Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

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

Personal information	
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Studio	
Name / Theme	Adaptive Re-use
Teachers / tutors	Hilde Remøy, Philip Koppels
Argumentation of choice of the studio	The theme of the adaptive re-use had the closest connection with the topic of sustainability in the built environment with focus on the existing buildings.

Graduation project	
Title of the graduation project	**Sustainability drivers and barriers: Mapping the motives of sustainable office development in Prague**

Goal	
Location:	Prague, the Czech Republic
The posed problem,	
research questions and	
design assignment in which these result.	

Aim of the research, design assignment:

Although more and more people acknowledge the rising importance of the sustainability issues in the built industry, the development of office buildings seems to be still based mostly on financial incentives. A lot of theoretical research has already been completed on the financial, social and environmental benefits of sustainable office buildings, but in practice such benefits are not always entirely recognized and implemented. In Prague the development of certified buildings has been steadily increasing in past years with the third-party certifications as LEED or BREEAM being by far the most prevailing type. However, the involved actors have not yet fully acknowledged the added value of these certifications, as the willingness to pay more for the sustainability features in buildings remains low. The main aim of this research is to map the current state of the sustainability "readiness" of the Prague office market and to evaluate the sustainability awareness and behaviour of developers, investors and tenants. Such will be done by mapping the theoretical drivers and barriers towards the sustainable office development in the worldwide literature and comparing them to the real perceptions of the actors in Prague. By this comparison it can be spotted, if and to what extent the national context influences the drivers and behaviour of actors within the sustainable office development. As the market state is also influenced by the national and local governmental policies, these will therefore be thoroughly investigated as well.

Completing this overview on the Prague local market's perception from all the different viewpoints is an important step as not much research has been done yet in the field of the sustainable built

environment in the Czech Republic. Mapping the factors for and against the sustainable office development both in theory and practice allows spotting opportunities, which could be the focus in speeding up the potential future development. Moreover, possible private and public incentives and potential drivers connected to Prague office market may be defined. The aim of this research is thus to function as a baseline for further future researches in this field in Prague or the Czech Republic.

Main research question:

What are the most important drivers and barriers of the development of certified office buildings in Prague and what is the perception of buildings' sustainability of main involved stakeholders in the Prague office market?

Detailed research questions:

The research sub-questions are divided based on the actors they relate to; developers, tenants and investors:

- What are the drivers and barriers for developing sustainable office buildings in theory and in Prague practice and how do these differ for different levels of green certifications?
- What are the benefits and hindrances of purchasing and owning sustainable office buildings for investors and how are these perceived in the Prague office market? What is the difference in this perception regarding various levels of green certifications?
- For which reasons do tenants prefer sustainable offices in theory and in Prague practice? To what extent is office building's certification important for the tenants compared to other decision-making factors?
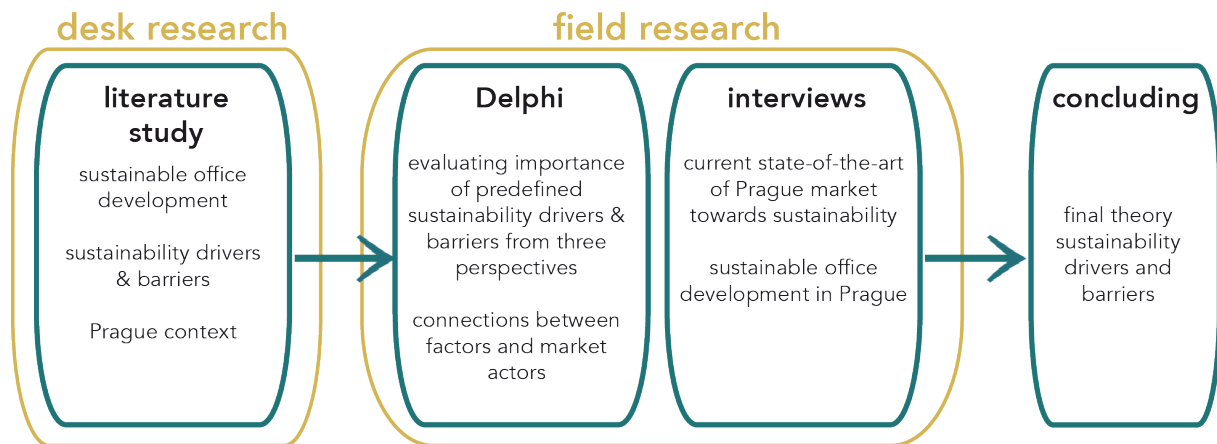
Conceptual model:
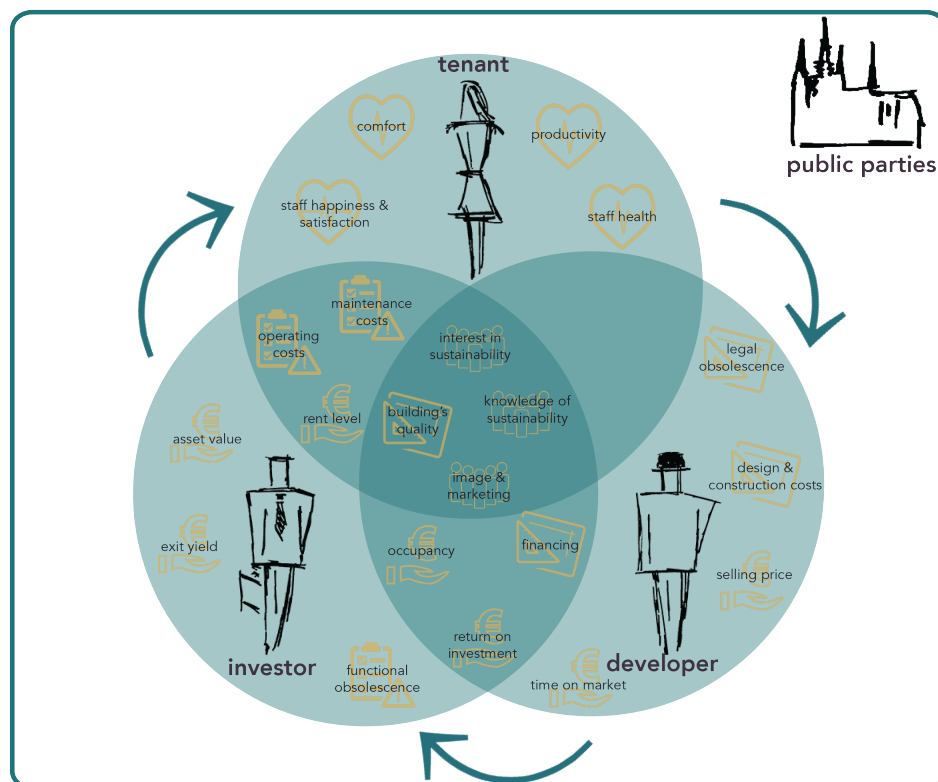
Process
Method description

Various methods are used during the research:
- Literature study, observations
- Scope interviews
- Delphi method
- Semi-structured interviews

desk research　　　　field research

literature study	Delphi	interviews	concluding
sustainable office development sustainability drivers & barriers Prague context	evaluating importance of predefined sustainability drivers & barriers from three perspectives connections between factors and market actors	current state-of-the-art of Prague market towards sustainability sustainable office development in Prague	final theory sustainability drivers and barriers

Literature study, observations

Literature study is described in detail in the following section. The observations will be mostly done based on the personal knowledge gathered from the Czech Republic.

Scope interviews

In order to get a grip on the characteristics of the Prague office market and the sustainable development in Prague and include this knowledge in the problem definition, three scope interviews were performed. The aim of these interviews was to understand the sustainable development in Prague from the different perspectives and to lay the basics for the empirical part of the research.

Delphi method

The Delphi method is widely used and accepted method for gathering data from respondents within their field of expertise and is used to form group consensus about the relative importance of issues. The Delphi method is essentially a series of anonymous questionnaires and/or interviews in several rounds, which are interrupted by controlled feedback. A key element is to provide feedback to the respondents on the overall judgment of the group and give respondents the possibility to adjust their initial answers accordingly. Hypothetically, the Delphi process can be continuously iterated until the desired degree of consensus among respondents is achieved. However, usually a Delphi research consists of two to four rounds of questions. It is commonly acceptable to use a structured questionnaire in round 1 if it is based on previous extensive literature review, in which the basic information on the issue is gathered. This approach was used in this study due to extensive literature review, in which a number of sustainability factors was identified together with the interrelations among the factors and the actors. The gathered theoretical knowledge, limited time and expected possible respondents` fatigue thus resulted in a two round structure used in this study.

The first round of the panel was organized in April and May 2016 in Prague in which one interview was held with each individual panellist. The second round of ranking adjustment took place in June and July 2016 and was performed by e-mail. The provided information consisted of the average

ranking of sustainability factors from the "most important" to the "least important", together with mean and range per rank; compared to their own ranking in the first round. This allowed the respondents to relate their own responses to the group responses and gave the possibility to revise their ranking in order to obtain a higher degree of consensus.

Semi-structured interviews

The semi-structured interviews took place together with the first round of the Delphi. The set of questions, leading the semi-structured interviews were defined in advance in several "clusters" which means that some of the questions differed depending on the field of expertise of the respondent. The semi-structured interview part also took an advantage of experts from different fields within the sector and aimed to broaden the knowledge about the issue.

Sampling

A snowball sampling together with opportunistic sampling methods were used. Overall thirteen interviews were performed from which eleven took part in the ranking of the sustainability factors. The participating respondents were selected as representatives of different groups within the commercial real estate sector in Prague.

Literature and general practical preference

The literature study includes all stages of the research, namely the definition of the problem and a creation of the problem statement, and the theoretical framework, and also functions in the final stage as a supportive aspect in the empirical research.

In the literature review, the theoretical part of this research, the focus lies in determining various sustainability drivers and barriers from all three discussed perspectives; developer, investor and tenant. The literature is however taken from the world-wide context and thus the empirical research further shows, to what extent is each of these sustainability factors applicable in Prague context and whether it is perceived more as driver or as a barrier there. This scoping of literature wass conducted until each of the previously mentioned categories (in this case the determinants or clusters) is well developed in terms of its properties.

Several literature sources were used while defining the problem in the exploitative part of the study:
- scientific articles on the topic of sustainable built environment, sustainability drivers and barriers in the office development, obtained from Scopus, Google Scholar and TU Delft repository
- Czech Building Law and other national and European regulations regarding the topic
- strategic governmental documents as Strategic Plan of the Municipality of Prague
- databases of the Prague office market, obtained from the Czech real estate agents as DTZ, Knight Frank, Colliers International, etc.
- newspaper articles about the topic of sustainability in the Prague context

Reflection
Relevance

Societal relevance

The sustainability of the built environment is a very complex socio-technical issue, which however from a future-generation perspective is a crucial one to tackle. The first step in solving any problem of such complex nature is understanding the current "state-of-the-art" as well as mapping various possibilities of how to approach the problem and how to reach the desired future state. Within the broad topic of sustainable buildings, this research focuses on sustainable office buildings in the context of the city of Prague.

Although the topic of green offices, environmental certifications and sustainable and energy efficient buildings in general is more and more visible in the theoretical discussions and also new developments in the Czech Republic, Prague in particular, the main drivers behind such development seem to be unclear. The incentives and motivations of each of the involved actors are influenced by the decisions and behaviour of the rest of the actors and often create barriers in the development potential. This research aims to bring an overview of the drivers, barriers and possible motivations of the development stakeholders in order to forecast, how the overall sustainable development of offices may be better facilitated and what are the main problems that hinder such development in Prague.

Scientific relevance

The issue of the sustainable offices has been already researched quite well in the western and northern part of Europe, the Northern America or Australia. The Central Eastern Europe region seems to slightly lack behind in the amount of research on the topic of sustainable offices. In order to fill in the knowledge gap, the locational focus of this research is the capital city of the Czech Republic, Prague. In this context the data on benefits of sustainable offices and the drivers of the market players to pursue sustainability is scarce, which makes this research a valuable starting point for further research in the area. The drivers and barriers of the actors could be context specific and might in practice differ from the theory and differ within countries. The actual drivers of the developers, investors and tenants in the Prague office market are researched and compared with the theoretical findings from the literature in order to understand the current state of the sustainable development of offices in the city.

It is notable that most of the similar researchers were using quantitative methods such as hedonic regression to draw the conclusions of their researches. Other methods used in the researched articles were literature review, questionnaires, or case studies. Specifically the Delphi method, used for this research, has not been used in any of the researched article as the main research method. Using this alternative approach to the researched problem may thus unravel some new important information about the field. Moreover, more qualitative general data was obtained through the semi-structured interviews, exploring the topic more in depth.

Time planning

	2015				2016											
September	October	November	December	January	February	March	April	May	June	July	August	September	October	November
	P1			P2					P3				P4	P5
literature review			scope interviews				interviews & Delphi 1st round	Delphi 2nd round						