Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences
Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

<table>
<thead>
<tr>
<th>Personal information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Student number</td>
</tr>
<tr>
<td>Telephone number</td>
</tr>
<tr>
<td>Private e-mail address</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Studio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name / Theme</td>
</tr>
<tr>
<td>Teachers / tutors</td>
</tr>
<tr>
<td>Argumentation of choice of the studio</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Graduation project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of the graduation project</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
</tr>
<tr>
<td>The posed problem,</td>
</tr>
</tbody>
</table>
Some municipalities do work on this as seen at the benchmark of 2017, but here is also evident that around 25% of the stock is categorized at label G, the worst label.

So, the Dutch government, national and local, are setting goals to be CO₂ neutral in 2050 conform the Paris agreement, but the implementation of those goals are not clear and seen back in the management of the public real estate on a municipal level.

This thesis will identify what the barriers are for this problem and how municipalities best can decide to implement a certain strategy. This strategy can be made based on the typology of the portfolio, current energy consumption, finance and other factors of the real estate and its management.

**Main research question**

What sustainable real estate management strategies are available, at a municipal level, and under what circumstances do they need to apply these strategies to reach the goal to have a public real estate portfolio that is energy neutral in 2050?

**Sub-questions**

1. What current theories for municipalities to manage Public Real Estate Management are used to make strategies?
2. What current sustainability strategies are already available and used by municipalities?
3. Are there sustainability strategies for different building typologies?
4. Are there cases where outsourcing can be an option?
5. How does the financial investments effects the decision-making process?
6. What are the opportunities and barriers of these strategies?

**Conceptual model**

![Conceptual model](own_image)

**Process**

**Method description / Literature and general practical preference**

The type of study that will be used in this thesis to answer the main question and sub-questions will consist of explorative, longitudinal, qualitative research. Qualitative research is appropriate when there has not been much research conducted in the past, or due to a lack of scientific body (Bryman, 2015). This type of research
will be suitable because while some studies have been conducted on municipal real estate management with a combination of sustainability, this field of research is quite new.

To test the most used energy neutral strategies that emerged from the theoretical framework will achieve the CO$_2$ neutral goal, a case study will be used. Case studies are often used for organizational and managerial processes (Yin, 2013).

### 1.4.2 Research design

![Figure 10: Research design based of REM scheme of Den Heijer (2011)](image)

The framework seen in figure 10 is based on the framework of Den Heijer (2011). This framework will be used to structure the research design for the theoretical framework as well as the case study.

The information that is needed for the research will be investigated through a theoretical framework. This step will determine the baseline of the research in terms of context and strategies.

The throughput will be defined as the sustainable strategies that make the added value according to the literature. So, these strategies show what municipalities can use to make the building portfolio CO$_2$ neutral.

After this, the output can be specified. It will indicate the performance levels for each studied CO$_2$ neutral strategy. This will indicate what the added value is for society, the organization, the user groups, and individuals. This output is a result of the studied CO$_2$ neutral strategies theoretical and in the case study and will consist of an added value overview consisting of: User satisfaction, financial policies, and political goals. Translating this to measurable indicators it will be an overview of:

- Timeline with interventions, in terms of decisions making and technical measurements
- kWh per m$_2$
- Costs in euro’s
- Obstacles and enablers

So, the framework will be used to gather the input for the case study. Through interviews with involved players of municipalities that have a CO$_2$ neutral strategy, the subconclusion of the theoretical framework can be tested and strengthened. The output will be given in: Energy reduction measured in kWh per m2, costs and a timeline of interventions and experience in terms of decisions making and technical measurements of the used strategy.
1.4.3 Data plan

First, the theoretical framework will identify what energy neutral strategies are available for municipalities. It will give insight to the current information available for energy neutral strategies.

Secondly, the information about the case study needs to be collected. This will consist of:

<table>
<thead>
<tr>
<th>General information about the municipality</th>
<th>Real estate portfolio</th>
<th>The added real estate strategy for becoming energy neutral</th>
<th>Process Interview documentation of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Typologies buildings</td>
<td>General documents of the strategy</td>
<td>Why was this strategy chosen?</td>
</tr>
<tr>
<td>Population</td>
<td>Year of built</td>
<td>Governance</td>
<td>Are you happy with the chosen strategy in general?</td>
</tr>
<tr>
<td>Political parties</td>
<td>Monumental status yes/no</td>
<td>Stakeholders identification</td>
<td>How was the process governance?</td>
</tr>
<tr>
<td></td>
<td>MOP if present</td>
<td>Timeline of interventions</td>
<td>Who in your eyes where the key stakeholders in the process?</td>
</tr>
<tr>
<td>Energy specifications</td>
<td>Methodology of the measurement of energy savings</td>
<td>Was the toolbox in your eyes complete?</td>
<td></td>
</tr>
<tr>
<td>Energy labels</td>
<td>Costs</td>
<td>Where the expectations of the strategy met?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Energy savings measured in kWh per m²</td>
<td>What would you have done differently if you had the change to do it over?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>What would you do again when you use this strategy</td>
<td></td>
</tr>
</tbody>
</table>

*Table 1: Information needed from the case study*

Agentschap NL (2013b) listed municipalities that are known to have a sustainable strategy and where willing to do interviews (appendix B). This thesis will therefore first look into these municipalities and ask if they are willing to conduct the case study. Often bigger municipalities are more professionalized than smaller municipalities and therefore making two case studies of municipalities with different size of population can influence the decision-making process. The general information of the municipalities that are used for the case study are mostly public knowledge and can be found on the internet. More detailed information needs to be gathers from the municipalities on the real estate portfolio, results of the strategy and the costs. Lastly, the information about the experiences with the strategy will be collected from the interviews.

All this data will be analysed and fair guiding principles of Wilkinson (2016) will be used to ensure people that need this data can easily excess the data. This means the generated data should be findable, accessible, interoperable and reusable. If done right this thesis can be a expand and be used for other research. When looking at the ethical considerations the data that will be used will not be used for other purposes than educational purpose. Data that is private will remain anonymous if the user of the data wishes this.

1.4.4 Data analysis

The CO₂ neutral strategies that have been emerged in the theoretical framework are being tested with a case study. This case study will be conducted at preferably two municipalities of different size that are working on different energy neutral strategies. The case study will also include sets of semi-structured interviews with experts that have worked with the strategy, most likely portfolio managers or sustainable coordinators at municipalities.
The data will be analysed through variables that can measure the added value

- kWh per m$^2$
- Obstacles and enablers seen in the case study

The interviews will be placed in an opalization scheme.

- Timeline with interventions, in terms of decisions making and technical measurements
- Obstacles and enablers seen in the case study

1.4.5 Research model

The research model displays the research design explained in chapter 1.4 and how the thesis comes to its conclusion that includes also a recommendation, discussion and reflection.

**Theoretical framework**
- Introduction with motivation, problem statement, relevance and research question
- Research framework
  - Context
  - Sustainability strategies, energy transition, and sustainability tools
  - Typologies and sustainability
  - Outsourcing
  - Sustainable smart investing
  - Opportunities and barriers

**Empirical research**
- Research setup
  - Hypothesis
- Results and analysis
  - Literature analysis
  - Case study information
  - Interviews

**Conclusion**
- Conclusion
- Recommendation and Discussion
- Reflection
1 Relation graduation topic, master track and programme.
Public real estate is a learning stool at MBE. This tightly relates to REM, real estate management. REM can be seen as 1 of four corners MBE, the master track stands for. MBE is about researching Design & Construction management, Housing, Urban area development and REM. REM looks at organizations, private and public and see where added value can be made through the real estate portfolio of that organization.

2 Societal and scientific relevance
Based on the previous market analysis and literature review we see a mismatch between national and local sustainable intentions and the implementation of those policies into the public real estate. Identifying strategies and looking at the performances of these strategies can benefit in the long term the energy expenses of the government, it helps reduce primarily the electricity and gas consumption and therefore help the climate not reach the global warming of 2 degrees Celsius. It provides an example for society showing that renovation towards CO\textsubscript{2} neutral is possible and can be an incentive for other private building owners to start transforming their homes and change their energy consumption. Besides this, having energy neutral public real estate is also good for the people that use them. In many cases energy neutral will be also accomplished through a renovation that creates better-isolated buildings, a better indoor climate, and therefore it increases the comfort level of the people that use them.

Scientifically, there will be new research and insight into the change in the decision-making process of municipalities. This can be extended to have more knowledge about management in public real estate on a municipal level now in 2018 and beyond.

Planning

- **P2**
  - Change what needed to be changed after P2
  - Collect information of municipalities and appoint interviewees

- **P3**
  - Proccess collected data
  - Combine literature and casestudy to come to a conclusion

- **P4**