.d.), the benefits of market-based approaches are: reducing the costs of compliance, creating incentives for early reduction, creating incentives for emission reductions beyond those required, promoting innovation and increasing flexibility and ensuring reliability.

### Clean Power Plan – Wisconsin

The World Resources institute did research about the ways, state can meet their standards under the Clean Power Plan, while minimizing compliance costs, ensuring reliability and harnessing economic opportunities.

For Wisconsin, the Clean Power Plan requires to reduce its power sector emissions 34% percent below 2012 levels by 2030. By expanding their three clean energy policies they do have now, Wisconsin can reduce emissions and exceed its Clean Power Plan target by reducing emissions, 64% below 2012 levels by 2030.

1. **Capturing more energy efficient:** As part of Wisconsin's Focus on Energy initiative - which offers money-saving efficiency programs to homes and businesses – the state has adapted annual electricity savings targets of about 0.8 percent of sales. Wisconsin can scale up these benefits by ramping the saving targets, to 2.5% by 2025.
2. **Scaling up use of renewable energy:** Wisconsin reached the goals of its renewable portfolio standard, two years early. Renewable portfolio standard, requires 10% of investor-owned utility sales to come from renewable energy. Building on this progress to increase generation to 30% by 2030, can help reduce emissions further.
3. **Making more efficient use of existing natural gas and coal plants:** Combined cycle natural gas plants, generated less electricity than they were capable of in 2012. By running existing natural gas plants at 75%, combined with making low- and no-cost operational improvements at existing coal plants, could help reduce emissions further. (Gaspar & Igusky, 2016)

Market-based carbon pricing programs and increasing investment in energy efficiency and renewable energy, cannot only reduce emissions, but yield economic benefits for Wisconsin itself. Benefits which derived from the programs are:

1. 1\$ invested in Focus on Energy from 2011 to 2014, returned 3\$ in benefits, saving homes and businesses a cumulative 1.7 billion U.S.-dollars.
2. By increasing the renewable portfolio standards to 25% by 2025, could lead to more than 2 billion U.S.-dollars in new capital investment in Wisconsin and 600 million U.S.-dollars in lease payments to landowners.
3. The state could take in 100 million U.S.-dollars every year from 2022 to 2030, by taking the three steps mentioned above, and selling surplus carbon credits to other states (which the Clean Power Plan encourages the states to do).

(Gaspar & Igusky, 2016)

#### 5.1.2 Madison Sustainable Plan

'Madison will be a self-reliant, peaceful community that relies on renewable, local resources and is able to adapt to changing environmental, social and economic conditions over time. It will be a beautiful place in harmony with the environment where life thrives.' This is the vision of the Madison Sustainability Plan. (City of Madison, 2011).



The City of Madison has as a service provider, a great impact on the environment. Madison maintains over 750 miles of roads, occupies 3.7 million square feet of building space, consumes 54 million kilowatt hours of electricity and 1.3 million natural gas. It produces almost 60.000 tons of garbage, maintains 6.000 acres of parkland and burns 2.3 million gallons of fuel. The City of Madison is one of the biggest employers in Dane County, with over 2.700 employees. Because of the fact that Madison is a large consumer and also steward of the environment, it is of utmost important that the city ensures that the current and future need of citizens and the environment can be met by implementing sustainable principles into its philosophy and operational practices. The City of Madison created a plan which is meant to provide guidance for current and future decision makers, City employees, Urban Planners, Developers and other entities. The strategies which are outlined in the plan are an attempt to lay out priorities and directions that will help the city of Madison to become more sustainable. (City of Madison, 2011).

The Madison Sustainability Plan covers three broad areas: Environment, Economic Prosperity and Social Capital and Community Health. Environment: Natural Systems, Planning and Design, Transportation and Energy and Climate. Economic prosperity includes: Economic Development and Employment and Workforce Development. Social Capital and Community Health: Education, Affordable Housing, Health and Arts, Design and Culture.

The plan tries to balance the three areas, recognizing that, *'A healthy environment underpins economic and social well-being'* (City of Madison, 2011).

Although the environment, society and economy are set-out as separate sustainable categories, there is a strong linkage and overlap between these three areas. To narrow the context of the Madison Sustainable Plan to the subject of this thesis, Appendix C and the matrix in this paragraph, will focus on Planning and Design and Energy and Climate, within the environmental area of the plan.

## 5.2 Incentives and Climate Change in the Netherlands

As part of the Kyoto protocol, the European Union agreed to make Green House Gas reductions of 8%, with special attention to the building sector, which contributes about 33% of global GHG emissions.

To achieve this target, the European Union Member States adopted the EPBD – Energy Performance of Buildings Directive – in 2002. This directive has an impact on the national, regional and local level of the housing sector, with a holistic approach and is translated into building codes and policies for new developments. *'Building companies and associations had to provide certification of their complete building stock, revision of their Energy Performance Certification schemes, implementation of their inspection of heating systems and air-conditioning systems accompanied by quality control mechanisms, training of qualified assessors, information campaigns, incentives and*

*subsidies to support the implementation and acceptance of these new regulations.*' (Brilhante & Skinner, 2014)

In 2010, the directive was revised and aimed to *'redouble the efforts to limit climate change, give the public sector a leading role in promoting energy efficiency and enhance a green economy by improving energy security'* (Brilhante & Skinner, 2014). The EU member states were obligated to accomplish five activities for the improvement in energy performance of developments.

- 1 Establish requirements to calculating an integrated energy performance of buildings
- 2 Set minimum energy performance requirements for new buildings
- 3 Set minimum requirements for the energy performance of existing buildings undergoing significant renovation
- 4 Certify energy performance of buildings
- 5 Carry out regular inspection of boilers and air conditioning systems in buildings and an assessment of boilers older than 15 years.

These new directives had a great impact on the EU country members. The Netherlands had to add a new chapter to the already existing building codes. A building code – Bouwbesluit - sets requirements for energy efficient design and construction of new developments/renovation of existing buildings. Building codes who are dealing with energy efficiency, are called BEEC: Building Energy Efficiency Codes. These energy codes examine the life cycle of buildings and intent to overcome the barriers to implementation and are *'key instruments for greenhouse gas mitigation in the building sector'* (Brilhante & Skinner, 2014). Therefore, energy efficiency requirements in these building codes are the most critical measures for ensuring the energy efficiency in new developments.

But, only an adjustment of the existing building codes cannot meet the requirements which are set up by the 2010 EPBD. Mitigation of new developments and the reduction of CO<sub>2</sub> emissions, need more support.

### 5.2.1 Sustainable initiatives in the Netherlands

The Buildingcode's (2012) - Chapter 5, is a mandatory performance-based code that requires an energy frame calculation to establish the maximum allowed energy performance coefficient (EPC) for residential-, commercial- and public buildings (Brilhante & Skinner, 2014). The Energy Performance of Buildings Directive takes into consideration, the target set by the European Union for new buildings after 2020: energy-neutral buildings with an EPC value of 0 with a use of only renewable energy sources.

Chapter 5 of the Building Code 2012, is dedicated to the technical building regulations in terms of energy efficiency and environmental construction. Chapter 5, section 5.1 covers energy efficiency: Control of the building, Energy performance coefficient, thermal insulation, ventilation, unheated use function, renewals and extensions and

temporary buildings. Section 5.1 covers new constructions and the environment: control of the building, sustainable construction and rebuilding. (BRIS Bouwbesluit Online, 2012)

With the EPG Energy performance of buildings standard, the Netherlands meets the requirements of the revised Energy Performance of Buildings Directive. 'The aim is to tighten the requirements for energy-neutral buildings using an integration of the assessment methods for new construction, existing construction, commercial and residential buildings. The new method adapts the European standards and the latest techniques. In order to obtain a building permit, an EPC calculation is necessary.' (Brilhante & Skinner, 2014)

A way to encourage real estate developers mitigate developments and develop sustainable properties, is to encourage property buyers to choose properties which, for example, are using relatively less fossil energie. The Netherlands tries to encourage property buyers by creating a building labelling scheme, along with regular inspection and assessment of heating and cooling installations. (Brilhante & Skinner, 2014)

The most common certifications to support enforcement of the building code are:

1. Energy performance certifications
2. Positive labelling for buildings beyond the minimum BC level
3. Inspection of boilers
4. Inspection of HVAC (heating, ventilation and air conditioning) systems
5. Green certifications

To encourage the use of green energy/energie efficient technologies of new developments and existing buildings and to support the reduction of CO2 emissions, the Energy Performing Certification is a legal instrument – complementary to the energy code, according to Brilhante & Skinner (2014)

### Energy Performance Certificate

The energy performance certificate assigns an energy performance rating to residential-, commercial- and public buildings: Energy certificate classes range from A (many energy saving measures taken) to G (many energy saving measures possible). When a building is for sale, the owner must present a valid Energy Performance certificate at the moment of transaction, which involves a qualified assessor to visit the property and assess the building in terms of the type and quality of constructions and installations. (Betlem, Van Eck, Beuken, Heinemans & Van Diggelen, 2010).

In 2006 the BEG (Decree on Energy Performance of Buildings) and the REG (regulation on Energy Performance of Buildings), were legally implemented in The Netherlands. In 2008, the Netherlands developed an Energy Performance Certificate for existing buildings. Since Januari 1th 2008, new developments requires an energy label, indicating the Energy Performance of Buildings. (Brilhante & Skinner, 2014)

### Supporting schemes

As already mentioned in paragraph 6.1.1, the Building Code sets out a framework for developers to follow for more sustainable and greener buildings. The Government of the Netherlands has also established several schemes to support the application of the Building Code. Largely because of the high costs implications of construction, using the new guidelines. (Brilhante & Skinner, 2014)

Below, the six schemes, of which two are voluntary.

### Energy investment Allowance

The Energy Investment Allowance is a tax deduction system for entrepreneurs/ developers who are investing in energy saving technologies, provided by the Ministries of Finance and Economic Affairs. This tax system offers two benefits: lower energy costs and a deduction on taxable profit. These investments in sustainable technologies, cover different types of technologies: from insulation and ventilation, to wind energy and lighting. It also covers investments in energy efficiency of existing residential buildings. (Rijksdienst voor Ondernemend Nederland, 2017)

### Stimulation of Sustainable Energy

Stimulation of Sustainable Energy, also known as SDE, is an operating grant by which producers – companies, institutions and non-profit organizations - receive a financial compensation for the renewable energy they generate. (Brilhante & Skinner, 2014)

### MIA/Vamil

MIA is a tax deduction scheme, introduced by the Ministry of Infrastructure and Environment, which focusses on investments in environmentally friendly technologies: e.g. friendly lighting systems, rainwater installations or insulation systems. This tax scheme encourages innovative environmentally friendly products, by facilitating their introduction to the market. MIA is meant for entrepreneurs/developers, just like Energy Investment Allowance.

### The Green Funds Scheme

The Green Funds Scheme is a tax incentive scheme which encourage green initiatives, with as goal to offer new opportunities for highly energy efficient buildings. How it works: through the Green Funds Scheme, projects with a green label, a green certificate, are eligible for funding at lower interest rates. (Brilhante & Skinner, 2014)

This tax incentive scheme is applicable for existing buildings and new developments, in both commercial and residential buildings. The Green Scheme table below, shows the type of construction and the quality for financing a green project.

### MJA (meejarenaafspraken) – Voluntary

MJA is one of the two, long-term (meerjaren) voluntary agreement on the effective and efficient use of energy, between large industries who are big energy consumers, and the Dutch Government. This agreement is a commitment for parties to achieve an 'average

*Energy Efficiency Improvement for their facilities of 30% in the period of 2005-2020'.*  
(Brilhante & Skinner, 2014)

#### Agreement 'more with less' for existing buildings – Voluntary

The More with Less agreements, is the second voluntary agreement to stimulate energy savings in existing buildings. Many of the existing buildings in the Netherlands have a lot potential for energy saving technologies and reduction of Greenhouse Gas emissions. Through joint venture with key players in the housing sector, the Dutch Government wants to stimulate energy savings. To make this stimulation possible, the website [www.meermetminder.nl](http://www.meermetminder.nl) was created to give information about subsidies and grants and about the incentives to save energy. These mitigation and energy saving measures do cost money, but national regulations and subsidies of the provinces and municipalities, makes it more affordable. Additional to these regulations and subsidies, the Ministry of Finance introduced a reduced VAT rate for improvement in insulation to wall, roofs and floors from 19% to 6%. The Dutch Government provides encouraging rate loans for homeowners who want to invest in energy efficiency. This subsidy which is developed by the Dutch Agency, is intended for: Municipalities and Provinces, Professionals in construction such as consultants, contractors and installers, housing associations and private landlords and homeowners.

### 5.3 Incentives and Climate Change in the Randstad region

The Dutch Government has the ambition to be energy neutral in 2050: New developments will be built completely energy neutral, by 2020 and the entire built environment will be energy neutral by 2050. This progressive ambition, and its accompanying measures is that the Dutch Government wants to be ahead of the climate change 'trouble', in the future (Dulk, 2013). Henk Ovink, Special Envoy for International Water Affairs at Kingdom of the Netherlands, explained in TV show: RTL Late Night (06-09-2017) that the Netherlands want to be prepared for the effects of climate change, their mindset is preventive, in contrast to the reactive mindset of the United States.

To gain insight into the effects of the Dutch Climate Change policies and the sustainable initiatives of cities in the Randstad, the initiatives of Utrecht and Rotterdam will be explained: Climate Neutral Utrecht and Zero Energy Rotterdam.

#### 5.3.1 Utrecht | Het Energieplan 2016

The ambition of Utrecht is to be climate neutral in 2030, which means: saving as much as possible energy, generating energy with renewable energy sources, replacement of non-renewable energy sources, such as natural gas and avoiding unnecessarily lost of generated energy. (Gemeente Utrecht, n.d.)

To achieve these ambitions, the 'Energieplan 2016' will function as a framework for how the municipality of Utrecht should start with making the city climate neutral, saving and generating, green energy.

## Energieplan 2016

Energieplan 2016, is the result of a gathering of 165 residents from Utrecht. In three 'city talks', the residents of Utrecht formulated an ambition about the goal of an energy transition from non-renewable energy to renewable, green energy: Utrecht should be climate neutral in 2030! However, the Energieplan 2016, which is created during these city talks, indicated the direction of a climate neutral Utrecht in 2030, but does not give the answer about 'how' these goals should be achieved, 'what' kind of resources are needed and 'who' should do what to achieve the goal of being climate neutral. Since the Netherlands has a long history of public led development, it is not a complete surprise that the 165 residents of Utrecht have given the Municipality of Utrecht the role to translate the Energieplan (2016), to concrete actions which need to be taken. (Gemeente Utrecht, 2015)

The City of Utrecht is dominated by gas and coal as energy supply. The oldest district heating network is based in Utrecht, and it is fed by heat from the gas-fired power station. Currently, Eneco is investigating the possibility for the realization of a biomass boiler that will supply heat to the city's district heating network. At this moment, there is no large-scale sustainable energy generation in Utrecht itself. Of all the energy, the city needs – 1.55 million tons per year -, about one-third is required for housing, for work it is almost half and the rest is for transportation. (Gemeente Utrecht, 2015)

The Energieplan consists out of 5 sections: housing, work, transportation, generating energy and grid and balancing of the grid and storage of energy. All five subjects need special attention when it is about becoming more sustainable, saving energy and generating green energy. However, because of the subject of this thesis, the focus of Appendix D and the matrix in this paragraph, will be on housing.

## Assumptions of the Energieplan 2016

### Collaboration between partners

Achieving the ambitions of the Energieplan (2016), a maximum commitment of parties, in- and outside the city is necessary: municipality, residents, companies, government and the province. Action has to be taken from all residents, visitors and companies. The Energieplan (2016), contains many measures, for which legal, technical and/or financial thresholds need to be terminated. The municipality of Utrecht cannot put the proposed measures into effect, all by it self. They need a proactive approach and collaboration from the province of Utrecht, the government and the European Union. This concerns for example: procurement of electrical public transport (done by the province), creating a broader offer for customers of district heating, possibilities for obligation in advance of energy-neutral and facilitating smart grid solutions. (Gemeente Utrecht, n.d.)



As already mentioned above, the residents of Utrecht asked for a more active role of the municipality by implementing the Energieplan (2016) and for a municipality that makes clear choices. The municipality will get four roles:

1. **Directing role:** The municipality takes the lead by making choices, for example in the case of large-scale spatial adjustments, the use of the city's heating system or choices about the replacement of existing gas pipelines.
2. **Legislative/enforcement role:** The municipality focusses (consistently) on its public-law instruments, such as maintaining saving energy under the Environmental Management Act.
3. **Leading and facilitating role:** The municipality as a driving force of activities in Utrecht, for example: facilitating purchase 'actions' of solar panels and LED lightning, providing land, and challenging market players for appliances to come up with low-cost construction so that low-income households can buy/use energy-efficient appliances, too.
4. **Exemplary role:** The municipality is as major buyer (of for example appliances, new constructions, et cetera), an example in the market, who can be seen as leader. So, she has to use her exemplary role, to encourage residents, companies, real estate developers, to be and to build energy efficient, with as goal energy neutral.

(Gemeente Utrecht, n.d.)

In order to achieve all measures, organizations and residents have to be more energy efficient, when it comes to housing, work and transportation. This asks for more knowledge about the possibilities to be more energy efficient, and the awareness of the changing climate. A central, independent information point that focusses on specific groups, can help raise awareness and knowledge. The municipality can play a role in stimulating awareness through improving information provision as described in various parts and measures in the Energieplan (2016). The municipality of Utrecht has a major and proactive role, in the transition to renewable energy. In many of the measures, the municipality initiates. The exemplary role of the municipality must make measures and possibilities, visible. This can be done by placing solar panels on all buildings of the municipality, such as schools. She can also provide more information by energy events, via the website or simply at the office. It could also permanently support residents' initiatives, for example the energy ambassadors. On long-term, it is possible that the municipality becomes an energy supplier, with residents as stakeholders. The university of Utrecht and other institutes, will bring knowledge about being more sustainable and they will start by mitigate their own buildings.

(Gemeente Utrecht, 2015)

### 5.3.2 Rotterdam | Programma Duurzaamheid 2015-2018

The ambition of the Municipality of Rotterdam is to generate more green, sustainable energy than the City uses themselves, in 2030. This ambition has been announced in 'Programma Duurzaamheid 2015-2018', a sustainable plan by the municipality of Rotterdam. Councilor of Rotterdam, Pex van Langenberg, explained in a press release (2015): *'By making homes and households more energy efficient, households will save up on energy costs. This can save all households €180 million a year. The next four years, at least 10.000 homes must be more energy efficient.'* (Van Gemert, 2015)

The harbor of Rotterdam will play an important role in the sustainable plan. According to the Municipality of Rotterdam, the harbor produces enough residual heat for 1 million households. The residual heat must heat 150.000 households via the district heating by 2030. In addition, 6000 homes will receive solar panels on the roofs, before 2018. Wind energy should be double and by 2025, wind should provide 200.000 households with energy. As Exemplary role, the municipality wants to give the inhabitants of Rotterdam a good example, by saving 40% energy at their own offices, gyms and school buildings. (Warm wonen, 2017)

In 2016, a progress rapport of the 'Programma Duurzaamheid 2015-2018' has been released. The 'Programma Duurzaamheid 2015-2018' will be used to gain insight and knowledge about the sustainable initiatives from the municipality of Rotterdam. The progress rapport will be used as a reflection on the ambition and goals of 'Programma Duurzaamheid 2015-2018'.

#### Programma Duurzaamheid 2015-2018

*'This program is the result of a basis, submitted to many Rotterdammers and stakeholders and to which they have given their input. We and you cannot realize sustainable ambitions alone.'* (Langenberg, 2015)

Rotterdam achieved, with a 'sustainability' budget of €26,5 million, in total more than €400 million worth of sustainable investments in the city and harbor, in four years. With the new sustainability program, the municipality continues and focuses on innovation and experimentation. The municipality of Rotterdam wants to do this, together with inhabitants of Rotterdam, companies, institutions and civil society organizations in the city and harbor. With her partners: Rotterdam Climate Initiative and Clean Tech Delta, the municipality encourages investment, promote innovations and wants to create more jobs. (Gemeente Rotterdam, 2015)

In 'Programma Duurzaamheid 2015-2018', three ambitions are announced, which overlap.

1. 'We work on a green, healthy and future-proof city'
2. 'We want cleaner energy at lower costs'
3. 'We strive for a strong and innovative economy'

The starting points for this program are:

1. Provide sustainable solutions and improvements in the living environment of inhabitants of Rotterdam
2. Offer inhabitants of Rotterdam more knowledge and information about sustainable solutions and improvements
3. Encourage and assist in initiatives from the inhabitants, make sure that the inhabitants of Rotterdam can join sustainable projects
4. Strengthen cooperation in the city between the municipality, institutions and companies
5. Provide a connection and keep in touch with the government and Brussels
6. Provide attractiveness by new types of business' in the city and port, such as Clean Tech

(Gemeente Rotterdam, 2015)

With the ambitions and starting points mentioned above, the municipality wants to give a good example by taking measures in their own organization and real estate: measures which save energy and contribute to improved air quality.

In appendix D, the three ambitions will be set-out. Ambition 1, part 4 and ambition 2 will be explained more in-depth, this due to the subject of this thesis.

(Gemeente Rotterdam, 2015)

## 5.4 Matrix sustainability plans

In this matrix, the three sustainability plans: Madison Sustainable Plan, Het Energieplan 2016 and Programma Duurzaamheid 2015-2018, will be compared. This will be done by classification of the 'actions' or 'tools' for sustainability, into four different roles from the municipality or government: directing role, Legislative/enforcement role, Legislative/enforcement role and exemplary role. The actions and tools described below, are not the complete list of actions or tools as mentioned in the sustainable plans. For the complete list, see Appendix C, D and E.

<b>Madison Sustainable Plan</b>	<b>Het Energieplan 2016</b>	<b>Programma Duurzaamheid 2015-2018</b>
<b>Directing role</b>		
Create programs, plans and policies at city level	Create plans at neighborhood level	Create plans, based on BREEAM methodology
Reallocate budget for more energy efficiency	Replacements of old gas pipelines	Reliable collective heat supply facility in 2030
Direct city purchasing	Start using alternative forms of heating facilities	Making agreements with housing corporations, to reach the goals
Develop carbon footprint		Feed the city with renewable heat and heat from green heat sources
<b>Legislative/enforcement role</b>		
Create strategies and requirements	Legally required to construct developments energy neutral	Sustainability as a requirement in the development criteria
Rewrite zoning codes and regulations to permit district	Control the degree of sustainability, on own land	Industry as heating, ensure that framework conditions in law and regulations will make this ambition feasible
Requiring minimum green building certification level, supported by public funds	Dutch Building Code	
	Influence private-led developments by further regulatory capabilities	

Leading and facilitating role		
Take initiative and lead the area in sustainability	Create awareness	Perform framework and facilitating role in the coming years, for developers, housing cooperations and other market parties
Encourage and stimulate private sector	Construction-based financing	Provide information and knowledge
Educate the public	Services that also allow low-income household to purchase energy-efficient devices	Provide financing for energy efficiency upgrades to private buildings
Create green building certification and incentives	Explore possibilities for lease constructions for energy efficient devices for lower-incomes and students	Encourage and stimulate private sector
Provide information and knowledge	Performance negotiations' between the municipality and the housing cooperations	Create knowledge and relational networks and facilitate sustainable developments
Provide financing for energy efficiency upgrades to private buildings		Present innovations that can improve and accelerate
Exemplary role		
Demonstrate sustainability on all public projects	Place the most energy-efficient devices in new developments	Participate in two pilots for the 'Energy performance certificate' (EPC)
Buy energy from clean power sources	Large-scale purchasing operations	Two collective solar panel projects in progress
Expand City's renewable electrical energy purchase as example to the community		A developed connection to district heating, leading to an approach for the rest of Rotterdam

### 5.4.1 Show case Utrecht | LieflandPARK

<b>Development</b>	DAO B.V.
<b>Construction</b>	Thunnissen Group
<b>Plan design</b>	Heren 5 Architecten B.V. Carve B.V.

LieflandPARK, is a residential area, located at the north of Utrecht's City Center. The former park was a hidden sports field where the future housing development will be realized, at the van Lieflandlaan - 20 sustainable homes will be developed, and a park - the LieflandPARK. (Tunnissen Groep, 2017)

The municipality of Utrecht has written out a 'tender' (development request). In the first phase, the municipality selected three parties that could make a plan for the location. The selection criteria were: Design quality, sustainability and participation with the neighborhood. In addition, the municipality of Utrecht had identified a number of concrete frameworks for the new buildings to meet. After the municipality selected three potential developers, the residents of the neighborhood had to compile a 'wish list' for the developers to anticipate on in their plans. (Thunnissen, 2017)

To make it possible for the neighborhood to offer much more quality than through a traditional tender, the municipality set a fixed price for the building plot. The ambition of the developing group that won the tender - DAO Project Development, Thunnissen Bouw en Heren 5 Architects in collaboration with Carve and Dietz Communicatie - is to make Utrecht's most sustainable housing at the Liefland Park. (Thunnissen, 2017)

The so-called energy performance coefficient (EPC) of a house expresses the energetic performance of a property. In addition, the lower the EPC value is, the more sustainable the dwelling. Around 2000, the government for new housing homes demanded an EPC of 1.0. Currently, this requirement has already been tightened to an EPC of 0.4. In comparison, the homes in Van LieflandPARK have an EPC value of an average of -0.22. (Tunnissen Groep, 2017)

All houses in Van LieflandPARK are nul-op-de-meter - Zero energy. This means that all energy needed for living in a house, is generated in a sustainable way. All homes are completely gas-free. By using a heat pump, much of the energy needed to heat the house is taken from underground. The solar panels generate energy for the heat pump that warms the house and produces hot water. (Tunnissen Groep, 2017)

With a zero energy house, energy costs are virtually eliminated. In addition, the extreme sustainability of the houses is rewarded by several banks with an additional discount on the mortgage rate. The result is therefore an affordable, comfortable house with minimal environmental impact. (Thunnissen, 2017)



## Van LieflandPARK: Zero-Energy goals

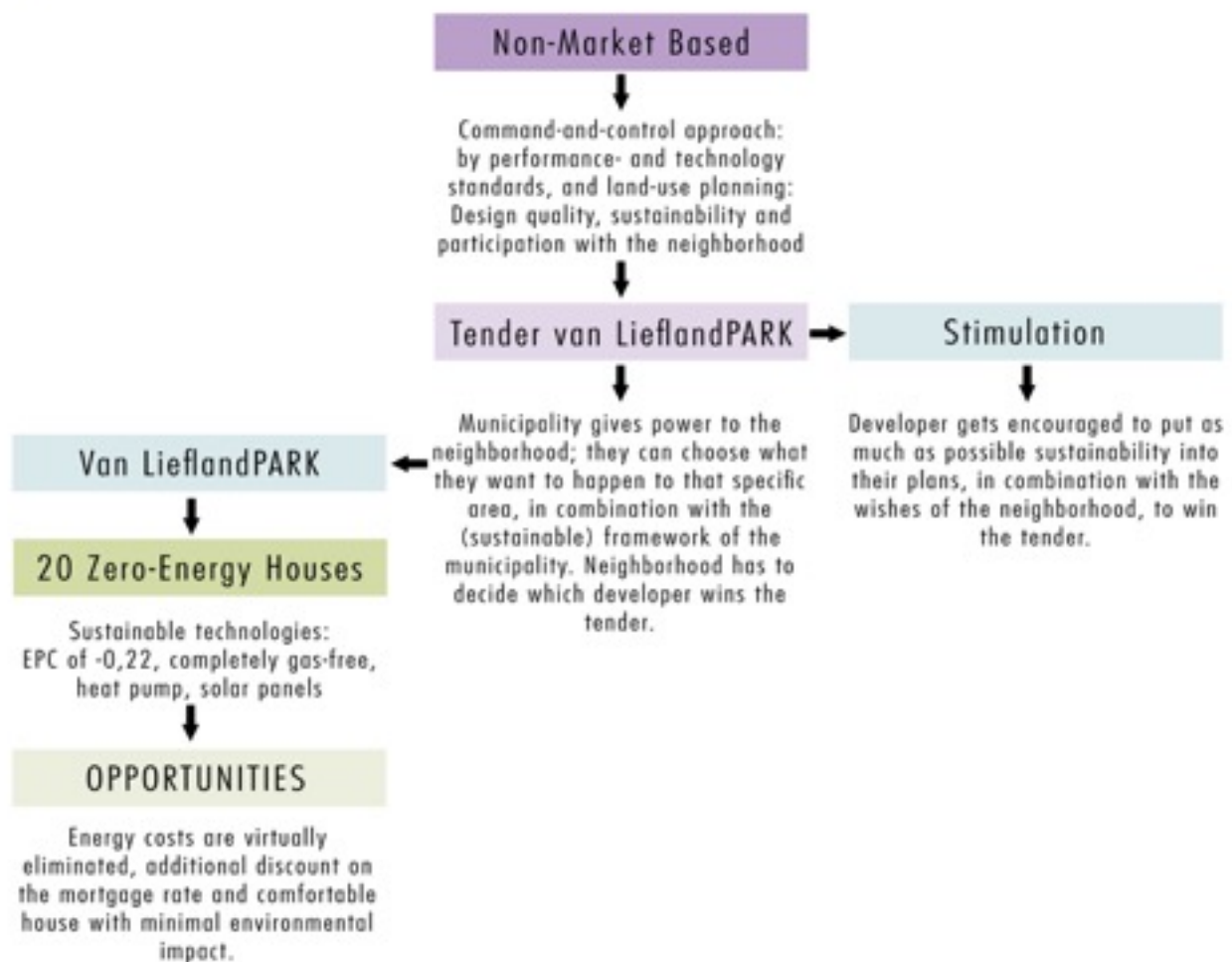


Figure 6: Van LieflandPARK (Own ill.)

### 5.4.2 Show case Rotterdam I Heijplaat

<b>Development</b>	Van Omme en de Groot B.V.
<b>Construction</b>	Van Omme en de Groot B.V.
<b>Plan design</b>	Kuiper Compagnons

In Heijplaat – one of Rotterdam’s City Ports – the ambition is to make the area energy-neutral by 2020. With a range of measures, a large number of partners are willing to collaborate in this ambition. (RDM Rotterdam, n.d.)

Het verborgen geheim’ is a residential area in Heijplaat. The goal is to realize 170 ‘nul-op-de-meter’ – zero energy - houses. This means, houses will generate as much energy as they consume. By solar panels, houses will generate enough energy for both, building as household energy consumption. Heating and cooling of the houses will be done by individual heat pumps, with heat and cold storage in the soil (Van Omme & de Groot, n.d.). Each home has its own heat pump, with ‘ground loops’ in the ground, which warms the house in the winter and cools in the summer. In addition, the houses are extra energy efficient, because of the triple glass and the heat recovery units used for ventilation and shower water. (Ooms Rotterdam, n.d.)

The benefits for the homeowner are the minimum monthly energy costs. All the homeowner has to pay, is a fixed rate for the rent of the heat pump and solar panels. This rent is lower than what a homeowner normally has to pay for energy bills. It is also possible to buy and/or finance the installations by way of a mortgage. When buying a zero-energy house, the buyer can get up to €27.000 of extra mortgage. (Ooms Rotterdam, n.d.)

Next to ‘Het verborgen geheim’, Concept House Village is located in Heijplaat, too. Concept House Village (CHV), is a result of a technical idea where innovative products, buildings and systems are tested by residents. According to RDM Rotterdam (n.d.): *‘How to design, develop and manage a more sustainable and smart environment?’* This is the leading question and goal of Concept House Village. The link between different tasks is possible in the test environment of Concept House Village. Think of the program ‘Versnelling010’ (large-scale energysaving initiative), Concept House Village and ICDuBo (Centrum Sustainable Construction). This collaboration creates a test environment for innovation and sustainable residential projects and concepts and products, for already existing buildings and new developments. An example hereof is the residents of Rotterdam who are living in prototype houses. These residents cooperate with studies regarding sustainable homes. This helps the researches to gather information for developing new and better concepts that can provide a more sustainable and energy-saving environment. Concept House Village is a collaboration with: TU Delft, University of Rotterdam, ICDuBo, SBR Curnet and the municipality of Rotterdam. (Gemeente Rotterdam, n.d.)

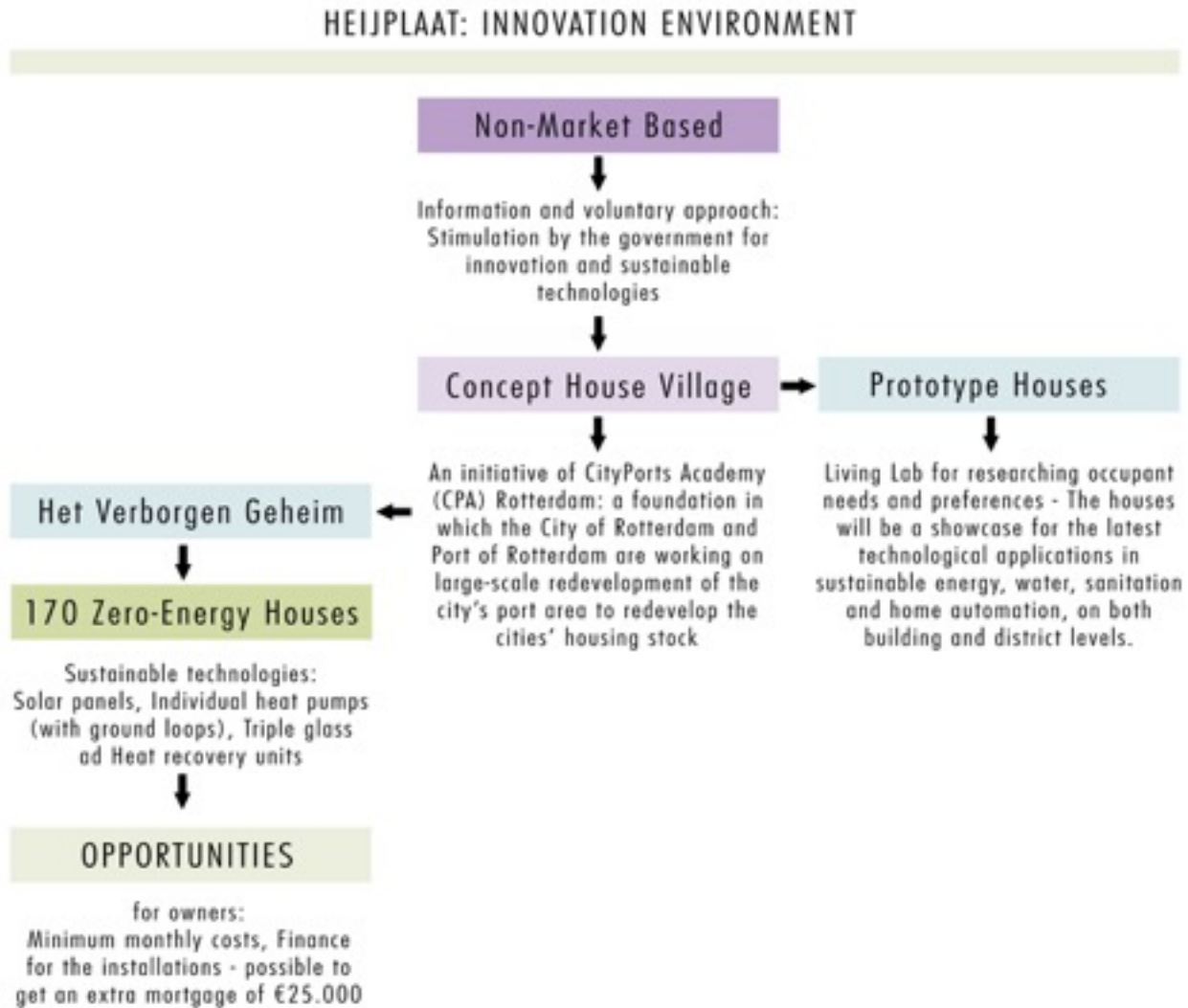


Figure 7: Heijplaat (Own ill.)



(Madison: Own photograph, 2017)



## Chapter 6 Real Estate Development Madison

This chapter presents four case studies about mitigation in residential real estate, downtown Madison. Before going into depth on the findings, the context of downtown Madison and the sustainable goals of the Madison Sustainable Plan, will be discussed. Through document analysis and interviews, the question: What are the most significant factors to have influenced the Residential Real Estate sector in Madison area to implement climate change mitigations, can be answered. (United States Census Bureau, 2016)

### 6.1 Madison

Madison is the county seat of Dane County, and the U.S. capital state of Wisconsin with a population estimates of 252,551 people in 2016.

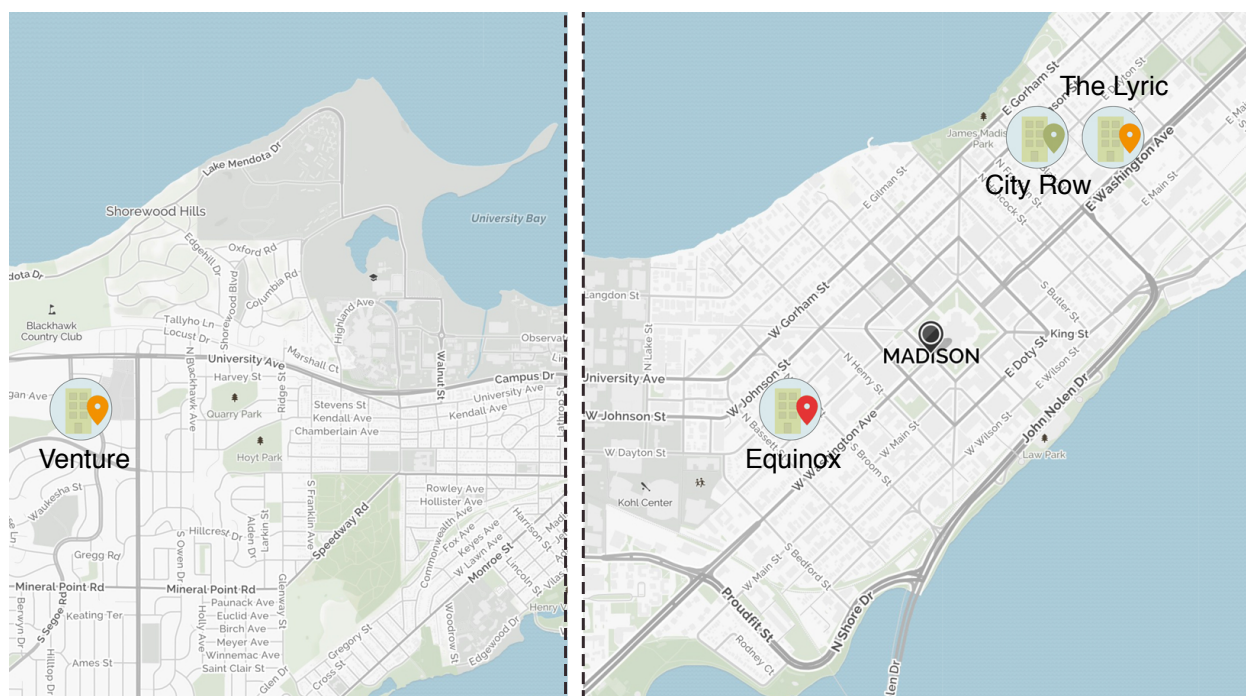


Figure 8: Case Study Map Madison (Own ill.)

The past 20 years, downtown Madison has witnessed memorable building spurts (Ivey, 2014). In 1997, the Frank Lloyd Wright-designed Monona Terrace Convention Center opened, followed by the nearby Hilton Hotel. During the real estate ‘run-up’, of the 2000s, downtown Madison experienced a spurt of condominium development nearby the Capitol Square, and student-oriented apartment projects around the University Avenue. These projects brought high-rise development to that busy corridor, downtown Madison. In 2006, downtown Madison reached a record, \$468 million worth of development projects. During the Great Recession in 2010, the worth of new

developments fell to just \$84.7 million: less than a fifth of the record in 2006. According to Ivey (2014), the urban core has seen a development boom, a sheer volume of new units brought onto the local market, since the recession ended. This new development propulsion is coming from the private sector (Ivey, 2014). The private developers are responding to the rising demand for luxury apartment properties. The reason behind this demand are the young professionals from e.g. the University and especially the employees of the Madison-based software company Epic (Krause, 2013). *'It's not totally surprising that 20- and 30-somethings with education and decent income would not want to live in vinyl-clad Verona and strongly prefer downtown Madison'* (Ivey, 2014).

## 6.2 Case studies

2010/2011	2016/2017
City Row Apartments Stone House Development, Inc.	Venture Apartments Madison Property Management, Inc.
Equinox Apartments Madison Property Management, Inc.	The Lyric Apartments Stone House Development, Inc.

Green stands for a development, which received sustainable certifications and did implement sustainable technologies to reduce costs and to receive financial support from the government. Red stands for a development, which did not receive sustainable certifications, nor did implement sustainable technologies at the time of construction. Orange stands for developments which did not receive sustainable certifications, but did implement sustainable technologies, in order to receive rebates on appliances and keep their own costs down.

The next four paragraphs will give inside into the context, type and sustainable features/decisions of the case studies.





(City Row Apartments: Apartments.com, 2010)

### 6.2.1 City Row Apartments

<b>Developer</b>	Stone House Development Madison, WI 53703
<b>Architect</b>	Knothe & Bruce Architects, L.L.C. Madison, WI 53705
<b>Date</b>	August 2010
<b>Location</b>	602 – 626 Johnson Street Madison, WI 53703

## Summary

City Row Apartments, a Stone House Development Inc. development which opened in August 2010. The project achieved an Energy Star certification. City Row Apartments consist of 3 separate buildings of 3 stories high, 83-units and underground parking stalls. The project provides 70,781 square feet of housing, 37,198 square feet for approximately 110 underground parking stalls and a 1.09-acre site. The total development cost for City Row Apartments is \$16,790,000. (R. Arnesen, personal communication, June, 2017)

City Row Apartments was the first WHEDA – Wisconsin Housing and Economic Development Authority - property closed in the state of Wisconsin in 2009, utilizing TCAP – Tax Credits Assistance Program - funds. For WHEDA Low-Income Housing Tax Credit Program, see paragraph 6.2.7.

## Location

The development is located at the 600 block of East Johnson Street in downtown Madison, Wisconsin. The site is roughly rectangular in shape and consists of 1.09 acre. The general area consists primarily of commercial uses and a mixture of owner and renter occupied single-family homes.

The site possesses convenient vehicular linkages with easy connections to the major roadways in the City of Madison. The site is deemed as an above average location for multifamily housing.

## Program

The building has 83 apartments and an underground parking garage for approximately 110 cars. The project provides about 70,781 square feet housing, divided into three separate buildings.

Stone House Development rents the apartments to family tenants with income levels at or below 60% of the Dane County median income and at restricted rent levels. As a result of these income and rent restrictions, the subject's ownership entity will be entitled to approximately \$1,415,232 of direct annual tax credit\* for ten years. (R. Arnesen, personal communication, June, 2017)

\*Section 42 of the Internal Revenue Code encourages construction of affordable housing by offering tax credits to developers for eligible units.

## Sustainable highlights

### **Solar PV**

City Row has solar electric panels that convert sun into electricity. These small panels are placed on the roof. Madison Gas and Electric (MGE), buys all of the electricity that is generated by the panels at \$0.25/kilowatt (vs. \$0.11) as an incentive to install the system.

### **Solar Hot Water System**

The large panels on the roof preheat hot water that is used for the in-floor radiant heat and for the domestic hot water: showers, dishes, laundry, et cetera.

### **In-Floor Radiant Heat**

All of the units and common areas have tubes in the floors (encased in lightweight concrete) that circulate hot water. This provides a very even heat throughout the apartment. Residents often find they can keep their thermostat at a lower level than with forced air heat. Each unit has a flow meter that keeps track of the usage and will generate individual tenant bills for heat and hot water.

### **Super-Efficient compact boilers/Indirect water heaters**

Operate as high as 98% efficient. In addition, the water coming into the boilers is pre-heated by the solar panels, which leads to additional savings. The project has no separate hot water heaters. The boilers that heat the water for the in-floor heat also heat water for the domestic hot water.

### **Energy Start Appliances**

All appliances are *Energy Star* rated.

### **High performance Lighting**

Units and common areas are all compact fluorescent (CF) lights. The underground parking structure is lit 100% by LED fixtures. In addition, there are motion sensors in the common areas to turn some lights off when not needed.

### **Building Envelope**

The exterior walls were all insulated with closed cell spray foam insulation. This creates a much more efficient exterior wall as well as provides much great sound isolation and air-sealing.

### **Un-heated Garage**

The garage is unheated. To accomplish this, it was necessary to insulate the floor of the first floor units as well as convert to a “dry” sprinkler system in the garage.

### **Plumbing**

The project has many water saving features including faucet aerators and “Water Sense” branded toilets.

### **Air Sealing and Testing**

The project incorporated a higher level of air-sealing between units and also between the units and the exterior. This involved extensive additional caulking during construction as well as monitoring (by *Focus on Energy*) and testing at the time of project completion (blower door testing) to ensure that the building performed as designed.

(R. Arnesen, personal communication, June, 2017)

### **Awards and certifications**

#### **2011 First place RPA Award for innovation**

The City Row Apartments in Madison, Wisconsin received the Radiant Professional's Alliance

#### **(RPA) First Place Award for Innovation**

Based on new or unique products and applications that advance radiant technology and use alternative energy sources to enter new markets. The award was presented to Cardinal Heating and Air Conditioning based in Sun Prairie, Wisconsin.

#### **Energy Star**

Sustainability in designing process. City Row Apartments is one of only 17 ENERGY STAR multifamily high-rise buildings in the nation.

#### **Green Built**

City Row Apartments are certified Green Built.

(R. Arnesen, personal communication, June, 2017)

### **Driving factors**

In this paragraph, the findings of which driving factors can encourage the residential real estate developers to mitigate their developments in Madison are presented. This part is mainly based on the interviews with the developers. The interview questions are related to the five 'drivers for development', as mentioned in the event-based model of the real estate development process (Adams & Tiedell, 2013): Economic, Political, Social Demographic, Technological, Cultural and Environmental. For the interview questions, see appendix G.

Driving factors for mitigation and implementation of sustainable technologies, may operate independently or in combination with each other. (Adams & Tiedell, 2013)



## Economic

Stone House Development, Inc. is aware of the changing climate, and has a history of incorporating sustainable technologies in their affordable housing developments. Although, they want to incorporate sustainable and energy saving technologies, the available budget for the development is decisive whether to implement or not to implement sustainable features.

*‘As a company, Stone House Development, Inc. has a history of incorporating sustainable and energy efficiency technologies whenever the budget allows.’*

(R. Arnesen, personal communication, June, 2017)

Although, the budget is a decisive factor for almost every private developer, the possibility to keep the operation costs low by mitigation of new developments, plays a big role too. Especially, since Stone House Development, Inc. is specialized in affordable housing projects, one of their priorities is to avoid flat revenue streams.

*‘In addition to the general societal benefits, we feel that anything that will keep our long term operating costs down will protect us against flat revenue streams, which is a big concern for an affordable housing project.’*

(R. Arnesen, personal communication, June, 2017)

*‘As an affordable housing development, where rents are restricted, anything we can do to lower operating costs will protect the economic well-being of the development.’*

(R. Arnesen, personal communication, June, 2017)

Next to keeping the operation costs down, mitigation – implementing sustainable technologies – can be an attractive market strategy. Especially for affordable housing projects, tenants with a low income are not able to pay expensive utility costs.

*‘City Row utilized many technologies that greatly reduced our tenants’ monthly utility costs, which makes our project attractive to people on a limited budget.’*

(R. Arnesen, personal communication, June, 2017)

Even though, mitigation is an attractive market strategy, Stone House Development does not invest in sustainable technologies because of market competition from other developers.

*‘We are generally doing much more than other developers.’*

(R. Arnesen, personal communication, June, 2017)

## Political

As mentioned in chapter 4, it is possible that governments may be able to use approaches, tools and policies to encourage mitigation and help companies overcome

barriers (Argwala, 2011). Stone House Development did not notice or experienced a political demand where they had to respond on.

*'We did not get encouraged by political support to implement sustainable technologies, nothing formal.'* (R. Arnesen, personal communication, June, 2017)

Although they did not have to respond on a political demand, they needed approvals from the municipality, there was a beneficial aspect on implementing sustainable technologies.

*'There was not a political demand and to respond on, although we think incorporating these technologies helps with neighborhood approvals.'*  
(R. Arnesen, personal communication, June, 2017)

## Technological

Now Stone House Development, Inc. explained why they did mitigate City Row Apartments, the questions why they choose for the sustainable technologies they did use, raises. What makes the technologies you did use attractive and how did you get encourages to use these technologies?

*'Much of what we chose was the result of our planning process with our green building consultant. For us to incorporate a given technology, it had to be something that we could get rebates/grants to help offset the cost, it had to be proven technology (we didn't want something that would break or fail after completion), also there had to be expertise from the local subcontractor base. In other words, we didn't want to choose a technology that no local contractor had experience installing. Also, we gave priority to items that had some tangible benefit (reduced operating costs or costs to tenants).'*  
(R. Arnesen, personal communication, June, 2017)

Even though they did implement sustainable features, 'money' was again the factor which withhold them to integrate more sustainable technologies.

*'The cost to implement discouraged us to implement more sustainable technologies. We looked into geo-thermal but decided that solar hot water was more cost effective.'*  
(R. Arnesen, personal communication, June, 2017)

## Social Demographic

According to Setterlund (K. Setterlund, personal communication, June, 2017), there is a social demographic marketing demand for Stone House, to incorporate sustainable technologies into their projects.



*‘The main demographic demand we see is any green technology that will reduce the energy costs to the tenants. One example of this is in floor radiant heat. This type of heat is extremely efficient, and therefore, low cost to the tenants’.*

(K. Setterlund, personal communication, June, 2017)

Because of the subsidies and requirement from the WHEDA program, they are able to anticipate more on what people want: less energy costs. (R. Arnesen, personal communication, June, 2017)

*‘We are able to anticipate which technology the tenants will be most excited about. This usually equates to anything that provides them a cost saving’.*

(K. Setterlund, personal communication, June, 2017)

### **Cultural**

Because of the general competition between real estate developers, it can be an interesting factor to implement new sustainable technologies and mitigate their developments. In this way, developers can compete with the newest technologies, so that tenants will choose their development over other, not that sustainable, developments. However, the factor ‘costs’ still plays a big role.

*‘We like to be the market leader, although rising construction costs over the last several years had made it difficult to continue to incorporate these technologies’.*

(R. Arnesen, personal communication, June, 2017)

### **Environmental**

‘How many of what you are doing is driven by the fact that Madison has stronger growth than for example Detroit, so there is stronger competition between developers? What if you were a developer in Detroit, would you do the same thing as you are doing right here in Madison?’ (Interview question, see Appendix G)

*‘Yes, if the budget allowed in any given market. Most developers in Madison don’t do much for sustainability.’* (R. Arnesen, personal communication, June, 2017)

### **WHEDA Low-Income Housing Tax Credit Program**

The LIHTC – Low-Income Housing Tax Credit – program was created in 1986, to encourage private developers to invest in/and develop rental housing for low- to moderate-income families, seniors and persons with special needs (WHEDA, 2017). The LITHCs are governed by Section 42: Internal Revenue Code and corresponding Federal Regulations.

Private developers are using LITHCs to achieve lower rents that are affordable for low-income to moderate households. Many of these LITHC developments are mixed use and/or include market-rate units too, for households regardless of income. LITHCs are not a grant, nor a loan, it is a so called ‘dollar-for-dollar tax credit’. *‘LIHTCs are Federal*

*tax credits that are used to offset income tax liability'* (WHEDA, 2017). How it works, the developer (owner) of an affordable housing development can use tax credits to generate an equity investment in the development. This equity investment reduces the amount of lending, and monthly debt service which the owner needs to finance the affordable development. A lower debt on the development, allows to developer/owner to charge lower monthly rents.

It is possible for the developer to convert the tax credits into equity in one of three ways:

1. The developer/owner can claim the tax credits directly against their own income tax liability.
2. The developer/owner can sell the tax credits to an investor in exchange for equity/capital for the development or rehabilitation of the housing.
3. The developer/owner can sell the tax credits to a syndicator who bundles tax credits from different developments and then sells them to investors.

(WHEDA, 2017)

*'LITHCs are awarded by WHEDA to housing developers through a highly competitive process'* (WHEDA, 2017). Applicants for LITHCs must meet several requirements to be considered for the program. For City Row Apartments, WHEDA did require threshold requirements and self scoring requirements. These requirements do not only require aspects regarding affordable units, but also sustainability requirements. Below, the requirements regarding sustainability, are set out. See appendix F, for these exact requirements for City Row Apartments.



### 6.2.2 Equinox Apartments

<b>Developer</b>	Great Dane Development Middleton, WI 53562
<b>Architect</b>	Knothe & Bruce Architects, L.L.C. Madison, WI 53705
<b>Date</b>	August 2008
<b>Location</b>	409 West Gorham Street Madison, WI 53703

## Summary

Equinox, a student housing apartment complex, has twelve stories of housing, over an underground heated parking garage with approximately 81 parking stalls. The apartment complex is located four blocks from the capitol square, at 409 West Gotham Street. The construction of the apartment building started in 2005. Madison Property Management, Inc. took over the management after it opened in 2006. The building structure material is concrete. The building with 115 rental units ranging from 446-1153 square feet, is located on a 0,5 acre lot. The project did not achieve any kind sustainable certifications. The total development cost of this development are unknown. (City of Madison, 2014)

## Location

The apartment complex is campus located at 409 West Gorham Street, four blocks west from the Capitol Square. The neighborhood around Equinox Apartments consists primarily out of commercial uses (stores and bars/restaurants), the Wisconsin University and rental student housing.

## Program

Equinox Apartments counts 12 stories of housing, over a heating underground parking. Landlord pays all utilities, including cable & internet and is central air conditioned. The site is a 0.5 acre lot, with an 115 rental units apartment complex, ranging from 446-1153 square feet. The heated underground garage counts approximately 81 parking stalls. The 115 units are all market-rate, and student orientated. (Madison Property Management, 2017)

## Sustainable highlights

None. (K. Stopple, personal communication, June, 2017)

## Awards and certifications

None. (K. Stopple, personal communication, June, 2017)



## Driving factors

*Madison Property Management, Inc. never purchased this property, they are managing it for the developers, who are known as Great Dane Development.*

### Economic

Madison Property Management, Inc., is not the owner of Equinox Apartments, they did not make the decisions whether to implement or not to implement sustainable features. However, Stopple (K. Stopple, Personal communication, June, 2017) mentioned that their decisions were about costs, the lack of urgency for sustainability and the upcoming building 'boom'/student housing demand, downtown Madison.

*'We were not involved in the construction process. I know it was based on costs. In 2008, it was not that prevalent to build sustainable, as nowadays.'*  
(K. Stopple, Personal communication, June, 2017)

Although the costs are a decisive factor for almost every private developer, the possibility to keep the operation costs low by mitigation of an existing or new development, plays a big role too.

*'Over time we converted all the electricity to the LED, more energy efficient. So that is one thing that we did overtime. But, it was just based on costs.'*  
(K. Stopple, Personal communication, June, 2017)

Next to keeping the operation costs down, mitigation can be as attractive as a marketing strategy. However, the Equinox was one of the first high-rises downtown Madison, and there was not much market competition between high-rises, back then.

*'I don't think it had something to do with the competition. We were one of the first high rises of that time, build during that time around that location. So, it was not competition driven at all.'* (K. Stopple, Personal communication, June, 2017)

Though, there was another kind of pressure *after* taking over the management of the property: the utility bills. It is very common in the U.S. that the owner does pay for all the utility bills. So does the Equinox. As already mentioned, after taking over the management of the building, Madison Property Management, Inc. converted all the electricity to LED.

*'The owner does pay for all of the utilities bills of the entire apartment. It made the property more marketable for a lot of students that comes from overseas, that they just have one bill. A lot of parents do not like to write multiple checks, if they are paying for their child's housing and what not. So, we converted everything over to LED.'*  
(K. Stopple, Personal communication, June, 2017)

## Political

In 2008, Stopple (K. Stopple, Personal communication, June, 2017) did not feel any pressure from the government where they had to respond on.

*'We work with focus on energy and they worked a lot with smaller landlords, single family homes and that kind of things. Now it comes more prevalent that focus on energy is getting involved within the construction. So no political support.'*

(K. Stopple, Personal communication, June, 2017)

The government did not and still does not encourage developers in Madison with grants, subsidies, et cetera. Even though this would encourage developers to implement sustainable technologies.

*'If there were grants, it would be something we would definitely consider, even in 2008 without any pressure'.* (K. Stopple, Personal communication, June, 2017)

## Technological

As already mentioned in the 'economical' driver, the developer of the Equinox did not use any sustainable technologies, at all. There was not any pressure for innovation or standardization of sustainable products.

*'We did not use any sustainable technologies at all, back then. The costs discouraged us.'* (K. Stopple, Personal communication, June, 2017)

## Social Demographic

For the developer (and Madison Property Management, Inc.), there was no social demographic marketing demand back in 2005, to incorporate sustainable technologies in Equinox apartments. Because of the lack of competition and pressure, anticipating on what people want was not a driver

*'Right, we did not anticipate on what people want, because there was not any kind of demand, we experienced.'* (K. Stopple, Personal communication, June, 2017)

*'Anyway, now it is becoming more and more popular, that they want more and more sustainable features. As a country, becoming sustainable is the goal.'*

(K. Stopple, Personal communication, June, 2017)

So, gradually, Stopple (K. Stopple, Personal communication, June, 2017) is experiencing acknowledgement from the government and pressure from (possible) tenants.



## Cultural

It can be interesting for developers to compete with other developers, in sense of who has to newest and best sustainable technologies and what amount of money can tenants save on their utility bills. For Madison Property Management, Inc., implementing sustainable technologies because of market competition and marketing, is not the case, yet, because there is still such demand for housing, downtown Madison. Stopple (K. Stopple, Personal communication, June, 2017) mentioned that it can be interesting in the future. For Madison Property Management, Inc., a successful development is an affordable building for the owner/manager, and for the tenant.

*'It think is has to be affordable on the construction end and the rental end. And than you can build something that is so expensive you would not be able to have residents to live there. Is has be affordable to build and it has be affordable to rent. And that is a win win.'* (K. Stopple, Personal communication, June, 2017)

## Environmental

*'How many of what you are doing is driven by the fact that Madison has stronger growth than for example Detroit, so there is stronger competition between developers? What if you were a developer in Detroit, would you do the same thing as you are doing right here in Madison?'* (Interview question, see Appendix G)

*'I guess, again, it is based on costs. There is not any kind of competition, here in Madison. Because there is such a demand for apartments, there is.'*  
(K. Stopple, Personal communication, June, 2017)



(Venture: Madison Property Management, 2017)

### 6.2.3 Venture Apartments

<b>Developer</b>	Madison Property Management Madison, WI 53703
<b>Architect</b>	Knothe & Bruce Architects, L.L.C. Madison, WI 53705
<b>Date</b>	August 2015
<b>Location</b>	602 – 626 Johnson Street Madison, WI 53703

## Summary

Venture Apartments has twelve stories of housing over three levels of parking, and the multifamily project consists of 115 apartments. The apartments are located one block west of Hilldale Mall at 619 N. Segoe Road, on the near west-side of downtown Madison. The construction of the apartment building started in 2014, and the building itself opened in 2015. The building type is post-tensioned concrete. The site is a 25,264.8 square feet lot, and the building complex it serves provides 240,000 of square footage, and approximately 151 parking stalls. The project did not achieve any kind sustainable certifications, but did use some sustainable features. The total development cost of this development are unknown. (Stevens Construction Corp., n.d.) (Emporis, n.d.)

## Location

The apartment complex is located one block west of Hilldale Mall at 619 N. Segoe Road, overlooking Hilldale Mall and Shorewood Hills. The site is within Aldermanic District 11, within the limits of the Madison Metropolitan School District, and was formerly used as a two-story bank with a drive-up service window. (City of Madison, 2014)

## Program

Venture Apartments counts 11 stories of housing over three levels of underground parking. Above the eleventh floor, the building has a mechanical penthouse, common room, exercise facility and roof terrace (Stevens Construction Corp., n.d.). The site is a 25,264.8 square feet lot, with an apartments complex of 240,000 square feet. The building contains 115 dwelling units and approximately 151 parking stalls. The 115 units are all market-rate. (City of Madison, 2014)

## Sustainable highlights

### LED Lighting

All appliances are *Energy Star* rated.

### Water-saving washing machines

Use less water and their high spin speed extracts more water so dryer time is cut

### Heat pumps

Efficient heating and cooling: Heat pumps move heat from one place to another. They are more important for efficiency because moving heat can use less energy than generating heat.

## Cooling Tower

Heat rejection device that rejects waste heat to the atmosphere through the cooling of a water stream to a lower temperature.

(K. Stopple, personal communication, June, 2017)

## Awards and certifications

### Energy-Star appliances

Venture Apartments got rebates for using Energy-Star appliances

(K. Stopple, personal communication, June, 2017)

## Driving factors

### Economic

Madison Property Management, Inc. is - just like Stone House Development, Inc. - aware of the changing climate. They want to invest in climate mitigation technologies, but there is not enough stimulation from the government or the market what makes it attractive to invest in (more) sustainable features. Although the demand for rental apartments keeps growing in Madison, there is almost no matter of market competition between developers regarding green certifications, et cetera.

*'Here in Madison is such a demand for apartments, and it keeps growing. It's a good thing, but pretty soon it's going to be over developed and than it is going to be a struggle.'* (K. Stopple, Personal communication, June, 2017)

In order to be ahead of this upcoming struggle, it could be an opportunity for developers to invest in mitigation 'up front'. Stopple (K. Stopple, Personal communication, June, 2017) is aware of the changing climate and the possibility of an over developed Madison. Madison Property Management, Inc., decided to invest in sustainable technologies, for as far as the budget allowed.

*'It is actually about the costs. There is a heating and cooling tower on the rooftop that heats and cools with water. So water can be recycled. And it is actual costs effective for the resident and the owner. It uses less electricity.'*  
(K. Stopple, Personal communication, June, 2017)

As Stopple (K. Stopple, Personal communication, June, 2017) mentioned, investing in mitigation measures is a possible marketing strategy, but it also can save utility costs for the owner and/or tenant, depends who needs to pay what. In this case, the pressure for Madison Property Management, Inc., to invest in mitigation measures, was because of the energy costs they need to pay for the common areas, and the attractiveness for tenants of paying less energy costs.



*'We do not pay for the utility costs of the residents. We pay for the common areas. Instead of putting in individual heat pumps, there is just one large system. And, tenants pay for the use of their unit only, so being that it is one large system, it is more energy efficient.'* (K. Stopple, Personal communication, June, 2017)

As Stopple already mentioned, the decision about whether to invest in sustainable technologies or not, it is more about the costs and the return on the investment, than based on possible marketing strategies or market competition between developers.

*'Our decisions are about costs and efficiency. The life expectancy of one large unit is longer than an individual unit. More easy to work on, so more efficient. It lasts a longer time.'* (K. Stopple, Personal communication, June, 2017)

## Political

Stopple (K. Stopple, Personal communication, June, 2017) did not experience a politically demand for investing in mitigation technologies. She mentioned a pressure from residents, who are interested in sustainable developments because of the lower energy, utility costs.

*'There is no political pressure from the government, that's it. From the residents, from the community, there is pressure.'* (K. Stopple, Personal communication, June, 2017)

The government can exert pressure by use of approaches, tools and or policies. However, Stopple (K. Stopple, Personal communication, June, 2017) did not feel any kind of encouragement or anything, at all.

'So the government does not stimulate you to mitigate and construct sustainable? Not even with grants?' (Interview question, see Appendix G)

*'I did not feel pressure when we built this building, there was not any pressure at all.'* (K. Stopple, Personal communication, June, 2017)

Stopple (K. Stopple, Personal communication, June, 2017) mentioned that even if developers are willing to invest in sustainable products, the price of these products is so high, that the return on the investment takes too long to be interesting.

*'If you use certain products - Focus on Energy -, you will get rebates. But those products may cost twice as much, or three times as much, so you are not going to see a return on your investment, for years... So, in some cases we could choose those routes up front because the cost was not two or three times as much. In other cases, we would not be able to necessarily build in the time frame we want it to, if we had used*

*all the products that focus on Energy proposed or what so ever. So, we did what we could in certain areas but no, the government does not try and make it a benefit.'*  
(K. Stopple, Personal communication, June, 2017)

After asking Stopple (K. Stopple, Personal communication, June, 2017) the question: *'What if the government would encourage you?'*, she immediately answered: *'Than, of for sure! That would be a great opportunity, and they should do that.'* (K. Stopple, Personal communication, June, 2017)

*'What is happening right no, is not encouraging at all. And than to make the product more expensive, that blocks everything.'* (K. Stopple, Personal communication, June, 2017)

## Technological

Madison Property Management, Inc., mentioned in the previous 'drivers' that the primarily reasons to invest, but also to not invest in climate mitigation technologies, are the costs and the *'return on your investment'*. But, in addition to the costs, and the (little) pressure by the neighborhood, they are aware of the damage they can cause to the environment.

*'We have chosen our technologies, because I just think overall it was more economical, less labor intensive, and yes better for the environment. We do not want to put bulbs in the ground, you are conserving water and time.'*  
(K. Stopple, Personal communication, June, 2017)

Even though the costs are the biggest factor whether to implement, or not implement mitigation technologies, Madison Property Management, Inc., does anticipate on what people, tenants want.

*'For a small part yes, we anticipate on what people want. Though, the biggest reason is saving money, because it is all about costs. But it is a good thing if you can making money by anticipating on what people want.'*  
(K. Stopple, Personal communication, June, 2017)

*'Historically, we built for what people want. But we cannot always go the sustainable route, based on costs.'* (K. Stopple, Personal communication, June, 2017)

In addition to the question *'Would not it be a great opportunity for developers and residents if the government would encourage sustainable development?'*, Stopple (K. Stopple, Personal communication, June, 2017): *' Yes, agreed! Because if residents want to have sustainable buildings, than it is more... It would drive developers to go that route, also because the market competition.'*



In order to understand why developers did or did not choose for investing in climate mitigation technologies - in addition to the costs -, it is important to understand their incentives in the context of what they think that makes their development(s) successful. Stopple (K. Stopple, Personal communication, June, 2017) considers their developers successful if the quality is high, with a long life cycle of the building, safety and attractiveness for the residents and naturally a fully leased apartment complex.

*'Quality makes our developments successful, they are not quickly built, more concrete and steel than wood constructions. Because of the safety. You have to have a fob to access the building, the amenities that are offered. The price point. The location.'*  
(K. Stopple, Personal communication, June, 2017)

Her answer shows that 'marketing and market competition' does play a role. Only the sustainability component is not really included in the aspect of market competition, yet. And, sustainability is not a 'real' motive or market strategy in order to get a fully leased apartment complex.

## **Social Demographic**

Stopple notices that it is becoming increasingly important to incorporate sustainable technologies, because of the acknowledgement from the government and the pressure from the (possible) tenants en environment. Again, it is based on costs and has to be financially feasible, in order to be able to invest in these technologies.

*'It is becoming more and more popular, that they want more and more sustainable features. As a country, becoming sustainable is the goal.'*  
(K. Stopple, Personal communication, June, 2017)

So, gradually, the social demographic demand and the acknowledgement is growing. This could be an opportunity for developers to anticipate, invest and respond on this demand.

## **Cultural**

It can be interesting for developers to compete with other developers, in sense of who has to newest and best sustainable technologies and what amount of money can tenants save on their utility bills. For Madison Property Management, Inc., implementing sustainable technologies because of market competition and marketing, is not the case, yet, because there is still such demand for housing, downtown Madison. Stopple (K. Stopple, Personal communication, June, 2017) mentioned that it can be interesting in the future. For Madison Property Management, Inc., a successful development is an affordable building for the owner/manager, and for the tenant.

*'It think is has to be affordable on the construction end and the rental end. And than you can build something that is so expensive you would not be able to have residents to live*

*there. It has to be affordable to build and it has to be affordable to rent. And that is a win win.'* (K. Stopple, Personal communication, June, 2017)

## **Environmental**

*'How many of what you are doing is driven by the fact that Madison has stronger growth than for example Detroit, so there is stronger competition between developers? What if you were a developer in Detroit, would you do the same thing as you are doing right here in Madison?'* (Interview question, see Appendix G)

*'I guess, again, it is based on costs. There is not any kind of competition, here in Madison. Because there is such a demand for apartments, there is.'*  
(K. Stopple, Personal communication, June, 2017)



#### 6.2.4 The Lyric Apartments

<b>Developer</b>	Stone House Development Madison, WI 53703
<b>Architect</b>	Eppstein Uhen Architects Madison, WI 53703
<b>Date</b>	August 2017
<b>Location</b>	1010 East Washington Avenue Madison, WI 53703

## Summary

The Lyric Apartments is a Stone House Development, Inc. developments, which opened Mid August, 2017. The project did not achieve any kind sustainable certifications, but did use some sustainable features. The Lyric Apartments is a mixed-use project and contains market-rate apartments, affordable apartments and commercial tenants. The complex provides 68,400 square feet of commercial office and retail space, 138 apartments and approximately 370 parking stalls. An affordable housing development – The Mifflin Street Project – will be attached to the parking structure of The Lyric Apartments. The structure of the construction contracts and the financing, will be separate. The total development cost will be \$46,700,000.00. (R. Arnessen, personal communication, June, 2017)

## Location

The site is located on the 1000 north block of East Washington Avenue. 1010 East Washington Avenue will be built on the southwestern corner of the block at the corner of Brearly St. and East Washington Avenue. The site is in the Tenney Lapham neighborhood and was formerly used as a dairy.

## Program

The Lyric Apartments counts eleven stories in height, with ground floor retail, two floors of office space, seven floors of apartments, and an eleventh floor community room, game room lounge, rooftop terrace, fitness center, and conference/board room for use by office tenants. The project contains 138 apartments, of which 8 are restricted to individuals or families earning no more than 80% of the Dane County Median Income, and 68,400 square feet of commercial office and retail space. The project includes a three floor enclosed parking deck containing approximately 370 parking stalls.

Stone House Development, Inc. have also received approval for an affordable housing project on the Mifflin St side of the block. This development will be attached to the parking structure of the 1010 project and will purchase 50 of the parking stalls in the parking structure. The Mifflin St. project will be owned by a separate LLC and will have separate financing and construction contracts. None of the investment or financing information contained herein involves the Mifflin St. project.

## Sustainable highlights

### **LED Lightning**

All appliances are *Energy Star* rated.

### **Exterior Insulation**

The exterior walls will be insulated with closed cell spray foam or similar high performance insulation. This creates a much more efficient exterior wall as well as provides much great sound isolation and air-sealing.

### **Rooftop Solar PV**

Solar panels on the roof will preheat hot water that is used for domestic hot water.

### **Un-heated Garage**

The garage will be unheated. To accomplish this, the floor of the first floor units will be insulated and the sprinkler system in the garage will be a dry system.

(R. Arnessen, personal communication, June, 2017)

## **Awards and certifications**

### **Energy-Star appliances**

The Lyric Apartments got rebates for using Energy-Star appliances

(R. Arnessen, personal communication, June, 2017)

## **Driving factors**

### **Economic**

Stone House Development, Inc. is aware of the changing climate as already mentioned in the case study of City Row Apartments. Although, it is required by WHEDA to mitigate affordable developments for climate change, it is not required for commercial mixed-use developments and/or market-rate apartments. In the case study of City Row Apartments, Stone House Development, Inc. already mentioned that they have as a company, a history of incorporating sustainable and energy efficiency technologies whenever the budget allows. For The Lyric Apartments, Richard Arnesen explained that there was not as much budget for sustainable highlights, as for City Row Apartments.

*'We incorporated as many as technologies as our budget allowed, primarily LED Lightning, exterior insulation and rooftop solar PV'.*

(R. Arnesen, Personal communication, June, 2017)

Even though it is not required to implement sustainable technologies, and there is no pressure to mitigate (new) developments according to Arnesen (2017), it is interesting for Stone House Development, Inc. to take climate change and energy saving technologies into account, because of the operating costs.

*'There was no pressure, but we made the decisions for same reasons as City Row: We feel that anything that will keep our long term operation costs down will protect us against flat revenue streams.'* (R. Arnesen, Personal communication, June, 2017)



The operation costs play a big role is the decision whether to implement sustainable technologies, or not. In addition to the operating costs, the factor ‘marketing’ is also present, but does not play a leading role within the development and the decisions for mitigation, of The Lyric Apartments.

*‘We did not invest in sustainable technologies exceptionally because of market competition, e.g. Our main reason is to lower operating costs and, to a lesser extent marketing or perception from potential residents.’*  
(R. Arnesen, Personal communication, June, 2017)

## Political

Governments may use approaches, tools and or policies to encourage implementation of sustainable technologies, mitigation of developments. Stone House Development did not experience any kind of political demand from the city, where they had to respond on.

Although they did not get encouraged by the city, they did anticipate on what the inhabitants in the neighborhood would appreciate.

*‘We did not get encouraged and did not get political support from the City. But, we did anticipate on the neighbors, neighbors appreciate sustainable efforts.’*  
(R. Arnesen, Personal communication, June, 2017)

## Technological

Richard Arnesen explained that they primarily get encouraged to implement sustainable technologies by bringing down operating costs. But in addition to costs, they get encouraged by the neighbor(hood)s. In this new development – the Lyric – they did not have to respond on all of the requirements from WHEDA, to gain tax credits. What discouraged Stone House Development, Inc. to mitigate The Lyric for climate change and implement sustainable technologies, was ‘money’, the costs of the technologies.

*‘The lack of resources, high construction costs, et cetera. That discouraged us’.* (R. Arnesen, Personal communication, June, 2017)

In addition to the question if there were sustainable initiatives that they considered but not used, Arnesen (R. Arnesen, Personal communication, June, 2017) answered: *‘Lack of available financial resources prevented us from incorporating more resources’.*

## Social Demographic

For the market-rate apartments, there is a social demographic marketing demand to incorporate sustainable technologies, but not as strong as for the affordable housing projects.



*‘Same as for City Row, the main demographic demand we see is any technology that provides them a cost saving’ (K. Setterlund, Personal communication, June, 2017)*

Because of the 10 affordable apartments, integrated in the market-rate apartment complex, WHEDA required some sustainability measures in order for Stone House Development, Inc. to be able to get the tax-credits. Setterlund explained in an conversation:

*‘It must be feasible for us to integrate green technologies, get these tax-credits and realize these affordable apartments, and yet to make returns and no unnecessary costs.’ (K. Setterlund, Personal communication, June, 2017)*

## **Cultural**

It can be interesting for a developer to implement sustainable technologies and thereby mitigate their developments, because of market competition. As Arnesen (R. Arnesen, Personal communication, June, 2017) already mentioned in the case study of City Row Apartments:

*‘We like to be the market leader, although rising construction costs over the last several years had made it difficult to incorporate these technologies.’*

The costs are the most common barrier for implementing more sustainable technologies to mitigate their developments. Especially in case of market-rate apartments, like The Lyric. Market-rate and commercial developments, do not get tax-credits from WHEDA, because they are not affordable rental housing developments. Also, WHEDA requires sustainable technologies, otherwise the developer will not receive the tax-credits. In an earlier conversation with Arnesen (R. Arnesen, Personal communication, June, 2017), he explained that if they would get encouraged by the government/City – in any form whatsoever – they would mitigate more developments, then they are doing now. If this was the case, there would be more competition between new developments, which would cause eventually, more profit by building a more sustainable development. The same counts for sustainable certifications. Arnesen explained, that there cannot be a competition between new developments with or without sustainable certifications, if most developers do not do much for sustainability and getting these certifications.

## **Environmental**

How many of what you are doing is driven by the fact that Madison has stronger growth than for example Detroit, so there is stronger competition between developers? What if you were a developer in Detroit, would you do the same thing as you are doing right here in Madison? (Interview questions, see Appendix G)

*‘Yes, if the budget allowed in any given market. Most developers in Madison do not do much for sustainability’. (R. Arnesen, Personal communication, June, 2017)*

### 6.3 Comparison Matrix

In this paragraph, the drivers, barriers, opportunities and interventions of the four case studies will be analyzed by using a matrix. The barriers are the factors which did encourage the developers to implement (more) sustainable technologies. The opportunities are the factors why it was or could be interesting for the developer to implement sustainable technologies. The opportunities why the developer did implement sustainable technologies are colored green, the possible opportunities are colored purple. The interventions are the factors what could have encouraged them, by the government.

City Row Apartments			
Drivers	Barriers	Opportunities	Interventions
Economical: Operating costs	Budget and costs	Attractive market strategy	<b>Shaping:</b> Governmental control by subsidizing and taxes
Political: -	No politically demand or encouragement	Helps with neighborhood approvals	<b>Regulation:</b> Governmental control by law and regulation policies
Technological: Rabates/grants	The cost to implement	Get rebates/grants to help offset the costs. Proven technology	<b>Shaping:</b> Governmental control by subsidizing and taxes
Social Demographic: Energy costs for tenants		Subsidies from WHEDA	<b>Shaping:</b> Governmental control by subsidizing and taxes
Cultural: Market leader	Rising construction costs	Market competition	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Capacity Building:</b> Creating a sense of urgency by owners and users
Environmental: Costs	The costs and no market competition	Market competition	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Capacity Building:</b> Creating a sense of urgency by owners and users

Equinox Apartments			
Drivers	Barriers	Opportunities	Interventions
Economical: Utility costs	Budget and costs	More marketable	<b>Shaping:</b> Governmental control by subsidizing and taxes
Political: -	No politically pressure or encouragement	Encouragement by grants/subsidies	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Regulation:</b> Governmental control by law and regulation policies
Technological: Gradually pressure from tenants	No pressure for innovation or standardization of sustainable products	Standardization of sustainable products	<b>Stimulation:</b> Stimulation by the government for innovation and sustainable technologies
Social Demographic: Gradually pressure from tenants	Financial feasibility	Acknowledgement from the government	<b>Shaping:</b> Governmental control by subsidizing and taxes
Cultural: Affordable to build	To expensive because of sustainable technologies	Affordable for developer and tenant	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Capacity Building:</b> Make investors aware of climate risks for real estate and the impact on the value
Environmental: Costs	No market competition	Market competition	<b>Capacity Building:</b> Creating a sense of urgency by owners and users and <b>Regulation:</b> Governmental control by law and regulation policies

Venture Apartments			
Drivers	Barriers	Opportunities	Interventions
Economical: Utility costs	Budget and costs	Market competition	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Regulation:</b> Governmental control by law and regulation policies
Political: -	No politically pressure or demand, they do not try to make it a benefit	Encouragement by grants/subsidies and rebates	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Regulation:</b> Governmental control by law and regulation policies
Technological: less saving money	Price of products to high, no return on investment	Standardization of sustainable products and market competition	<b>Stimulation:</b> Stimulation by the government for innovation and sustainable technologies and <b>Capacity Building:</b> Make investors aware of climate risks for real estate and the impact on the value
Social Demographic: Gradually pressure from tenants	Financial feasibility	Acknowledgement from the government	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Regulation:</b> Governmental control by law and regulation policies
Cultural: Affordable to build	To expensive because of sustainable technologies	Affordable for developer and tenant	<b>Capacity Building:</b> Creating a sense of urgency by owners and users and <b>Shaping:</b> Governmental control by subsidizing and taxes
Environmental: Costs	No market competition	Market competition	<b>Capacity Building:</b> Creating a sense of urgency by owners and users and <b>Regulation:</b> Governmental control by law and regulation policies

The Lyric Apartments			
Drivers	Barriers	Opportunities	Interventions
Economical: Operating costs	Budget and costs	Marketing and perception from residents	<b>Shaping:</b> Governmental control by subsidizing and taxes
Political: -	No politically demand or encouragement	Politically support Neighbors appreciate sustainable efforts	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Regulation:</b> Governmental control by law and regulation policies
Technological: Operating costs	Lack of resources and high construction costs	Financial resources from the government	<b>Stimulation:</b> Stimulation by the government for innovation and sustainable technologies and <b>Shaping:</b> Governmental control by subsidizing and taxes
Social Demographic: Costs saving and appreciation from the neighborhood	financial feasibility of integrating green technologies and unnecessary costs	Grants and susidies WHEDA	<b>Shaping:</b> Governmental control by subsidizing and taxes
Cultural: Market leader	Rising construction costs	Market competition and sustainable certification	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Capacity Building:</b> Make investors aware of climate risks for real estate and the impact on the value
Environmental: Costs	The costs and no market competition	Market competition	<b>Shaping:</b> Governmental control by subsidizing and taxes and <b>Capacity Building:</b> Creating a sense of urgency by owners and users





(Parc del Fòrum, Christian, 2017)



## 7 Conclusion

The final step, is to answer the main research question and sub-questions, which have been drawn at the start of this thesis. Based on the results of the literature review, document analysis and interviews, conclusions will be drawn for these questions. Also, some recommendations will be made for the features that are influencing the behavior of the Residential Real Estate Developers, the use of spatial planning tools in general and future research. First, the conclusions are presented in paragraph 7.1 and next the recommendations are given in paragraph 7.2.

### 7.1 Conclusion

The main question in this research is:

*What encourages climate mitigation measures in Residential Real Estate in Madison area, and how to understand this in the context of climate mitigation policies in the United States, with a Dutch perspective?*

Residential real estate developers in Madison can get encouraged to invest in climate mitigation measures, by taking away the **barriers** that hinder the capacity of the developer to mitigate. These barriers are mainly that there is **no pressure** or **encouragement** from the government, **no market competition** and a **lack of resources**: financial feasibility and knowledge. Opportunities to take away these barriers are **financial encouragement** and **support** from the government and creating **marketed competition** and **standardization of sustainable products**. Next to these opportunities, the developers can get enforced by **governmental control**, sustainable **requirements** and **policies**. **Capacity building** can help to create a sense of urgency by owners and users and to make investors aware of climate risks for real estate and the impact on the value

In context of spatial planning:

**Shaping**: Governmental control by subsidizing and taxes

**Regulation**: Governmental control by law and regulation policies

**Stimulation**: Stimulation by the government for innovation and sustainable technologies

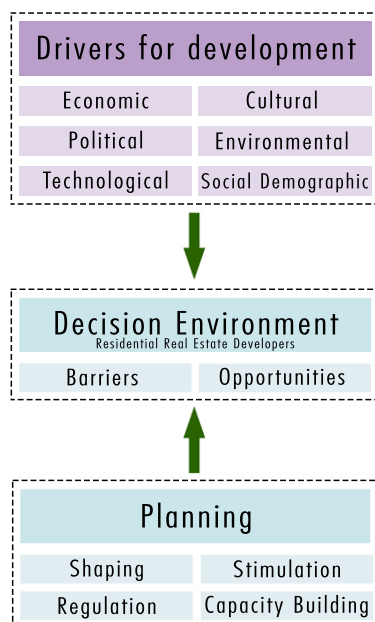
In order to understand and explain this in context of climate mitigation policies in Madison is a bit difficult, given the fact that the developers did not feel pressure from the Madison Sustainable Plan or government, at all. However, this can be understood in the context of the United States' **market-based approach**, versus the Dutch **non-market-based approach**. Where the Dutch approach is characterized by a high level of **public involvement** and **regulation**, is the core value of the US being **market-oriented**, with a lack of direct **financial support**, 'sustainable' **requirements** and **integral approaches** to a certain area, from the **government**.

The Hypothesis, stated in the introduction of this thesis: *Governmental interventions and the elaborations hereof in the Netherlands and in the United States will differ. This because, the government exercises much influence in the Netherlands within the real estate market and less in the United States.*

**Governmental interventions** and the elaboration hereof in the United States, does differ from the Netherlands. The governmental interventions which can **encourage** residential real estate developers to invest in climate mitigation, do not differ. According to the interview results, residential real estate developers in Madison can get encouraged to invest in climate mitigation, in the same way as residential real estate developers in the Netherlands - the Randstad - do. The difference is that the government in the Netherlands has a history of using these **encouraging interventions**, and it is still unfamiliar and unusual to use these interventions in the U.S., because of their **market-based tradition/approach**.

Below will be explained, which information and reasoning have lead to this conclusion

### 7.1.1 Influential factors for real estate developers



In recent years, environmental changes have become more important as government and development actors have prioritized sustainability (Adams & Tiesdell, 2013). This change can be a driver for development. These **drivers for development: economic, political, social and demographic, technological, cultural and environmental** change, can stimulate the development activity, ensure sustainable development pressure and opportunity; ones it becomes clear that the existing building-space/building-stock cannot fully satisfy the need or demand (Adams & Tiesdell, 2013).

In many developments, there are several **barriers** that can hinder the capacity of the developer to mitigate, the incentives for action, and the perspectives towards the need to mitigate. It is possible that governments use approaches, tools and policies to encourage mitigation and help companies overcome barriers (Argwala, 2011).

Planning is primarily a form of governmental intervention and tries to effect the **decision environment** of key development actors. According to Adams (2017), planning can be defined as deployment of four types of policy instruments to aim to **shape, regulate or stimulate** behavior of market actors or **build capacity** to do so.

Due to the fact that the residential real estate developers are market driven in order to run their business, (roughly) there are two types of instruments which can encourage or

enforce developers/investors to invest in sustainable technologies and mitigate their properties: **market-based instruments** and **non-market-based instruments**. These instruments have the capacity to remove the barriers of the developers to invest in climate mitigation.

The barriers can be categorized into five categories: knowledge and information from stakeholders, technologies, capacity related, social cultural and politically and institutional. See paragraph 4.4 for an extended list of barriers.

Based on the results of this literature review, promising interventions to remove these barriers can be:

1. **Shaping**: Governmental control by subsidizing and taxes
2. **Regulation**: Governmental control by law and regulation policies
3. **Stimulation**: Stimulation by the government for innovation and sustainable technologies
4. **Stimulation**: Start climate proof designing for buildings with vulnerable features
5. **Capacity Building**: Creating a sense of urgency by owners and users
6. **Capacity Building**: Make investors aware of climate risks for real estate and the impact on the value

The opportunities for the real estate developers themselves, to build more sustainable are: a flexible construction for a longer lifetime, benefits for owners in e.g. lower insurance premiums and lower operating and maintaining costs for owner (Hoogvliet, et al., 2015).

### 7.1.2 Influential factors for mitigation in the Randstad

The Dutch planning tradition is characterized by a high level of public involvement, a **non-market-based** planning system. The United States has a long experience with a **market-based** planning system (Spaans, Janssen-Jansen, & van der Veen, 2011). Based on the results of the (policy) document analyses, the show cases and the interviews, the Dutch approach is based on **land level** and the U.S. approach is more based on **building level**.

In both countries, cities translating their climate change goals into sustainable initiatives and policies, both in cities in the U.S. and the Netherlands. The Sustainable Plan Madison, the Energieplan (2016) Utrecht and Programma Duurzaamheid 2015-2018 Rotterdam, do not differ a lot from each other. All three are a combination of non-market-based and market-based instruments, with an emphasis on the facilitating role of the government. An explanation for this result can be the movement from the Dutch public-led development system, towards a private led system in which the municipality is more facilitating. (Vos, 2017)

Two cities in the Randstad, are show cases for sustainable developments on area level. Utrecht: van LiefelandPARK, and Rotterdam: het Verborgengeheim. The results of

the two show cases, can both be linked to the climate change policies of Utrecht and Rotterdam.

The specific influential factors for climate mitigation of the developments in the van LieflandPARK, are **non-market based** with a **command-and-control approach**, by **performance- and technology standards**, and **land-use planning**: design quality, sustainability and participation with the neighborhood. For creating a master plan for this area, the municipality gave power to the neighborhood: they were able to choose what would happen to that specific area, in combination with the sustainable framework that the municipality did set out. In this way, the developer got encouraged to put as much as possible sustainability into their plans, in order to win the tender.

The specific influential factors for climate mitigation of the developments in het Verborgten Geheim, are also **non-market based**, with an **information and voluntary approach** for the government, by **stimulation** of innovation and sustainable technologies. This stimulation is based on the City Port foundation, a collaboration between the government, the neighborhood and other involved actors, who are working on a large-scale sustainable redevelopment of the city-port area.

### 7.1.3 Real Estate Development in Madison

The decisive factor in all **drivers** whether to invest or not invest in climate mitigation, is based on the developers **budget** and **costs** of these technologies, and the integration of it. This is not surprising given the fact that private real estate developers are profit based, and need to make money in order to run their business. Within this driver of costs and budget, the **operating** and **maintenance costs** plays the most important role. If the developer can keep the operating and maintenance costs down implementing sustainable technologies, they will invest in climate mitigation. However, the **return on investment** of these technologies, is often the real decisive factor.

*Even if developers are willing to invest in sustainable products, the price of these products is so high, that the return on the investment takes too long to be interesting. (Stopple, 2017)*

The recurring **barrier** that restrains the developers from investing in climate mitigation, is next to budget and costs, **no political pressure**, (financial) **stimulation** or **encouragement**. Because of this lack of pressure, not much developers in Madison do invest in sustainability, with as result: no market competition. Without market competition, developers do not need these sustainable technologies as a marketing strategy to acquire tenants. No market competition, means no pressure from the market, what results in no necessity for developers to invest in sustainable technologies. Except, there is one necessity factor which determines the choice to implement sustainable technologies, even without market competition or as an attractive marketing strategy: keeping the operating and maintenance costs as low as possible, as mentioned above. But, only if the return on investment outweighs the costs of the investment.

*The decision about whether to invest in sustainable technologies or not, it is more about the costs and the return on the investment, than based on possible marketing strategies or market competition between developers. (Stopple, 2017)*

However, there is one exception: the WHEDA Low-Income Housing Tax Credits Program. This federal **tax credits program encourages** private investment in the development and rehabilitation of rental housing for low to moderate-income families, seniors, and persons with special needs. (Wheda, n.d.)

Because of this program, Stone House Development, Inc., was forced to meet the **sustainable requirements** from WHEDA, in order to get the **tax-credits**. This situation is a win-win for developers and tenants. Developers will get a **return on investment** and be able to keep operating and maintenance costs low, and at the same time, developers can build sustainable, with **less energy costs** for the tenants.

*Because of the subsidies and requirement from the WHEDA program, developers are able to anticipate more on what people want: less energy costs. (Arnesen, 2017)*

As mentioned in paragraph 4.1, the United States has a long experience with a **market-based** planning system. Given that information, it is not a surprise that this **taxation system** fits well in the market shaping, building level based approach from in the United States.

Stopple (Madison Property Management), explained in her interview that the best opportunity to encourage developers to mitigate developments, lies at the government.

*The biggest opportunity to obligate and encourage developers is by subsidizing and taxes, and by governmental control. (Stopple, 2017)*



Since the demand for apartments keeps growing in Madison, it will be over developed pretty soon (Stopple, 2017). Because of this fact, it could be an opportunity for developers to invest in mitigation 'up front'. The government can **stimulate** this by (financial) **encouragement** or **enforcement**. If the government encourages developers to mitigate their properties for climate change, in combination with the overdevelopment in a few years, climate mitigation will become a **market strategy**, because of the **market competition** between developments.

For now, the government can encourage and stimulate developers by **shaping**: governmental **stimulation** by **subsidizing** and **taxes** and by **regulation**: **governmental control** by **law** and **regulation policies**. In addition, a possible intervention could be the **stimulation** by the **government** for **innovation** and



sustainable technologies. This intervention can **stimulate** the use of sustainable products, because developers do not prefer using products that are not proven technologies without any expertise from the subcontractor base (Arnesen, 2017).

#### 7.1.4 Differences and similarities

The real estate development process in Madison and the Randstad occurs in the same way: the city's planning department creates a **zoning plan** with the additional codes in order to indicate what development is permitted, conditional or prohibited and the additional **permit requesting process** (Vos, 2017). Private developers in both countries are **profit-based**, they need to make money in order to run their business.

The differences between both countries are the **public** or **private-led development** system. This may explain the differences in what encourages the developers in Madison and the Randstad, to implement and invest in sustainable technologies. The Netherlands has a **public-led development** system, while the United States has a **private-led development** system. The planning system in the U.S. is argued as very reactive to the developer and the market: the United States is very market, private driven (Vos, 2017). The market in the Netherlands, mainly functions as being the employer for the country, **regulated by the government**. In contradiction to the United States, where the market has more power and has to deal with **less market regulation** for the government. *'Some suggest that regulation follows the market, while in The Netherlands there is a lot more regulation regarding what market parties can and can't do and that the market follows the regulation.'* (Vos, 2017)

The differences and similarities between the showcases and the case studies, can be linked to this information above. The developers, interviewed for the case studies, mentioned over and over again that they **did not get encouraged**, stimulated or enforced by the government, they did not feel any pressure at all. While the show cases in the Netherlands **did get encourages**, stimulated and even enforced by the government to design and develop sustainable. The developers in Madison based their decisions whether to invest or not to invest in sustainable technologies, mainly on **costs** and their **budget**. Because of the (still) rising demand for rental apartments, there was not much **market competition** yet, so they did not feel the pressure or urgency to invest in climate mitigation in order to be more sustainable than other developments. They did base their decisions on keeping their own **operating and maintenance costs** down, with as positive additional effect: **lower energy costs** for their tenants. In Utrecht, the municipality stimulated developers to design the most sustainable plan by writing out a tender with a strict **sustainable framework**: they created **market competition**. In Rotterdam, the municipality stimulated developers, inhabitants and the neighborhood by facilitating **knowledge, information** and (financial) space for **innovation**. None of this, came back in the interviews and document analysis of the case studies in Madison. This is surprising given the fact that Madison has her own Madison Sustainable Plan. According to Arnesen (R. Arnesen, Personal communication, June, 2017) and Stoppie (K. Stoppie, Personal communication, June, 2017), they did not based their sustainable investment decisions on this Madison Sustainable Plan, and

as already mentioned: they did not feel any pressure or encouragement from the government or City of Madison, at all.

## 7.2 Recommendation

This recommendation is based on the developers and the municipality/government of Madison, Wisconsin. The developers indicated several times, that they do not feel any **pressure** or help from the government, in form of **financial** or **technological support**. Based on this observation, developers need more influence from the (local) government, in order to bridge the gap between **opportunities**, **costs** and **barriers**. The recommendation for the (local) government of Madison, is to **stimulate**, **regulate** and **increase awareness** of the benefits of mitigation and the risks of not being prepared for climate change.

### Stimulate

The (local) government, can **stimulate** residential real estate developers, to invest in climate mitigation, by primarily **financial support**. The developers mentioned that there is a gap, a barrier, between the **opportunities** and **benefits** of investing in climate mitigation, and the actual **costs** of implement sustainable technologies. By financial support, the government can bridge this gap which makes it more attractive for developers to invest and implement sustainable technologies in their developments. An example and idea to support developers, is by translation of the **WHEDA tax credits program**, into a **sustainable housing tax credits program**. Hereby, developers can get tax credits if they fulfill all the sustainable requirements of the sustainable housing program, which makes it more attractive for developers to invest in climate mitigation. More 'existing' measures, based on the market-based stimulation tools, are:

- **Price-adjusting actions:** development grants, tax incentives and project bonuses.
- **Capital-raising actions:** provide or facilitate access to development finance, where the capital of the private development sector is not sufficient.

### Regulate

In addition to stimulation of climate mitigation investments, developers can get **enforced** to implement sustainable technologies and mitigation their properties for climate change. The Netherlands is a great example of **regulation** by **sustainable requirements** and **standards**. For Madison, it is possible to set and tighten the standards and requirements, by:

- **Discretionary actions:** Discretionary approaches can publish what will be expected in individual cases, in advance: through e.g. plans or policies and other material considerations.

### Increase awareness

In order to create pressure - to invest in climate mitigation - from the neighborhood, it is important to provide **information** and create **knowledge** for all actors involved in the

development process, including the neighborhood. **Non-market-based instruments** can help provide **information** and create **knowledge**, by **information** and **voluntary approaches**:

- **Information and voluntary approaches**: Instruments that 'improve consumer awareness' about environmentally impacts of products and practices. They also can give information about alternatives which are less damaging. (de Serres et al. 2010)

By creating **showcases**, just like in Rotterdam and Utrecht (the Randstad), sustainability and the price of it, will become tangible for developers, tenants and other involved actors and can kick start **innovation** of products. By playing an **exemplary role**, the government can achieve this, and create an insight for developers why it could be interesting and **cost effective** to use particular sustainable products. Next to this, **innovation** of products and **acquaintance**, can create **standardization**, just like what happend by Rock-wool insulation. The Rockwool company has become so big, that it can afford to keep the prices down.



(Climate reality, Hendry, 2017)

## 8 Reflection

### 8.1 Theory and research

The theory and theoretical framework that have been used for this thesis seemed to be sufficient to cover the content of the research and to be a guidance throughout this thesis. Especially the focus on the drivers for development, connected to the decision environment, turned out to be very helpful when looking at the opportunities and barriers for climate mitigation investments in general. The theory and theoretical framework are suitable for both, Madison and the Randstad. Based on the drivers for development, interview questions have been formulated for the case studies. The results of these interviews are linked to the four types of policy instruments to aim to shape, regulate or stimulate behavior of market actors or build capacity to do so (Adams, 2017).

What could be interesting is finding a theory which will provide insight into the drivers for development: economic, technological, political, social demographic, cultural and environmental. A possible theory could be the Theory of Change. According to James (2011), the theory of change could be described as: *'Theory of change is an on-going process of reflection to explore change and how it happens - and what that means for the part we play in a particular context, sector and/or group of people.'*

### 8.2 Research design and further research

The methodology of this research was qualitative, given the fact that this was the only option to answer the main- and subquestion, because all questions were very open. Next to the open questions, it was good to let the interviewees give their opinion about their 'decision environment'. However, it turned-out that it is quite difficult to find real estate developers who are willing to talk about the incentives and their 'sustainable' business-model.

#### Case studies

The case studies consist out of interviews and document analysis. During the time-frame of this thesis, I was able to conduct four interviews, with two developers in Madison. For further research, it could be interesting to conduct more interviews, with more different developers, with as parameter: conduct 2 interviews per year, for the last 5 years. The rest of the parameters can stay the same.

Next to conducting more interviews, questionnaires can be acquired in the neighborhood of the developments. This can give insight in what really matters for the neighborhood and if the neighborhood has influence in the decision environment of the developers, or policies/decisions of the government, at all.

#### Show cases

For the show cases, it could be interesting to study 2 show cases per year, for the last 5 years. The rest of the parameters can stay the same. Next to study show cases,



interviews with the associated developers could be an addition to the research and shall increase the quality of it. For these show cases, select only projects which did invest in climate mitigation. This allows to researcher to compare the cases which did not invest in climate mitigation, with project which did: find out why the other project did implement sustainable technologies and the other one did not. And, what can be learned from that difference.

#### (Local) government

For both, the showcases and the case studies, it will be interesting to conduct interviews with the (local) governments, which did or did not influence the developers and the developments. The result could be finding out what their strategies were, what they tried to do, what they did and what they think what is important. Further, the interviewer should try to make a connection between the developments and the (local) sustainable policy(ies). In Madison, the developers did not mention the Madison Sustainable Plan, at all. They did not feel pressure from this policies, or whatever. By asking the interviewee (government and developer) a question about the local sustainable policy(s), and connecting this policy to the development, insight can be provided about the original plan and goal of the policy and the effectiveness of it.

In short, this research can serve an extensive prior knowledge and base, for further research. This prior knowledge is necessary for asking targeted and substantive questions, and going more in-depth into the incentives and business models of developers and the goals and strategies of the government. Further, it is possible to make a connection between the (local) government in Madison and developers and compare this to the collaboration between the Dutch government and developers. Hereby, it is possible to find out what Madison and the Randstad can learn from each other in order to stimulate developers to invest in climate mitigation.



(Holland Amerika lijn., 2017)

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(Jökulsárlón Iceland, Tarnutzer, 2015)

## Appendixes

- A Spatial Planning interventions*
- B Market-based and non-market-based instruments*
- C Madison Sustainable Plan*
- D Het Energieplan (2016)*
- E Programma Duurzaamheid 2015-2018*
- F WHEDA requirements for City Row Apartments*
- G Interview questions*

## Appendix A

### Spatial Planning interventions

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#### Four types of policy tools

Tools	
<b>Shaping</b>	Shaping the decision environment or context
<b>Regulation</b>	Defining the parameters of the decision environment
<b>Stimulation</b>	Restructuring the contours of the decision environment
<b>Capacity building</b>	Developing actor's ability to identify and/or develop more effective/desirable strategies

#### 1. Market-shaping tools

In context of the real estate market, shaping plans can be considered to be the main directive tool. *'By coordinating substantive actions and by searching to shape independent market actions, plans increase the possibility of achieving a desired state'* (Adams, et al., 2008). Policies within market-shaping are policies that frame the decision environment of the key market actors. Market-shaping sets a context where it become worth it for market actors to move in the direction intended by shaping instruments (Adams & Tiesdell, 2012).

#### Making plans

The government can articulate what they think should happen to specific areas by publishing spatial (development) plans, visions, frameworks, strategies, policies, et cetera. Plans are necessary to address uncertainty and manage complexity in real estate development (Adams & Tiesdell, 2012). Spatial plans can forewarn market actors - real estate developers -, about future plans. These plans can set out direct actions which need to be taken by the plan maker, such as investment in infrastructure. But, they can also specify criteria by which the spatial planner will respond to any development proposals, made by others. By providing such a 'public statement of intentions', plans can influence how market actors determine their own strategies (Adams & Tiesdell, 2012). Thus, plans can shape the real estate market because of the information they hold. This information will be reflected in the prices paid in individual transaction and therefrom in what are considered to be the underlying land values in a specific area. (Adams & Tiesdell, 2012)

#### Reforming institutions



*'Shaping markets seeks to rewrite the rules of the game by which real estate markets operate'* (Adams & Tiesdell, 2012), to assure integration between market actors, while transforming their behavior so as to create better places. To illustrate this, two specific institutions will be set out: property rights and taxation systems.

### Property rights

The real estate market reflects the way in which the government determines to design its system of property rights. Thus, the way places develop, depends on the particular property rights system in force at the time. In the United States, the courts are very protective of their private property rights, a concept of graduated density. *'This permits higher densities on larger sites, so rewarding developers who undertake land assembly'* (Adams & Tiesdell, 2012). This rewarding system has been applied in many parts of the United States, with as goal to provide an economic imperative to encouraging redevelopment through the private exchange of property rights. An example of transferable property rights: historic buildings and public space in New York, is often protected from development, by allowing a transfer of their property rights to nearby developments, which then benefit from greater height and/or higher density (Adams & Tiesdell, 2012).

### Taxation systems

There are several taxation systems, e.g. development charge and targeted taxation. Development charge is a tax, collected from developers and building, when planning permission/building permit is granted, to carry out projects that increase the value of the land. For example, increasing the plot ratio, rezoning to a higher value use or infrastructure. (Urban Redevelopment Authority, 2008)

Targeted taxation incentives are often used on temporary basis, as a stimulus of development of specific types and/or in specific location. Paragraph 4.4.3 Market-stimulation tools, will give a more in-depth explanation of these targeted taxation incentives.

### Strategic market transformation

The main task of strategic market transformation (mostly led by the public sector), is resolving 'collective action' problems. In order to resolve these problems, it requires an institutional framework to promote and manage collective action. This because the real benefits of transformation derive from what transcends in the form of individual development, e.g. better connectivity, enhanced spatial efficiency and improved urban design. These 'collective goods' are characterized by unclear property rights, they are not entirely public, nor entirely private. An example of strategic transformation, regarding infrastructure: *'strategic transformation is dependent on effective financial planning in to ensure early infrastructure investment, while allowing cost recovery to be delayed until nearer the completion of the development, whether in whole or in part'* (Adams & Tiesdell, 2012).



## 2. Market-regulation tools

Regulation is '*Defining the parameters of the decision environment*' (Adams, et al., 2008). The regulation or control of the real estate market and the real estate itself, effects the development of properties, the management, the use and the ownership. According to Adams (2008), there are two types of regulation, 1. Regulation by the state or third party by planning and development controls. And 2. Contractual or bi-lateral regulation, by restrictive covenant attached to land transfers. (Adams, et al., 2008) See paragraph 4.2 Climate mitigation incentives, for a more detailed explanation of market regulations and regulation tools.

Adams (2008), outlines seven regulatory choices and considers their implications for real estate development: regulation by statute or contract, preventative or directive regulation, regulation of activities or actors, sequential or integrated, managerial or absolute, elective or mandatory enforcement and discretionary or predefined.

### Regulation by statute or contract

Regulation can be done by statute or by contract. Public regulation is mainly set by statute and can implicate either the elimination of certain rights or the exercise of 'police power'. In the United States, zoning regulations are considered as an example of 'police power'. Within the real estate sector, there is a long history of private regulation by contract. Such contracts can control the form in which land is developed and the way in which that development is managed, afterwards. (Adams, et al., 2008)

### Preventive or directive regulation

Preventive regulation is intended to 'stop' an action which is negative in its outcome, where direct regulation seeks to achieve a positive outcome. It is easier to draft regulations to prevent a negative outcome, which is why regulation is often identified with the command do not, rather than do. (Adams, et al., 2008)

### Regulation of activities or actors

*'Real estate activities tend to be regulated by statute, while real estate professions are left to regulate themselves'* (Adams, et al., 2008). Architecture is an exception: The build environment profession is regulated by statute.

### Sequential or integrated

For real estate development; regulation does not refer to a single set of legislative decisions. *'Regulation of most housing systems has arisen through a series of unrelated acts, bounding the market in specific ways and producing a specific competitive rationale'* (Barlow and King, 1992: 381). In order to resolve possible clashes between regulatory requirements, sequential regulation can be replaced by integrated regulation. (Adams, et al., 2008)

### Managerial or absolute

Managerial regulation is more common than absolute regulation. By managing regulation, the task of the regulator is to achieve the requested amount of the regulated activity. For real estate, an absolute regulation can be applied as e.g. a regulation which

prevents the demolition of historic buildings. However, changes to historic buildings are usually governed by managerial regulation. (Adams, et al., 2008)

### Elective or mandatory enforcement

In real estate development, mandatory enforcement is rare. In many offenses, the government has discretion, depending on the particular circumstances of the breach, to decide which practical action is needed in order to eliminate the breach and prevent its re-occurrence.

According to Adams (2008), enforcement resources need to be focused on tackling the most important regulatory breaches in a way that is consistent and fair to discourage further breaches. The plainer and clearer the regulations, the easier it becomes to achieve.

### Discretionary of predefined

Discretionary approaches can publish what will be expected in individual cases, in advance: through e.g. plans or policies and other material considerations. *'Discretionary approaches to regulation are therefore pragmatic and enable flexibility as circumstances change'* (Adams, et al., 2008). Predefined approaches publish comprehensive standards, norms and zoning regulations, et cetera. These standards, norms and regulations set out what is permissible, in advance. Predefined approaches develop certitude for involved parties, because they deliver *'clear development rights and floor space limits and often building envelope controls'* (Punter 2007b: 167).

## 3. Market-stimulation tools

### Price-adjusting actions

Price-adjusting actions are stimulation actions that impact on projected costs and revenues in a development appraisal. There are three main forms of price-adjusting actions: development grants, tax incentives and project bonuses. The first two - development grants and tax incentives - involve an immediate cost to the state, through either incurred costs or tax revenue foregone. Project bonuses operate as a deregulatory stimulus, enabling developers to realize more of the development potential of their sites. (Adams, et al., 2008)

### Risk-reducing actions

*'The perceived risk involved in a proposed development, the lower the projected capital value'* (Adams, et al., 2008). Town Centre Management (TCM) schemes and Business Improvement Districts (BIDs) can reduce development and investment risk by the collective commitment of local authorities, businesses and other key players to the effective management and enhancement of an area as a whole. *'They seek to make places more attractive, accessible, cleaner, lively and safer to the extent that those urban centers in which numerous different interests own and operate property can then compete more effectively with out-of-town centers, which are usually owned and well managed by a single landlord'* (Adams, et al., 2008).

### Capital-raising actions

Capital-raising actions are those that provide or facilitate access to development finance, where the capital of the private development sector is not sufficient. For example, loan guarantees may be provided by the state to enable private sector actors to lend from the banks for developments, that otherwise might be deliberated as a high level of risk development, and thus a high interest rate even if funding were available at all. (Adams, et al., 2008)

## 4. Capacity building

Capacity building capacitates actors to function more efficiently within their own opportunity area, while affecting the opportunity area of other actors to broader advantage. Across the 'full spectrum' of development actors, each actor has potential to increase their competence for place-making in various ways. (Adams, et al., 2008)

### Market-Shaping cultures, mindsets and ideas

An essential cultural mind shift for spatial planning (public sector), is to see themselves as effective and active actors of development, communicating vision and promoting innovation, rather than being an external 'controller' of development. Capacity building can help planners to envision that their task is one of making places, rather than simply plans, and of achieving preferable change rather than simply resisting not preferable change.

*'Effective place-making involves working across culturally embedded barriers to create a holistic or rounded vision of what makes places function well'* (Adams, et al., 2008). According to Harvey (1989b), building an 'ideas bank' about successful practices and places, can encourage mind-shifts among developers and funding agencies as well as among professional advisers.

### Market-rich information and knowledge

Creating better places, requires information and knowledge about the quality of the place, and in what way it can be affected through market and development processes. This asks for knowledge about 'the rules of the game' by which such processes work, as well as specific information about their practical operations. Market-rich information and knowledge increases the certainty of planners and empowers them to look at a wider range of policy alternatives. An example of these alternatives is: enabling redevelopment through restructuring property rights, rather than by direct government intervention. Such information needs to be amplified by better understanding of the motives and behavior of actors from the private-sector, in order to recognize which landowners, developers and investors most probably share policy agendas and which are most probably more inimical. A better understanding and more detailed knowledge of the real estate sector and industry, can also help to certain better contractual agreements, whether in relation to planning profit or development subsidies. (Adams, et al., 2008)

### Market-rooted networks

Plan-shaped markets do not arise from external statements by spatial planners, but from the close relation between planners and other market actors. Capacity building is about improving relations within the development sector, so that planners working for public agencies are well connected with other professionals (working in the development industry). These connections need to be characterized by a two-way respect, rather than dominance by one side or another. Good connections can stimulate and generate a strong coalition of shared interests to increase the quality of place-making, in which market priorities and policy intent shape and influence one another. While it stays important to keep the probity of government decision-making, it is also important to promote mutual learning and sharing of knowledge and experience between the public, private and voluntary sectors, so as to break down barriers between them. (Adams, et al., 2008)

### Market-relevant skills and capabilities

Capacity building actions: market-relevant skills and capabilities, facilitates more effective operation of market shaping, regulation and stimulus. It can include activities as, for example: *'continuous professional development, on-the-job training, exposure to good or innovative practice, expert seminars, field visits, and job swaps or secondments'* (Adams, et al., 2008).

## Appendix B

### Market-based and non-market-based instruments

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#### Market-based instruments

##### Taxes

Taxes directly applied to the pollution source: *‘The most straightforward way of internalizing the external cost of greenhouse gas emissions is to impose a tax on the actual emissions’* (Görlach, 2013). The most common Green House Gas emission tax, is the carbon tax: a fee imposed on the burning of carbon-based fuels. The Netherlands initiated the carbon tax in 1990. 1992, it was replaced by the Environmental Tax on fuels :taxes partly no carbon content and partly on energy content. The United States is one of the few, large nations that does not implement a carbon tax. (Wikipedia, n.d.)

Taxes on inputs or outputs of a production process: These taxes can be based on the product, unit or installation that emits GHG. If this tax is based on the carbon content, it is in fact the same to an emission tax. (Görlach, 2013)

Financial support mechanism for climate-friendly products and activities: These mechanisms can take different forms, like differential tax rates or direct support. A differential tax rate can take the form of a partial tax exemption (reduced tax rates), to a full tax exemption (or tax break), to negative taxes (or subsidies per unit of consumption) (Görlach, 2013).

##### Emissions trading

Cap-and-trade: Cap-and-trade systems set a fixed ceiling the amount of emissions. A central authority sets this limit. (Görlach, 2013)

Baseline-And-Credit systems: Credit systems set a ‘minimum performance limit’ on the quantity of the emissions amount. A regulator sets the level for each participant and the regulator oversees the actual emissions. Afterwards, participants can claim credits based on their emission reductions. (Görlach, 2013)

##### Removal of perverse incentives

Removal of perverse incentives: Subsidies on environmentally damaging activities and products, e.g. a subsidy on the production of fossil fuels, through payments to producers. (Görlach, 2013).

Correction of other incentives: e.g. readjustments to the liability framework, where dispensation from liability or insufficient liability rules an implicit subsidy and pervert competition. (Görlach, 2013).



### Liability rules

General liability rules: reduce environmentally consequential actions (Görlach, 2013).  
*'Liability instruments impel concerned parties to internalize external costs through the threat of consequential costs'* (Sorrell 2003).

Adapting liability rules in dependence of environmental impact: *'Increasing the liability polluting activities beyond the general rules can reduce the environmental impact by reducing the optimal level of pollution achieved by the pollutant'* (Görlach, 2013).

### Deposit-refund

Deposit-refund systems: are charge systems, 'upfront payment', for the sale of a consumer product, combined with a subsidy for returning it to a collection point. (Görlach, 2013).

## Non-market-based instruments

### Command-and-control regulation

Framework standards: These standards are qualitative requirements, which require performance clarification, but can also include requirements for operating certification. (Görlach, 2013).

Performance standards: also known as benchmarks or minimum energy performance standards, are standards which set specific environmental targets for concerned parties without mandating particular technologies. (Görlach, 2013).

Technology standards: Technology standards can be implemented in several GHG emission reduction technology production processes. They can oblige operators to use a specific product. (Görlach, 2013)

Prohibition or mandating of certain products or practices Building codes and standards: This addresses, bans on certain products or practices, or obligations to obtain special permits and control-certificates for operations involving specific products. (de Serres 2010)

Building codes and standards: Building codes and standards set environmental targets in the construction of buildings, see paragraph 5.2. (Görlach, 2013).

Land use planning, zoning: Land use planning (EU) and zoning (USA) set specific environmental targets in how land is used without choosing the technology that has to be used in the planned space. (Görlach, 2013).

### Stand alone Reporting requirements

Stand-alone reporting is usually the first step to a future regulation and required to increase the information level in the administration. (Görlach, 2013).

Active (green) technology support: These are created to promote the “development and deployment of technologies” (de Serres 2010). The accent in active (green) technology support policies is directly acting on supply and not relying on environmentally friendly demand (Görlach, 2013).

Public and private RD&D funding: This funding fits a range of possibilities of investment, which can extend from investing in public research to direct governmental funding of private R&D and tax incentives. (Görlach, 2013).

Public procurement: Refers to public adoption of policy instruments, which sets a standard of product or instrument usage in the process of public procurement. (Görlach, 2013)

Green certificates: Renewable energy certificates. These green certificates can be traded and used to meet renewable energy agreements/obligations, among consumers and/or producers. The green certificates can also be used for voluntary renewable energy power purchases. For a more in-depth explanation of green building certificates, see paragraph 4.3.3. (Görlach, 2013).

Renewable portfolio standard: This standard obligates a minimum percentage of electricity purchased, or generation capacity installed to be provided by renewable energy sources. (Görlach, 2013)

Feed-in tariffs: Feed-in tariff is a policy instrument, which gives a fixed (and guaranteed) price at which power producers can sell renewable power into the electric power network (IEA, 2010). The tariff can be adjusted in conformity to the current electricity price but must guarantee a minimum price for each kWh generated over a certain period of time. (Görlach, 2013).

Public investment in underpinning infrastructure for new technologies: *‘Public investment in underpinning infrastructure for new technologies entails a governmental body including new technologies in current or future public investments’* (Görlach, 2013).

### Financial measures (subsidies)

Policies to remove financial barriers to acquiring green technology: These policies are financial instruments, which provide financial resources for the specific purpose of environmental protection (Sorrell 2003).

### Information and voluntary approaches

These approaches use instruments that 'improve consumer awareness' about environmentally impacts of products and practices. They also can give information about alternatives which are less damaging. (de Serres et al. 2010)

Education and training: Policy instruments which correct a "lack of information" for consumers, by '*building the capacity to respond by appealing to consumer values and/or attempting to modify values*' (Sorrell 2003).

### Product certification and labelling

This 'certification' or 'labeling' is the usage of a label or symbol which indicates that compliance with specific standards has been verified. The use of a label or certification is generally controlled by a standard-setting body (Liu, 2003).

Environmental labelling programs: This program is the practice of labelling products, based on a wide range of environmental considerations. Environmental considerations are for example, hazard warnings, certified marketing claims, and information disclosure labels. (Görlach, 2013)

Award schemes: Award schemes are a form of public acknowledgement from public authorities - at both national and supra-national levels- , recognizing environmental performance achievement based on several criteria, set by the awarding body. (Görlach, 2013)

Public information campaigns: Public information campaigns entail public actors raising awareness about environmental policy initiatives and, or concerns. (Görlach, 2013)

Voluntary agreements: '*Negotiated agreements between the government and particular industrial sectors to address a specific environmental concern*' (de Serres, 2010). The level of strictness, control and sanctions varies between these agreements. Their goal is usually to prevent or bend the introduction of more straight approaches. (Görlach, 2013)

Unilateral commitments: These commitments are voluntary policies, which companies (or industrial groups) undertake and self-initiate to decrease pollution and/or other environmental problems. (Görlach, 2013)

Public voluntary schemes: This entails a voluntary adoption of e.g. standards, procedures and targets, which are developed by public bodies. (Görlach, 2013)

## Appendix C

### Madison Sustainable Plan

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#### Planning and Design

Vision ‘Our built environment respects the natural environment and provides convenient access to food, health, recreation, economic livelihood, and other basic needs for individuals and families through compact urban design. Our neighborhoods include informed and engaged people of mixed income and diverse ethnicity. The places where we live, work, learn, and play are safe, sustainable, affordable, healthy, and inspire a sense of well-being. Madison’s land use patterns, and our planning and design policies and practices, provide and protect quality of life for existing and future generations.’ (City of Madison, 2011)

The City’s Comprehensive Plan – Madison Sustainable Plan - outlines specific guidelines and priorities for land use, neighborhoods and the preservation of the natural environment. To be able to achieve this vision, the Planning and Design part of the environmental area sets-out four goals: 1. Improve transportation planning systems to provide better access for community’s needs. 2. Foster holistic land use. 3. Support sustainable infrastructure and buildings. 4. Promote and foster local food systems. Especially number two and three are important regarding mitigation of residential real estate development.

#### Foster holistic land use

The main goals of the section ‘foster holistic land use’, are that the city of Madison should take initiative and lead the area in sustainability, whereby they will help the area to create a stronger economic base. Natural resource policies, urban design and architecture should eliminate neighborhood blight and promote and protect a sustainable, high quality, built environment and development with a preservation of the area’s natural resources and open spaces. To achieve these goals, twelve actions are set-out by the Madison Sustainable Plan.

Create walkable neighborhood opportunities, upgrade walkability in already built out neighborhoods	Increase storm water infiltration, reduce heat island effects by changing the requirements for all surface parking and other strategies to reduce environmental impacts
Maintain, utilize and re-invest in existing public and private infrastructure	Develop guidelines for developers and committees to follow when creating and reviewing plans to re-invent old big box, strip malls and other commercial developments with similar low density uses to better use the land and surrounding parking lots
Educate the public on the inventory of underdeveloped land parcels and encourage sustainable development	Develop a mechanism for creating community gardens and for returning properties that have been used as community gardens, including those used conditionally as derelict and vacant, to development
Encourage higher density of single family housing	Review land use plans on the edge of the city to ensure compliance with sustainability principles through open and transparent process with all stakeholders
Advocate for enhancing the jurisdiction and authority of a regional planning agency that helps implement county-wide planning and communication on land use	Create a Redevelopment Plan for the city which includes eliminating blight in all neighborhoods. Prioritize infill development to maximize use of existing infrastructure and facilities
Establish a preferred maximum of parking places and an actual maximum parking threshold, within the parameters of the Zoning Code	Involve Planners in transportation improvement project selection process

The plan is to achieve foster holistic land use goals by policy, regulation and education, with budget from the city and grants. The lead agencies in this plan are the City of Madison Planning and Engineering Division and the City of Madison Inspection.

### Support sustainable transportation and buildings

As mentioned in chapter 4, developers and investors are still missing the knowledge of the importance of investing in climate mitigation (Hoogvliet, et al., 2015). Therefore, it is important for developers to feel the pressure to mitigate their developments and gain knowledge about the risks of climate change and the benefits/possibilities of sustainable mitigation.



Reducing energy use and emissions in City facilities, transportation systems and building processes, is the main goal of the section ‘support sustainable transportation and buildings’ of the City of Madison. This section shows 15 actions to encourage sustainable development and make Madison a more sustainable city.

Encourage sustainable private development	Design the parks to provide rain catchment and provide solar spacing between buildings.
Demonstrate sustainability on all public projects	Use high-volume cement replacements in all public buildings and infrastructure projects
Create LEED or equivalent third-party certified construction with tiered incentives based on level of certification	Provide financing for energy efficiency upgrades to private buildings
Investigate requiring minimum LEED silver or equivalent third-party certification for all construction supported by public funds	Create a list of measurable and verifiable examples of case studies that show clear environmental, financial and social stewardship
Create project management teams within City agencies to support and encourage developers and builders to work toward environmentally-friendly outcomes. Project management teams should be very knowledgeable about City regulations and approval processes, plus know about sustainable design, building and development practices	Investigate rewriting current City TIF policies to allow consideration of TIF subsidy increase above 50% based on the degree of measurable sustainability in a project Encourage mixed-income buildings
Improve opportunities for physical activities through sidewalk, signage, safe routes, lightning and bike paths	Create incentive programs to encourage rehabilitation of existing buildings and new infill development
Create a website that provides information on ways to improve household, workplace and community sustainability.	Create a Mayor’s honor roll and award program for exemplary projects that show sustainability benefits and how those benefits were achieved

The same as achieving achieve foster holistic land use goals, the plan is to achieve sustainable transportation and buildings by policy, regulation and education, with budget from the city and grants. The lead agencies in this plan are the City of Madison, Parks, Engineering and Traffic Engineering.

## Carbon and Energy

Vision 'Madison embraces sustainable approaches to fuel our economy and community, achieving an 80% carbon reduction by 2050. Our City government and staff set examples of reduced energy use and emissions for businesses and individuals to emulate.' (City of Madison, 2011)

For the Carbon and Energy section, the Madison Sustainable Plan sets-out six goals, to address and reduce two significant sources of GHG, motor vehicles and electric power generation: 1. Influence reductions in transportation related carbon impacts. 2. Systematically upgrade existing buildings, equipment and infrastructure. 3. Improve new buildings and developments. 4. Engage the public in energy efficiency and climate change programs. 5. Obtain 25% of electricity, heating and transportation energy from clean energy sources by 2025. 6. Report carbon footprint to the public.

Number two and three are interesting goals for this thesis, regarding mitigation of developments and the buildings itself. Number four and five are important because of the lack of knowledge of the risks of climate change and the benefits of mitigation and adaptation and number six is a goal which the Netherlands pursues, too. Chapter 7 will give insight into the sustainable and energy reducing goals of the Netherlands. The actions which need to be taken to achieve these goals, are set-out per goal, below.

### Systematically upgrade existing buildings, equipment and infrastructure

For systematically upgrading buildings, equipment and infrastructure, the second goal is to reduce the energy consumption in public and private sectors by 50% in 2030. The Madison sustainable plan makes a distinction between public and private, in describing the necessary actions to achieve this goal. Below, the public and private action are shown.

#### Public

City government prioritizes and accelerates City's government building and equipment upgrade schedule.	Create a policy of retro-commissioning existing City buildings for energy efficiency and operation.
Reallocate a portion of all City agencies' operating budgets to the annual replacement of capital assets to improve energy efficiency and reduce carbon emissions.	Upgrade at least one City building per year and certify to LEED-EB: OPERATIONS AND MAINTENANCE or equivalent certification program.
Create an incentive for City agencies to allocate operating budget resources to retool capital assets under their control.	Hire an energy manager for the City to measure and track efficiencies, savings and carbon reduction.
Establish audit program through Facilities and Sustainability Office and Finance	Department to ensure that budgeted upgrades are spent on the approved items

Implement low cost behavior-based operational programs that minimize energy use in operations	Investigate creation of a Long Term Capital Budget (more than five-years) and “Citizens’
Budget Commission” to better oversee the City’s stewardship of capital assets that affect sustainability and energy use	Give preference to LEED certified or equivalent certificated buildings in acquiring leased space for City government use
Create an upgrade schedule for existing buildings with energy performance targets to upgrade: The bottom performing 30% by 2020 to 69% ENERGY STAR level. The middle performing 30% by 2022 to 75% ENERGY STAR level	Direct City purchasing and procurement to give preference to vendors whose buildings, equipment, products and services meet achievable sustainability targets

### Private

Promote and incentivize upgrading existing commercial and residential building stock to improve energy efficiency, indoor air and building environment quality	Investigate developing an energy performance level requirement for new construction or renovation of 50% or more of the gross square footage of a commercial building that could be activated at the time of plan review
Gather benchmark information on private buildings related to energy use and its impact on property sales, rental and occupancy rates to show value of upgrading systems	Create policy with incentives and energy performance targets to foster upgrades of existing buildings
City and community partners participate in EPA’s Better Building Competition or institute an award program for building owners who: a) measurably reduce energy consumption over a 12-month period, and b) provide an educational report about how they did it	Investigate impact of promoting a 30% reduction in energy use below code for existing buildings that receive TIF funding
Analyze current housing stock: square footage, demographic data, age, etc., to determine target areas for energy retrofitting	Encourage businesses to participate in the MPower champions program
Educate the private business owner about the value of disclosing information on lower energy use to commercial and residential buyers or leases	Encourage incentives for the private sector to convert to low carbon or alternative fuel vehicles

Track energy retrofit for low-income housing EECBG (Energy Efficiency and Conservation Block Grant) program	Collect pre- and post-tests and statistical data
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To be able to accomplish these actions and achieve the goal, funding will exist out of budget from the city and grants, the strategy types will be: policy, operations and education. The lead agencies in this plan are the Facilities and Sustainability Office, Planning, Utilities, Community Organizations and Partners, Media Outlets, Advertising Agencies.

### Improve new buildings and developments

The third goal is to meet zero net energy standards by creating a target for new buildings and development, by 2030. The city of Madison has to give/show examples for this energy goal by retrofitting or developing a facility that exhibits techniques and concepts of zero net energy, by 2015.

Create incentives (e.g., expedited permitting, decreased permit fees, etc.) for new residential construction/remodels that meet Home Performance with ENERGY STAR at the top 20% level. Assess fee for additions to new buildings, a percentage of which will be rebated if addition meets ENERGY STAR standards	Incorporate zero net renewable energy infrastructure into neighborhood plans where applicable
Develop a green building (energy efficiency, water conservation, construction materials, landscaping, etc.) program that help City staff guide new commercial and public construction	Create and adopt strategies and requirements to minimize urban heat islands, optimize carbon sequestration and promote water retention (e.g., green roof, bio swales, urban tree canopy, vegetative parking)
Create commercial LEED or other third party certification program. Charge reasonable fee and provide rebates at different percentages based on LEED or certification level achieved	Allow on-site energy generation (e.g., ground source heat pumps or other district clean energy source, or on-site solar generation)
Develop by 2015, with the support of key Zero Net Energy stakeholders, a Zero Net	Energy program and incentives for new and retrofitted residential/commercial buildings and development

Have Common Council adopt Zero Net Energy (ZNE) by 2030 and create ZNE stakeholders group to implement plans	Design all buildings to incrementally improve their energy efficiency to achieve Zero Net Energy (ZNE) by 2030, to standards set by the ZNE stakeholders group
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The strategy types to accomplish these actions are: policy, operations and education, with a funding out of budget from the City of Madison and grants. The lead agencies or partners of this third goal are Facilities and Sustainability Office, Planning, Utilities, Community Organizations and Partners, Media Outlets, Advertising Agencies

### Engage the public in energy efficiency and climate change programs

By 2030, 60% of Madison's population needs to be aware that community members are being encouraged to engage in climate change and energy efficiency programs, e.g. Mpower Madison, by mobilizing programs, targets, measures and marketing through educational programs and community partnerships.

Establish feedback and information systems	Create rotating 5-year marketing campaign partnerships with media groups that spread the message on energy conservation and carbon reduction
Publish and post City Government agencies' utility bills for public to view	Ask businesses, institutions, trade associations, Chambers of Commerce and other organizations to actively and regularly promote energy efficiency and climate change information to their members and members' employees
Help building owners compare their energy usage with other comparable buildings	Initiate an ongoing media series featuring the energy and carbon reduction actions taken by high profile community members
Create and implement an energy consumption feedback system (secure database) between local utilities and the City of Madison Assessor's Office to allow consumers to compare their energy consumption with other consumers in Madison based on building data (size, age, construction materials, etc.)	Encourage communities of faith to provide ongoing campaigns to change members' behaviors and raise awareness around energy conservation and carbon emissions reduction
Implement public outreach between the City and utility providers to inform consumers of the availability of the new energy consumption feedback system	Develop a series of special action days that ask people to take specific actions on energy conservation, carbon reduction and sustainability



Continue Mpower Madison member partnership program on climate change	Create a City-wide recognition program for innovative energy savings initiatives that achieve measurable results
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To achieve this fourth goal, the strategy type will be: policy, operations and education, with funding from budget and grants. The lead agencies or partners will be Facilities and Sustainability Office, Planning, Utilities, Community Organizations and Partners, Media Outlets, Advertising Agencies.

### Obtain 25% of electricity, heating, and transportation energy from clean energy sources by 2025

The fifth goal is to increase the use of green, clean energy sources by 2025. The 14 actions are listed below.

Buy energy from clean power sources (i.e., bio-fuel, wind, geothermal, bio-mass, etc.)	Adop a general policy preference for energy sources located as close to Madison as reasonably practical
Expand City's renewable electrical energy purchase (now at 24%) as example to the community	Divert urban organic wastes into fuel sources for local bio-digester energy production
Encourage private sector green power purchase (residential/commercial)	Work with MMSD, Dane County Landfill and local businesses to identify and rank various opportunities for greater bio waste-to-energy projects
Encourage higher renewable energy content in the grid	Rewrite zoning codes and other regulations to permit district and decentralized energy generation and distribution systems
Investigate ways to increase on-site renewable energy generation, initially with City facilities and then within the community	Permit and create incentives for decentralized renewable energy utilities (e.g., wind installations and solar canopies in mall parking lots, etc.) on public and private structures, while minimizing impact on existing architecture and historic areas and recognizing that state law currently prohibits regulatory protections
Create solar charging stations to recharge electric vehicles	Promote solar-powered City infrastructure where feasible

Work with utilities, institutions and businesses to authorize, facilitate and design district-scale sustainable energy systems	Encourage new above-grade parking facilities to have solar canopies or green areas on top level
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This strategy of this fifth goal will be by policy, partnerships and operations with again a funding from budget and grants. The lead agencies or partners will be: Engineering, Utilities, Community Organizations and Dane County.

#### Report carbon footprint to the public

The sixth and last goal of this section is developing a comprehensive report regarding Carbon Footprint, for the City of Madison. This report has to highlight green house gasses and air pollutants emitted and has to be provided to the public, every two years.

Develop a carbon footprint baseline for public, City-owned and/or controlled facilities and activities. Prepare a matrix of metrics, both measurable and value-based, to establish baselines and track progress	Hire energy manager to assist in carbon analysis and coordination
Develop a carbon footprint estimate for all facilities and activities within City limits (residential, commercial, industrial sites)	City will publicize the plan and incorporate the goals into future planning, budget and outreach activities
Develop a baseline carbon analysis, carbon budget and outline a climate action plan with benchmarks and targets for future years (e.g., 2020, 2030, 2050)	Create Carbon Footprint measures and take CO <sub>2</sub> into account when determining City Projects: Create an internal carbon pricing system for the city. Determine a price per ton of CO <sub>2</sub> to project costs when assessing options

The strategy type of achieving these actions will be the policy, with funding from budget and grants. The lead agencies or partners will be: Facilities and Sustainability Office, Engineering, Committees, Community Groups, Utilities and Dane County Agencies. (City of Madison, 2011)

## Appendix D

### Het Energieplan (2016)

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The Energieplan consists out of 5 sections: housing, work, transportation, generating energy and grid and balancing of the grid and storage of energy. All five subjects need special attention when it is about becoming more sustainable, saving energy and generating green energy. However, because of the subject of this thesis, the focus of Appendix C and the matrix in this paragraph, will be on housing.

#### Housing

The ambition for housing is challenging: In the future, residential properties must be energy neutral, comfortable and affordable. All appliances and lighting has to be energy-efficient and residents must be able to choose between different energy providers. This ambition involves measures for different actors: Real Estate Developers, Property- and home owners and tenants. These measures will be explained in this appendix. (Gemeente Utrecht, 2015)

#### New developments energy-neutral

From 2020, it is legally required by regulations, to construct developments energy neutral. However, it is important according to the Energieplan (2016), to built new developments, energy-neutral and future-proof, as soon as possible. In areas where the municipality of Utrecht owns land themselves, they can control the degree of sustainability by high and low ratings: EMVI Method (Gemeente Utrecht, n.d.). In areas where the municipality of Utrecht, by their own land management, wants to sell land for new residential developments, the municipality – in anticipation of the national regulations – will rate the sustainability/energy-neutral factor of the developments in the tendering process. In order to achieve a high rating, real estate developers have to make use of solar panels and other energy saving measures. Developments and buildings plots, intended for private development – land plots which is not owned by the municipality -, have to follow the requirements of the Dutch Building Code. The municipality cannot set higher demands regarding sustainable technologies, than indicated in this Building Code. In order to bridge the gap between private development and development directed by the municipality, the municipality of Utrecht wants to discuss experimental space with the government. By experimental space, the municipality can influence the private-led developments by e.g. further regulatory capabilities, including the context of the new environmental law. (Gemeente Utrecht, n.d.)

#### District heating

The municipality of Utrecht, no longer wants to be independent on gas as one of the biggest energy sources. The Energieplan (2016), wants where possible, no replacements of old gas pipelines and start using alternative forms of heating facilities: buildings which will become more energy efficient by district heating or fully electric

heating systems. Before replacement of gas pipelines will take place, the municipality wants to do research, together with Stedin, stakeholders and neighborhood residents, to see if there are enough alternatives for gaining energy in an efficient way. To make this legally possible, the government has to agree with the use of these alternatives. (Gemeente Utrecht, n.d.)

### Less energy costs in existing homes

The Energieplan (2016), distinguish developments/buildings with and without district heating. According to the municipality, maximum isolation and the use of sustainable, local energy is required to get energy neutral. The old city center of Utrecht consists of many older houses where maximum insulation is difficult to realize. For these houses, a more sustainable heat supply is a good start, with a favorable location of the current district heating network, namely the historic city center. In order to make choices in the strategy to be followed, the municipality is creating plans at neighborhood level. These plans elaborate options to create a climate neutral neighborhood, based on the age of the housing, the availability of district heating, the presence of major energy consumers, potential energy providers and maintenance plans for the existing energy infrastructure. (Gemeente Utrecht, n.d.)

### Awareness

The awareness of climate change has a prominent place in the Energieplan (2016), for both: residents and companies. To create awareness, the municipality will make and show inspiring examples, and see which communication tools they can use. In addition, the Municipality sees the energy consumption of families, in comparison with other nearby houses or streets as a good tool to make the user more aware of the consumption of energy. This can be done in different ways: e.g. making energy bills more insightful and comparison between different houses/households in the same area. To make this possible, the municipality will consult with Stedin. (Gemeente Utrecht, n.d.)

### Financing

The Energieplan (2016) asks for new and sufficient funding opportunities. Especially, construction-based financing. In case of this funding possibility, linked to 'bricks', the municipality is planning a construction where the financing, for example from an energy supplier or municipality, is linked to the house (the bricks) itself, and not to the owner of the building. In this case, the housing expenses will stay the same and the owners does not need to worry about a possible moving. However, to make this type of funding possible, adjustments of the regulations are necessary. Therefore, the municipality needs a collaboration and commitment between them and the government. (Gemeente Utrecht, n.d.)

### Energy Efficient Appliances

Appliances and devices are becoming more and more efficient as a result of the European Legislation. Given the nature of the market (global producers), the municipality thinks that European regulations are most effective in ensuring that more efficient devices are on the market. The municipality has no major role in stimulating further

efficiency enhancement in devices. However, they see the opportunity to offer the market, services that also allow low-income household to purchase energy-efficient devices. Together with market parties, the municipality explores the possibilities for lease constructions for energy efficient devices for lower-incomes and students. In addition, it is possible to place the most energy-efficient devices in new developments. Again, this requires cooperation from market parties. Additionally, the municipality facilitates, next to a purchase action for solar panels, also other large-scale purchasing operations, including LED-lighting. (Gemeente Utrecht, n.d.)

### Tenants

The Energieplan (2016), is based on energy-neutral rental housing. The quality of rental housing must be good, with as focus affordability. The municipality is going to discuss with the housing cooperations, the possibility to offer all rental homes the opportunity for solar panels. With the 'performance negotiations' between the municipality and the housing cooperations, the municipality wants to make new social housing developments energy-neutral, from now on. (Gemeente Utrecht, n.d.)

### Work

In this section, 'work' is related to the energy use in all other buildings than residential real estate: offices, industry, stores, schools, hospitals, et cetera. In principle, this sector applies the same measures as housing does. LED lightning and energy efficient equipment are available, everywhere. Offices, restaurants and supermarkets, can make use of soil energy (heat and cold storage) for their cooling systems. Because energy rates (including taxes) for this sector are lower than for households, the investment costs of some measures (regarding energy saving), do not recover later or not at all. Another difference is that for building owners, there are more obligations in our plan, than for residents. (Gemeente Utrecht, 2015)

### Transportation

The Municipality of Utrecht wants to increase the use of public transport and transportation by bike, in the future. 'If we need a car, we drive environmentally conscious and clean cars. In the longer term, all cars and buses are electric. Trucks will drive on electricity or biofuels'. (Gemeente Utrecht, 2015)



## Appendix E

### Programma Duurzaamheid 2015-2018

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#### Ambition 1: Green, Healthy and future-proof city

In order to be a healthy, green and future-proof city, the municipality focuses on the following themes:

- Clean air: optimize sustainable mobility, aimed at less polluting vehicles in the city center and a growing use of bicycles and public transportation
- More green: Increase of useful green (trees, grass, et cetera) in the city
- Dry feet: A combination of water safety and reinforcement of the resilience of the city
- Sustainable areas: There are standard frameworks and goals for sustainability, for each spatial development

#### Ambition 2: Cleaner energy at lower costs

- Energy saving for residents: Through the 'Versnelling010' program, the municipality wants to focus on the energy use of rental- and condominium housing
- Energy saving for entrepreneurs: By performing energy scans, the municipality can show where small and medium-sized enterprises (SMEs) can save energy and money
- The industry/port as heating: Extend the number of connections to industrial heat from the district heating network
- Profit by wind: Compliance with the ambitions agreements of Rotterdam as wind farm, with direct profit for the inhabitants of Rotterdam
- The sun as a source: Ensure that more use can be made of the sun as a source of energy

#### Ambition 3: A strong and innovative economy

- Opportunities for Clean Tech: Stimulating Clean Tech business in Rotterdam
- Stronger competitive position through energy saving: Construction of large-scale infrastructure for disconnection of industrial residual heat, steam and CO2
- Head of circular economy: Rotterdam as the central turning point in the circular economy
- Developing the bio-based economy: Focusing on green chemistry, green fuels and other biomaterials based on second- and next generation of soil and residual flows.
- Cleaner transport and logistics: More use of liquid natural gas and hydrogen in transport and logistics

## Ambition 1 Sustainable areas

According to 'Programma Duurzaam 2015-2018', sustainable areas are potential money makers. A combination and application of different forms of sustainable measures provides yielding areas that add value to the areas themselves. These sustainable areas avoid future and hidden costs; They are health-promoting, are prepared for climate change (adaptation) and reuse vacant real estate. According to van Aalst, in an interview with NRC.nl (van Aalst, 2016): *'Every Euro we invest in climate adaptation - anticipating the adverse effects of climate change -, before a 'climate disaster', will save multiple euros on costs, afterwards.'*

The municipality wants to achieve sustainable spatial planning by: giving attention to every spatial development, - aspects such as green space, air quality, sustainable housing/construction, re-use of real estate, affordability and accessibility as well as sound and attention for a bicycle- and walk friendly area – in a coherent view. This is an important responsibility for the real estate developers of those areas. These developers are often not the municipality itself, but project developers, housing corporations or other market parties. The municipality will explicitly perform a framework and a 'facilitating role', in the coming years.

In the major spatial development projects - Hart van Zuid and Rotterdam Central District – sustainability should be set as a requirement in the development criteria, for example in the procurement system. In smaller area developments, developers should gain experience and knowledge about instruments that integrates an area

In smaller spatial planning projects, developers should gain experience with an instrument which can review sustainability tasks on integral area level. This instrument is based on the internationally recognized BREEAM methodology. Based on this, the municipality, together with market parties, creating a plan for implementing concrete measures. Aspects of this plan are: affordability, realization potential and mode of implementation. *'Our goal is to use this methodology in all new area developments, so that sustainable areas are no longer the exception but the rule'*, according to the municipality of Rotterdam. (Programma Duurzaamheid 2015-2018)

## Ambition 2 Energy saving for residents

Rotterdam encourages making the existing housing stock more energy efficient, by working intensively with all kind of parties in the city. In 2013, the joint venture 'Versnelling010' was created: the municipality works together with fifteen partners, including housing corporations, construction industry and energy companies, to make the existing housing stock more sustainable and energy efficient, at a more rapidly tempo.

In order to achieve this, the goals of the municipality are:

- 7000 households (from housing corporations) need to be more energy effective: Rotterdam and corporations need to 'activate' tenants by making funding sources available and presenting innovations that can improve and accelerate this approach
- 'Activating/encouraging' owner-occupied residents to make 3000 households more energy efficient: Residents will get informed, activated and facilitated, regarding getting consciousness about an energy effective behavior and taking measures
- 'Activating/encouraging' neighborhoods': With the help of improvement coaches, the municipality wants to encourage neighborhoods to make energy efficient housing improvements
- Creating and bundling of partners 'Versnelling010': Together with Rabobank Rotterdam, the municipality is developing a loan that can help the inhabitants of Rotterdam to finance energy saving technologies
- Facilitate and participate: In promising, innovative initiatives by residents and companies, to create knowledge and relational networks which will help and facilitate sustainable developments, elsewhere in Rotterdam
- National and European lobby: Access of governmental recourses to make the existing housing stock more sustainable and energy efficient

### Energy saving for entrepreneurs

The municipality of Rotterdam supports businesses and institutions from SMEs, in order to be more sustainable and saving energy in their operations, buildings, products, et cetera. 'Programma Duurzaam 2015-2018, focusses on this support, in addition to maintaining regulatory requirements, performed by the 'Dienst Centraal Milieu Beheer Rijnmond' – Central Environmental Management Service Rijnmond-, commissioned by the municipality of Rotterdam. The municipality tries to do this by energy scans and participation in two pilots:

- Offering energy-scans to small and medium-sized companies: this gives insight into the potential returns of these energy savings for companies and advises how to realize this
- Participate in two pilots for the 'Energy performance certificate' (EPC): Within the framework of the national energy agreement and the agreement to introduce an EPC for small and medium-sized companies, the government has asked to submit proposals for pilots from cities and regions

### Industry as heating

With the residual heat from the Port of Rotterdam, it can be achieved that buildings and houses, no longer need to be dependent on gas. The goal of the municipality is to 'feed' the city with renewable heat and heat from sustainable/green heat sources. The ambition is to establish a reliable collective heat supply facility in 2030, which is payable for the end-user. To enable households and companies to use renewable heat sources, the number of connections to district heating should be extended. In 2030, 150.000 houses and half of the remaining real estate need to be connected to district heating.

For this propose, measures need to be realized, in cooperation with housing corporations and energy- and heat supply companies.

- Creating awareness of the benefits of warmth supply, by communication and information
- A heat-map that provides insight into areas with the highest connection potential
- Two pilot-projects, whereby the connection to district heating is developed, leading to an approach for the rest of Rotterdam
- Cooperation with the government to ensure that the 'framework conditions' in law and regulations, will make this ambition feasible

### Profit by wind

The municipality has as ambition to generate 350 MW of wind power, within the Rotterdam municipal boundaries: of which at least 300MW in the port area. 350MW is enough for the annual energy consumption of 200.000 households. The municipality of Rotterdam supports the energy and raw materials consumption, with less CO<sub>2</sub> emissions.

The ambitions of the municipality are described in the 'Covenant Wind Energy', and in the 'Port Covenant Wind Energy' of Rotterdam. Concrete actions under these two covenants include:

- The commissioning of wind farm 'Hartel 2', in 2015
- Realization of wind farm 'Nieuwe Waterweg' and 'de Slufter'
- Start development wind farm 'Landtong Rozenburg' and junction 'Beneluxster'

### The sun as a source

Solar energy is one of the renewable energy sources, with less environmental damage. With 18.5 km<sup>2</sup> of flat roofs – 70% of the total roofs of Rotterdam -, Rotterdam has a lot potential for generating energy by solar panels. With the current technique, the solar potential for the city is about 1500 GWh, which will cover about 60% of the energy-use of the city.

Rotterdam wants to encourage the use of solar panels and make it possible for more inhabitants, companies and institutions, to work with solar energy, by:

- Stimulating, encouraging and facilitating residents to reach the goal of 4.500 households with solar-panels on their roofs
- Making agreements with housing corporations, to reach to goal of 1.500 households with solar-panels on their roofs
- At least two pilot-projects with solar panels on social property
- At least two collective solar panel projects in progress

## Appendix F

### WHEDA requirements for City Row Apartments

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#### **Development requirements**

Showerheads & faucets:

- a) Low flow showerheads of 1.75 gpm, or less, must be installed on every showerhead within each dwelling unit in the development, and
- b) b) Faucet aerators with a rating of 1.5 gpm or less must be installed on every faucet within each dwelling unit in the development.

Common Area Lighting: Appropriate high efficiency lighting, including High Performance T-8 systems, T-5 systems, or Compact Fluorescent Lamps (CFLs), shall be installed in all interior common areas, including decorative fixtures.

Appliances: being replaced or initially installed must meet current ENERGY STAR® standard(s).

Window or Central Air Conditioning Units: being replaced or initially installed must meet current ENERGY STAR® standard(s).

Setback Thermostats: All Family housing units located in the development are required to incorporate setback thermostats.

#### **Required building envelope**

Building envelope worksheet calculations: Must exceed the State of Wisconsin Department of Commerce Building Envelope Requirements by, at minimum 2%, based upon (2006 IBC code) REScheck™ software calculations AND heating loads must be calculated at the maximum infiltration rate allowable in REScheck™ ( 0.5 air changes/hour).

Preservation and Adaptive Re-use developments must make efforts to exceed the State of Wisconsin Department of Commerce Building Envelope Efficiency by 2% (2006 IBC code). If the full 2% cannot be achieved, documentation (submitted with the final LIHTC application) must demonstrate efforts AND greater than normal efficiencies of ancillary items such as window replacement “U” value, insulation “R” value, heating systems and lighting systems.

#### **Energy Efficiency and Sustainability**

National Green Standards: Points will be awarded to developments certifying they will be/have built according to one of the following national green building standards: LEED-Certified, Wisconsin Green Built Homes or Green Communities Program. The architect must certify at initial application the development will be built to the standard. It is not necessary to provide the actual certification from the standard.



Focus on Energy\* Consultation: Submit a letter from Focus on Energy, stating that the applicant has met in person with Focus on Energy staff to review this proposed development for possible energy savings ideas, OR, provide evidence that Focus on Energy has conducted a no-cost energy audit for an existing multifamily building.

Indoor Air Quality: Developments using Energy Star-labeled bathroom fans (exhausted to the outdoors and equipped with humidistat sensor or timer), AND using Energy Star-labeled power vented fans or range hoods (exhausted to the outdoors).

Minimum of 20% recycled content material - excluding mechanical equipment and electrical equipment. Architect Certification required with initial application.

Minimum of 35% of wood products are either salvaged wood, engineered materials, and/or Forest Stewardship council certified wood products and materials. Architect Certification required with initial application.

\*Focus on Energy: a program - funded by the ratepayers of participating Wisconsin utilities - with as goal to encourage energy efficiency and the use of renewable energy, enhance the environment, and ensure the future supply of energy for Wisconsin. *'The program provides information, resources and financial incentives to help e.g. developers implement energy saving projects/technologies, that otherwise would not be completed'.* (United States Environmental Protection Agency, 2015)

## Appendix G

### Interview questions

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#### Economic

1. Why did you decide (not) to implement sustainable technologies?
2. What was the pressure?
  - *Tenant has to pay for MGE/competitive market, market strategies*
  - *Developer has to pay for MGE, strong incentive to implement sustainable technologies*
3. Did you (not) invest in sustainable technologies because of market competition from other developers? Where there other reasons? If so, what were they? (see question 1)

#### Political

4. Was there a political demand and did you have to respond on this demand?
5. Did you get encouraged by political support to implement sustainable technologies? If so, explain how this occurred?

#### Technological

6. Why did you choose the technologies you did use? What makes it attractive – for example: marketing (new technology), marketing (familiar technology), subsidies for using this technology, et cetera? How did you get encouraged?
7. What prevented or discouraged you from using more technologies in your development?
8. Are there sustainable initiatives that you did consider but not use? And why is that?

#### Social Demographic

9. Is there a social demographic marketing demand for you to incorporate sustainable technologies into your projects? How do you anticipate this marketing demand/do you anticipate on what people want – and why?

#### Cultural

10. What are your cultural perspectives, mindsets or ways of thinking? Human perspective: what is successful and what should it take?
11. Do you want to be the market leader or do you respond on the market – and why?

#### Environmental

12. How many of what you are doing is driven by the fact that Madison has stronger growth than for example Detroit, so there is stronger competition between developers? What if you were a developer in Detroit, would you do the same thing as you are doing right here in Madison?