SUSTAINABILITY DRIVERS AND BARRIERS

MAPPING THE MOTIVES FOR SUSTAINABLE OFFICE DEVELOPMENT IN PRAGUE

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Foreword

This report presents my graduation research, performed at the department of Management in the Built Environment at Delft University of Technology, Faculty of Architecture and the Built Environment, within the lab of Adaptive Re-use.

This research aims at describing the current development in Prague regarding the awareness and willingness to build sustainable offices. It focuses on drivers and barriers from the overall perspective, taking into account standpoints of various actors in the process.

My interest in sustainability was intrigued already several years ago and as this topic is not yet very often discussed and taught in the Czech Republic, this interest of mine among other reasons led to studying my Master degree abroad. Therefore, naturally, my thesis also focuses on the topic of sustainability, more precisely on a small part of this complex issue, the willingness to develop, occupy and operate sustainable office buildings.

I came across the topic of sustainable office buildings already in 2012 during my part-time job in the development company Skanska Property Czech Republic. It is a development branch of the Swedish company Skanska, and is one of the leaders of the development of green offices in the Prague market. In 2015 I had a possibility to look at the topic from different perspective while working on the project TRANSFORM during my internship at the Municipality of Amsterdam. TRANSFORM was a European initiative about finding ways to reduce carbon emissions in cities in order to reach the European 20-20-20 targets. The focus on sustainability continues in my on-going career and I am hoping to keep broadening my knowledge while pursuing further work experience in this field. The thesis therefore functioned as an important step for my personal and professional development.

All of these study and working experiences convinced me about the importance of sustainability of buildings and built environment, but also showed me the obstacles on the way towards it, placed there by various, often contradictory, interests of actors involved in the process. Moreover, I was also able to experience the complexity of such topic, which remains still not yet completely explored, especially in the context of Central Eastern Europe. Therefore, while writing my thesis, I tried to bring new and hopefully useful information, which may function as one of the starting points for further development towards sustainable future in my home country.

Finally, I would like to sincerely thank my mentors at TU Delft, Hilde Remøy and Philip Koppels, who guided and helped me throughout the whole thesis project. I am very grateful for their long-lasting support, which led to a completion of this report.

I hope you will enjoy reading it!

Karolína Dvořáková
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Summary

Introduction

Sustainability of the built environment has been a vibrant topic already for several years. Buildings are responsible for approximately 40% of the total energy consumption and 36% of the total CO_2 emissions; moreover 50% of raw materials and 30% of water worldwide is related to building industry as well as 36% of all waste is produced by the built industry (European Commission, n.d.; Haas, as cited in van den Dobbelsteen, 2015). Discussions about sustainable buildings comprise building zero-energy or passive buildings, new as well as retrofitted, and in recent years have also included social aspects of sustainability.

In the office market, the level of a building's sustainability is usually measured by a third-party environmental certification, which assesses buildings and area developments against pre-defined benchmarks. In the certification process a building gathers points for implemented sustainable solutions and the overall score determines the level of the certification achieved. The most well-known and widely used certifications are BREEAM and LEED. BREEAM has been developed by the Green Building Council in the United Kingdom and is awarded on scale Pass, Good, Very Good, Excellent and Outstanding (BREEAM, n.d.). The LEED system, developed by the American Green Building Council and its levels vary from Certified, through Silver and Gold, to Platinum (USGBC, 2016a). Next to these international certifications, many more national ones exist, such as SBToolCZ in the Czech Republic. For the purpose of this research, the "sustainable office building" has been defined as a building that has acquired a certificate of LEED Gold or Platinum, BREEAM Excellent or Outstanding or the same level of another similar certification.

Figure 1 Certified buildings in the Czech Republic in 2015 (CZGBC, 2016)

Although the rising importance of sustainability issues in the office sector is often acknowledged, the actual practice seems to be still based on financial values. Whereas in the Czech Republic and in Prague in particular the amount of environmentally certified offices has been rapidly increasing in past years (Figure 1), the involved actors have not yet fully acknowledged the added value of such certifications as they are not willing to pay more for the sustainable features of a building. The aim of this research is to evaluate the

sustainability awareness of the main market players (developers, investors, tenants) in the Prague local context and thus map the market "readiness" towards sustainable development. This is done through answering the main research question, stated as follows:

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?

Understanding the motivations as well as potential barriers of each of the involved actors is a first step in a process, where potential follow-up actions are to be taken aiming to speed up the development towards sustainability. This explorative research is also done in the local context of Prague, where not much research on similar topics has yet been done; this research thus aims to contribute in filling in this knowledge gap.

Sustainability factors

Sustainability drivers and barriers

The interrelations between actors, involved in the sustainable development of office buildings, were described already in 2000 by Cadman (as cited in RICS Europe, 2008) in his so-called "vicious circle of blame" (Figure 2). Cadman suggested that investors, developers, occupiers and contractors/designers blame each other sequentially in a loop for the failure to adopt sustainability in the building practices. RICS Europe (2008) in effort to turn the circle into positive connotation followed up with a statement that "not going green" may eventually lead to the building's obsolescence as over time actors will naturally prefer the sustainable buildings to the common ones. The circle of blame functioned as a starting point of this research, however the contractors/designers were omitted in the argumentation.

owners / end users

"We would like to have sustainable buildings but there are very few available"

designers & constructors

"We can build or retrofit buildings in a sustainable way, but developers don't ask for it."

developers

"We would ask for sustainable buildings, but the investors won't pay for them."

investors

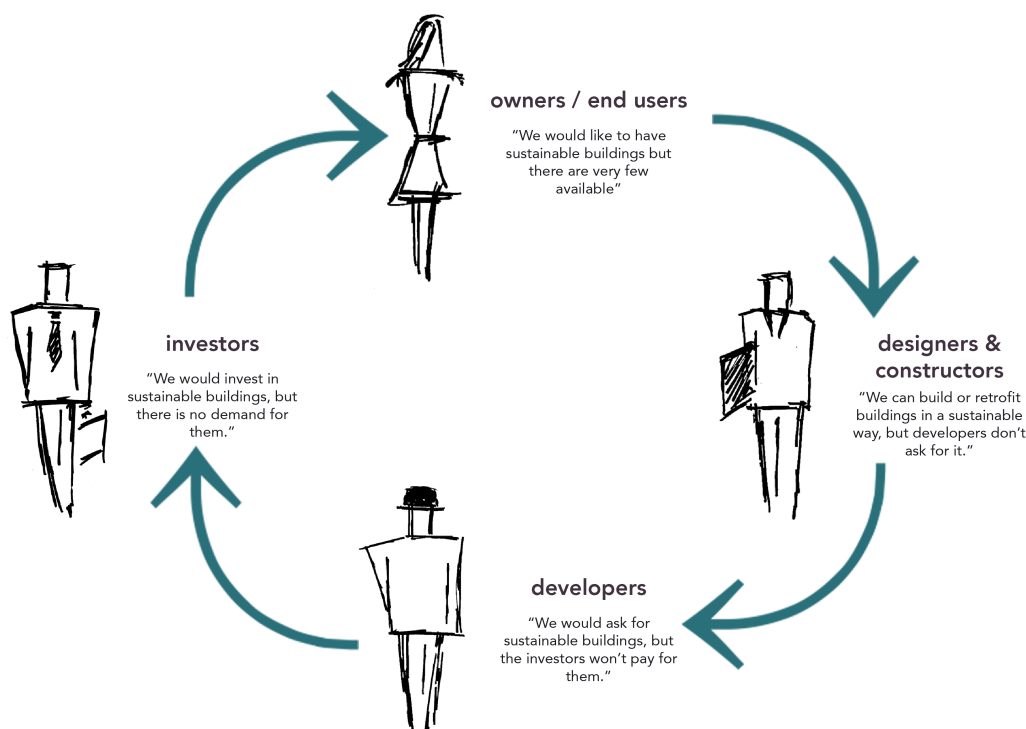"We would invest in sustainable buildings, but there is no demand for them."

Figure 2 Vicious circle of blame (RICS Europe, 2008)

In the office market, three main market actors can be defined: developers, investors and occupiers. All these manoeuver in an environment, which is influenced by other parties such as local and national government, suppliers, consultants, etc. Each of these three actors has a different perspective on the issue of the sustainable office development and for each of them different drivers and barriers to build/buy/occupy a sustainable office building may be spotted. These drivers and barriers are often very intertwined, sometimes shared by the actors, and sometimes contradictory to one another. Based on the analysed literature, several general clusters of these drivers and barriers have been defined as follows: corporate social responsibility, design & construction process, market value, life cycle, and staff wellbeing (Figure 3).
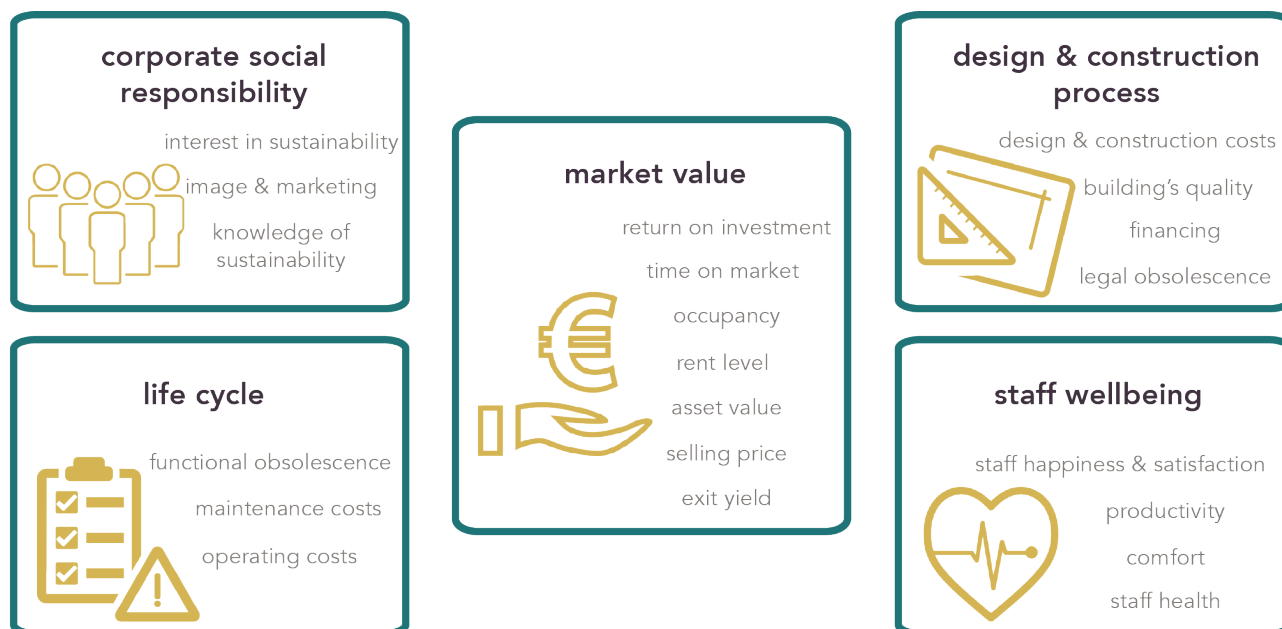

Figure 3 Clusters and sustainability factors (own ill.)

Corporate social responsibility (CSR) has become a normative standard describing firm's choices about inputs, internal processes and publicity (Thompson & Ke, 2012). Companies with well-defined CSR policies may outperform others due to an improved corporate reputation, less intrusion from activists and governmental organizations, reducing threat of regulation, and improved profitability by lower input costs and higher employee productivity (Eichholtz, Kok, & Quigley, 2010; World Green Building Council, 2013). In relation to the office market, by occupying a green office space a firm may signal a long-run commitment to the environment, which may hereinafter translate to an improved reputation of the company (Eichholtz, Kok, & Quigley, 2016). Same reasoning could be used for developers building and for investors running and maintaining green office buildings, who may through such actions create their image in the market.

Design and construction process is influenced by several important variables such as design and construction costs, ways of financing, and legislative processes in permit procedures. The additional design and construction costs for top levels of certified office buildings are perceived as one of the main barriers against its broader implementation, it is however very difficult to identify the exact costs of sustainability as it cannot be straightforwardly recognized (Feige, Wallbaum, Janser, & Windlinger, 2013). A lot of research has already been done on specifying the cost premium for sustainable buildings, and the findings vary from 0% to 20% (Rehm & Ade, 2013). Green buildings have mostly thanks to the integral technological solutions and innovative energy efficient technologies proven to save costs on operational as well as maintenance. Researches show that the energy savings typically exceed the cost premium on design and construction within a reasonable payback time; effective management and robust commissioning are important keystones in this matter as well (World Green Building Council, 2013). However, such leads to the so-called split incentive problem, as the savings on operating and maintenance costs are not usually attributed to the

developer, who invested more in the energy efficiency of a building (Feige et al., 2013). The split incentive problem is also addressed in an upcoming trend of green leases as well as new financial incentives such as green mortgages, where banks favour sustainable investments due to their lower risk levels (RICS Europe, 2008).

The legal framework of a particular country, in which the development takes place, also significantly influences the development process. The procedural aspects of a building control in form of a permit procedure differ across EU countries (Deloitte, 2016; Pedro, Meijer, & Visscher, 2011). From the sustainability perspective a long lasting permit procedure may be of a barrier against innovation as at the time when the building permit is achieved and the development enters the construction phase, the technologies designed in the building may have already become obsolete.

Sustainability of a building may positively affect the future value of a real estate and its return on investment. Moreover, the tenant preferences and investor risk screening may translate into the risk of obsolescence for inefficient buildings (World Green Building Council, 2013). Thus overview of the development project from a life cycle perspective of sustainability may be perceived as mitigating the risks of building's obsolescence, higher maintenance costs, and lowering return on investment. Pivo and Fisher (2010) defined "responsible property investing" as seeking to address environmental and social issues while achieving acceptable financial returns on the investment.

Some empirical researches demonstrate that sustainable office buildings are able to achieve rental premiums and thus yield higher profits for developers and investors, due to higher occupancy rates and possibly shorter time on market, as the certificate is used as a marketing tool attracting specific tenants (Nappi-Choulet & Decamps, 2013). Many researches have tried to determine the exact rental premium and asset value increase of sustainable buildings, and whether or not tenants are willing to pay the increased rental price, however their findings vary (Bonde & Song, 2013; Eichholtz et al., 2010; Fuerst & McAllister, 2011; Gabe & Rehm, 2014; Newell, MacFarlane, & Walker, 2014). This variability in findings is probably caused either by a national context and a state of the local market in which the particular research has taken place, or by not being able to cluster "sustainability" as a single building's element to be evaluated and measured.

In recent years more and more emphasis has been put on the intangible aspects of green buildings such as their impact on health, wellbeing and satisfaction of the occupiers. The sick building syndrome and a poor indoor air quality are contributory factors to ill health and reduced employees' productivity. As the staff costs usually account for the highest part of the companies' expenses, improvement of the working environment may thus have a direct impact on the organization's financial performance (Armitage, Murugan, & Kato, 2011; Eichholtz et al., 2010; Smith & Pitt, 2011).

Prague local context

Motivations and hindrances of the sustainable office development do not only depend on the perspectives taken while approaching the issue, but are also formed by the national and local context. Governmental sustainability initiatives and policies are being implemented across Europe in various countries and municipalities, and are mostly triggered by the European Directives as well as the Europe 2020 strategy, prescribing reduction in energy demand and greenhouse gas emissions and increasing the share of renewable sources of energy by 2020 (European Commission, n.d.-b).

Based on the 2010 Energy Performance of Buildings Directive a new legislation has been implemented in the Czech Republic, prescribing a compulsory certificate of the building's energy efficiency, if a building is built, refurbished, sold or rented (Ministry of Industry and Trade, 2014). Moreover, based on this directive all newly-built buildings will need to be built in a "nearly-zero consumption" standard from 2020 onwards

(Šance pro budovy, 2013). Regarding the country's capital, Prague, a thorough city-wide sustainability agenda is lacking, although some of the concerned aspects are being implemented in the on-going proposal for the new Strategic Plan (IPR Praha, n.d.). In general the development of the built industry is not perceived by the professional public to be well facilitated by either the national government or the Prague municipality. Moreover, the unstable political environment in the Prague magistrate further hinders the improvement of the city sustainability issue (Deloitte, 2016).

In contrast with the public efforts, the Prague office sector has been moving into the sustainable direction through private means. From 2011 a wide implementation of the voluntary environmental certifications as LEED or BREEAM has taken place and has currently reached a level, when basically almost every new office building in Prague aims at certain level of one of these certificates (Czech Green Building Council, 2016b; Šance pro budovy, 2015). In general the Prague office market has stabilized in the past few years with a positive development activity, significant amount of commercial investments and a strong demand in the prime city locations (Knight Frank, 2016). The issue of sustainability in general and environmental certifications in particular has become an important aspect of the office development nowadays, as it is believed that top-level certified buildings are more attractive to prime tenants as well as investors; however it is doubtful whether these actors are willing to invest more into renting or buying such offices.

Research methods

The research consists of two main parts: the desk research and the empirical research. The desk research takes the form of an extensive literature review. The follow up empirical research comprises two separate parts, which are however closely linked together: quantitative part, which is approached through Delphi method, and a qualitative part where semi-structured interviews are used as a research method.
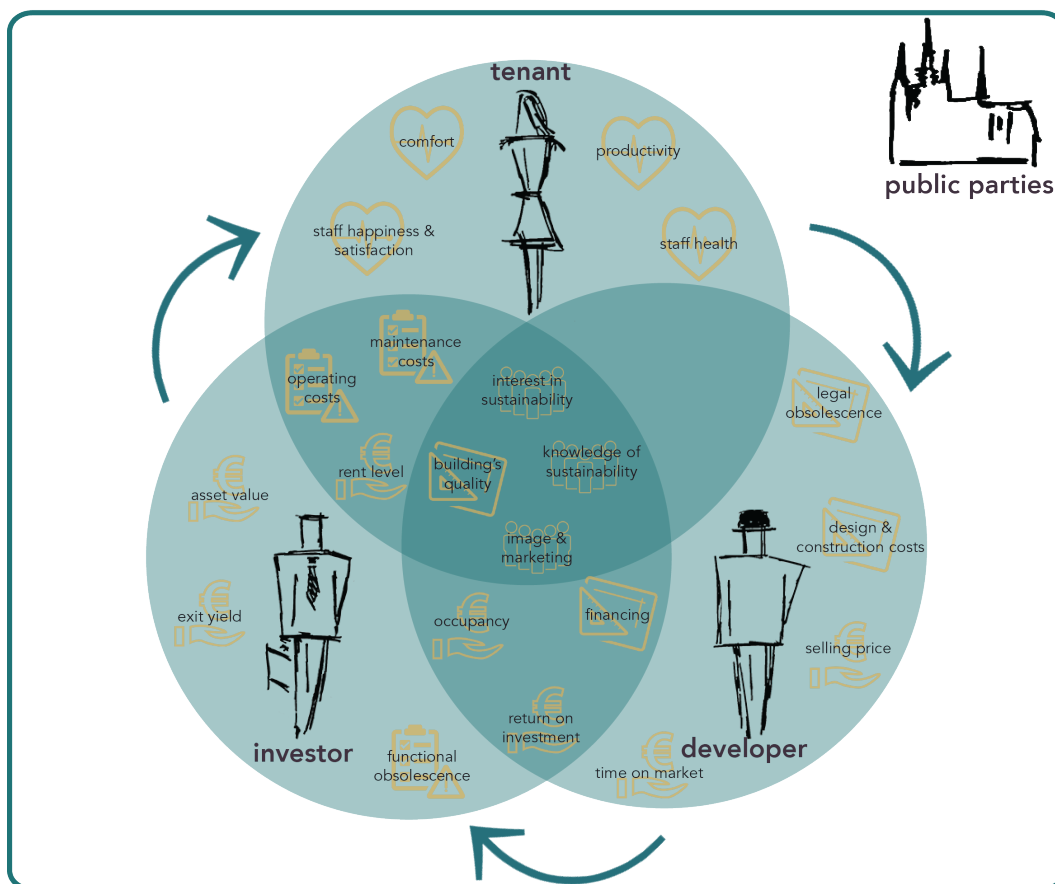

Figure 4 Conceptual model of this research (own ill.)

The literature study takes place in all the stages of the research. In the problem definition phase, literature is used for exploration of the main concepts in the topic area; in this phase the literature study is also supported by several scope interviews. In the theoretical framework, main part of the literature study, various sustainability drivers and barriers are established together with their connection to the researched actors. The theoretical framework is concluded with a conceptual model, summarizing the main sustainability factors, which are then further explored in the empirical research. In the final phases of the research, additional literature is used as a support for the argumentation.

The theoretical framework brings an overview of the drivers and barriers towards green offices in the worldwide literature. The main outcome of the literature study is the conceptual model, presented in Figure 4. The conceptual model summarizes the main sustainability factors per each actor and shows how are these connected between each other. The follow up empirical research aims at evaluating the real perception of the actors in Prague and comparing it with the outcomes of the literature study. Such comparison may determine if and to what extent the national context influences the drivers and the behaviour of actors in the office development in connection to sustainability.

The Delphi method is a method for gathering data from respondents within their field of expertise and is used to form group consensus about relative importance of issues (Delbecq, as cited in Koppels et al., 2007). It consists of series of anonymous questionnaires and/or interviews in several rounds, in which the respondents are given chance to adjust their previous responses (Hsu & Sandford, 2007). At the beginning of a Delphi process a desired degree of consensus (measured by variable Kendall's W) is determined and hypothetically, the Delphi process can be continuously iterated until such desired degree of consensus among respondents is achieved (Hsu & Sandford, 2007). However, usually the Delphi process consists of 2 to 4 rounds (Hasson, Keeney, & McKeena, 2000). Due to limited time, gathered theoretical knowledge prior Delphi and expected respondents' fatigue, a two round structure was used in this research, the first round in combination with semi-structured interviews. The panel consisted of experts within the built industry, who were expected to have a significant knowledge about the office market in Prague and the topic of sustainability within this market. As the Delphi method requires a rigorous procedure of identifying and selecting relevant experts for the panel, snowball sampling in combination with opportunistic sampling were used (Delbecq, as cited in Koppels et al., 2007). Within Delphi, respondents were asked to rank the provided sustainability factors (defined in the theoretical framework) according to their importance in the decision-making process from all the three concerned perspectives: developer, investor, and tenant. In the first round, overall 13 interviews were performed, out of which 11 took part in the ranking. In the second round the respondents were presented the average ranking together with mean and range per rank as well as their own ranking from the first round. This allowed respondents to relate to the group responses and gave them possibility to revise their ranking in order to obtain higher degree of consensus.

As stated above, the first round of Delphi was combined with face-to-face semi-structured interviews. These interviews aimed at broadening the knowledge about the issue in the Prague context, as well as gathering more general qualitative knowledge about market perception, market development and its current state-of-the-art, importance of sustainability within the Prague office sector, and possible future. It was acknowledged that different experts have slightly different fields of expertise and thus the interview questions were adjusted accordingly. The structure of the research is presented in Figure 5.

desk research

field research

| literature study | Delphi | interviews | concluding |

literature study

sustainable office development

sustainability drivers & barriers

Prague context

Delphi

evaluating importance of predefined sustainability drivers & barriers from three perspectives

connections between factors and market actors

interviews

current state-of-the-art of Prague market towards sustainability

sustainable office development in Prague

concluding

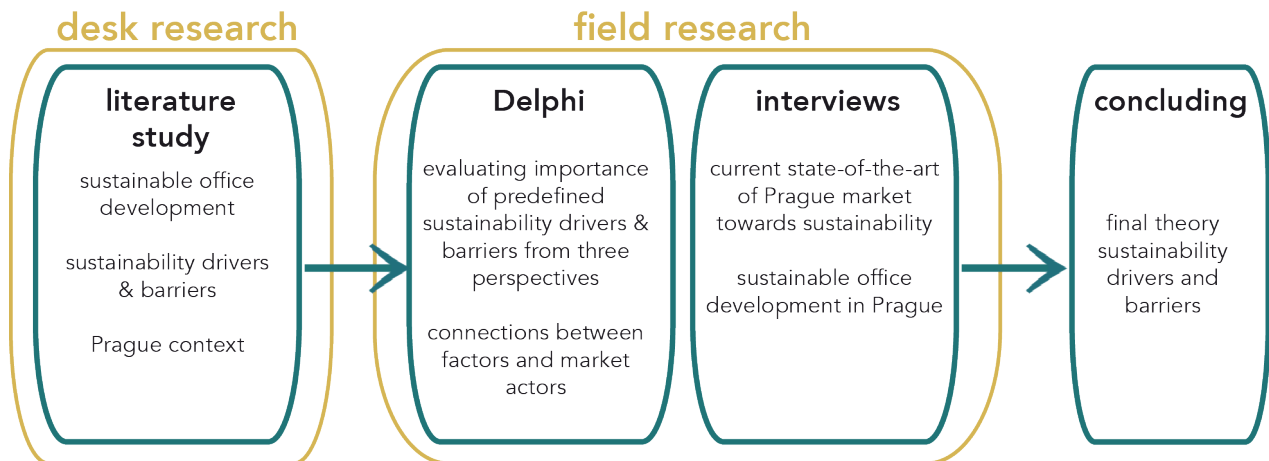final theory sustainability drivers and barriers

Figure 5 Overview of the research stages (own ill.)

Before the panel was interviewed, a required degree of consensus needed to be defined. The measure of consensus achieved can be described by Kendall coefficient of concordance, W. It measures the degree of association among k sets of ranking; in this case the degree of consensus within the expert panel regarding the perspectives of developer, investor and tenant. The Kendall W can take values between 0 and 1, while the value of 0,7 and higher is considered as a strong agreement and the ranking is considered to be of a high confidence (Schmidt, as cited in Koppels et al., 2007). This Kendal W= 0,7 was thus taken as a desired degree of consensus to be reached in the panels (Table 1).

Kendall W	interpretation	confidence in ranks
0,1	very weak agreement	none
0,3	weak agreement	low
0,5	moderate agreement	fair
0,7	strong agreement	high
0,9	unusually strong agreement	very high
1	complete agreement	very high

Table 1 Interpretation of Kendall coefficient of concordance W (Koppels et al., 2007)

Research findings

This section will present the findings of the Delphi panel, which was performed in combination with the semi-structured interviews; thus both qualitative and quantitative data were gathered and these could have been combined and compared using an iterative approach in writing down the findings. The Delphi measured the importance of predefined sustainability factors from three different perspectives of developer, investor and tenant, by answering the question: *What are the most important decision-making factors for the developer/investor/tenant to build/invest in/occupy a (sustainable) office building?.* The factors were arranged in order of the perceived importance: the factors considered to be of the highest importance in the decision making process were ranked first (number one), the least important factors were ranked last. For the analysis of the Delphi ranking, two groups of respondents were created per each perspective: respondents active in the field of the particular perspective being the first group, and the remaining respondents creating the second group (named "others"). Moreover, the general profile per perspective, combining answers of all the respondents was determined. The semi-structured interviews built up on the Delphi ratings by more thorough understanding of the Prague market current state-of-the-art and its development, overall awareness of sustainability of the involved actors, and which of the factors are perceived more as barriers and which as drivers for the sustainable development.

Developer's perspective

From the developer's perspective, in the Delphi panel the Kendall W reached 0,503 after the second round, which is right above moderate agreement threshold, signifying a fair confidence in ranking. For the developer profile the Kendall W after second round indicates a strong agreement (0,782) that signifies high confidence in ranks, for the "others" profile the Kendall W remains fairly low (0,407), signifying low confidence in ranks and weak agreement among respondents. The main changes between the rounds may be noted in "others" profile, where image & marketing and legal obsolescence dropped two ranks, and interest in sustainability went up three ranks. These changes signify heterogeneity in the opinions resulting in lower Kendall W compared to the developer profile (Table 2).

Developer's perspective																	
General profile (N=11)						Developer profile (N=5)						"Others" profile (N=6)					
sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change
	mean	rank	mean	rank			mean	rank	mean	rank			mean	rank	mean	rank	
return on investment	1,91	1	1,55	1	=	return on investment	1,0	1	1,0	1	=	return on investment	2,7	1	2,0	1	=
selling price	3,00	2	2,55	2	=	selling price	2,6	2	2,2	2	=	selling price	3,3	2	2,8	2	=
occupancy	4,73	3	4,55	3	=	design & construction costs	4,6	3	4,2	3	=	occupancy	4,5	3	4,0	3	=
design & construction costs	5,36	4	5,73	4	=	occupancy	5,0	4	5,2	4	=	financing	4,8	4	5,5	4	=
financing	5,55	5	5,91	5	=	time on market	5,6	5	5,4	5	=	design & construction costs	6,0	5	7,0	5	=
time on market	6,45	6	6,55	6	=	building's quality	6,4	7	6,2	6	↓	building's quality	6,7	7	7,0	6	↑
building's quality	6,55	8	6,64	8	↓	financing	6,4	6	6,4	7	↑	interest in sustainability	8,5	10	7,0	7	↑
image & marketing	6,45	7	7,27	7	↑	image & marketing	6,6	8	7,2	8	=	image & marketing	6,3	6	7,3	8	↓
legal obsolescence	7,00	9	7,55	9	=	legal obsolescence	7,0	9	7,4	9	=	time on market	7,2	9	7,5	9	=
interest in sustainability	9,36	10	8,55	10	=	interest in sustainability	10,4	10	10,4	10	=	legal obsolescence	7,0	8	7,7	10	↓
knowledge of sustainability	9,64	11	9,18	11	=	knowledge of sustainability	10,4	11	10,4	11	=	knowledge of sustainability	9,0	11	8,2	11	=
Kendall's W	0,493		0,503		0,010	Kendall's W	0,728		0,782		0,054	Kendall's W	0,364		0,407		0,043

Table 2 Comparison of the rankings from developer's perspective (own ill.)

When comparing the three profiles, some similarities are noteworthy. For example the top two ranks stayed constant in all the rounds, being the return on investment in the first place and selling price in the second place; moreover, in all three profiles the knowledge of sustainability was ranked the lowest from all the factors. This indicates prevailing financial focus of the developers in the market that leads to sustainability being viewed mostly from the economical perspective; developers invest into sustainable solutions when they expect increase in the selling price, or decrease in the time on market, influencing their return on investment. The knowledge of sustainability is connected with the interest in sustainability, which also ranked fairly low not only from the developer's perspective, but also from the perspectives of the two remaining actors. The low rank of knowledge and interest in sustainability is linked to one of the biggest barriers of sustainability, mentioned several times in the interviews, being an unsatisfactory education in the field, and the reluctance of market actors to understand the topic thoroughly. From the interviews and observation it seems that for most of the actors in the field, the sustainability issue is limited to earning points in the environmental certification systems, not giving too much effort to understand the problem in a more systematic way.

The interviews investigated the issue from some additional perspectives. The opinions of respondents regarding the increase in the design and construction costs for the top levels of certifications varied from an estimate of 2% to 15%. These findings thus confirm the outcomes of the theoretical review, proving that it is very hard to establish a hard number of the cost increase due to immaturity of the field, project phase in which developer decides to certify a building, the original design quality of a building before certification, etc. However, the cost increase is clearly linked to the targeted level of certification, as the low levels of certifications may be achieved only by small improvements and "easy" credits (not requiring changes in the design), the top levels require stronger devotion, higher financial inputs and early decision making. Another factor that was often mentioned as hindering not only the sustainable development, but development of buildings in Prague in general, is the complex regulatory environment and long permit procedures in cases of big developments.

Investor's perspective

The investors unfortunately did not have substantial representation in the Delphi panel; due to cancellation of the planned meeting with investors operating in the Prague market only one respondent remained within the panel as representative of the investor's perspective. Despite the lack of investors in the panel, Kendall W coefficient reaching 0,512 after the second round in the general profile signifies the highest consensus among the three perspectives (Table 3). This highest coefficient, however still signifying a moderate agreement among respondents, points to investors being solely financially focused as the financial factors rank the highest in the panel, or it may on the other hand reflect a stereotypical thinking about the profession of an investor, whereas the professionals may be potentially already looking at sustainable offices differently.

Investor's perspective																	
General profile (N=11)						Investor profile (N=1)						"Others" profile (N=10)					
sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change
	mean	rank	mean	rank			mean	rank	mean	rank			mean	rank	mean	rank	
return on investment	1,64	1	1,36	1	=	return on investment	1,0	1	1,0	1	=	return on investment	1,7	1	1,4	1	=
asset value	3,64	2	3,36	2	=	asset value	2,0	2	2,0	2	=	exit yield	3,4	2	3,5	2	=
exit yield	4,00	3	4,09	3	=	operating costs	3,0	3	3,0	3	=	asset value	3,8	3	3,5	3	–
occupancy	5,82	4	5,45	4	=	maintenance costs	4,0	4	4,0	4	=	occupancy	5,3	4	4,9	4	–
rent level	6,27	5	6,00	5	=	functional obsolescence	5,0	5	5,0	5	=	rent level	6,1	5	5,8	5	–
operating costs	7,55	6	7,91	6	=	building's quality	6,0	6	6,0	6	=	financing	8,0	8	8,1	6	↑
maintenance costs	8,36	10	8,27	7	↑	image & marketing	7,0	7	7,0	7	=	operating costs	8,0	6	8,4	7	↓
image & marketing	8,36	9	8,36	8	↑	rent level	8,0	8	8,0	8	=	image & marketing	8,5	10	8,5	8	↑
functional obsolescence	7,73	7	8,36	9	↓	interest in sustainability	9,0	9	9,0	9	=	maintenance costs	8,8	11	8,7	9	↑
building's quality	8,09	8	8,55	10	↓	exit yield	10,0	10	10,0	10	=	functional obsolescence	8,0	7	8,7	10	↓
financing	8,45	11	8,55	11	=	occupancy	11,0	11	11,0	11	=	building's quality	8,3	9	8,8	11	↓
interest in sustainability	9,64	12	9,18	12	=	knowledge of sustainability	12,0	12	12,0	12	=	interest in sustainability	9,7	12	9,2	12	–
knowledge of sustainability	11,45	13	11,55	13	=	financing	13,0	13	13,0	13	=	knowledge of sustainability	11,4	13	11,5	13	=
Kendall's W	0,471		0,512		0,041	Kendall's W	-	-	-	-	0,0	Kendall's W	0,505		0,556		0,051

Table 3 Comparison of the rankings from investor's perspective (own ill.)

Only minor changes in the rankings are visible between the first and the second round. The return on investment ranks first as well as from the developer's perspective, showing that both actors may be clearly perceived as profit-driven market players. In case of the investor this notion is supported also by other factors ranking high in the list with close connection to one another as the asset value, exit yield, occupancy or rent level. Financing is placed at the bottom of the ranking, probably due to a fact that while the decision making about an investment is taking place, the financial means are already secured. Also the concepts as green banking or green mortgages are not yet very well spread in the Czech Republic and are thus not yet recognized as significant incentive, as was confirmed by several respondents.

In the Prague office market, the investors currently demand the office buildings in their portfolio to be certified, hoping for lower running costs and attractiveness of the buildings for A-class tenants. Some respondents saw positive impacts of the certification on the building's management, the way the building performs in the operating period and the way it is commissioned. Theoretically speaking the certified buildings should be more energy efficient than ordinary buildings, saving on the costs of operation. However, in practice this is not always the case, perhaps due to behaviour of the occupiers not operating the building as supposed to, commissioning reports not filled in according to actual data, or that the energy efficiency was not given too much emphasis in the building's design and certification process.

Tenant's perspective

The tenant perspective shows by far the lowest consensus among the respondents. After the second round the Kendall W resulted in 0,302 signifying weak agreement among respondents and low confidence in ranks (Table 4). This low consensus in the tenant perspective may be caused by several reasons. Firstly, defining "tenants" as one homogeneous group is difficult as tenants consist of various companies operating in

different fields, by which they are strongly influenced, by companies of different sizes and nationality. Secondly, real estate agents represented the standpoint of tenants within the Delphi panel. Therefore, a mismatch between the perceptions and actual acting of tenants may have occurred. Thirdly, the tenant perspective in this research stood for the perspective of the company's management, the employer. Looking at the issue from the employee perspective changes significantly the importance of factors in the decision-making process. Lastly, as was the case in other perspectives as well, some factors may have been too connected, making it difficult to rank them in concordance.

Although it is difficult to draw conclusions from the Delphi due to the weak consensus among respondents, a prevailing focus on the financial aspects of the building's occupation as rent level or operating costs seem to outweigh the less tangible aspects as productivity or satisfaction. The emphasis on the rent level indirectly shows that the market is not yet fully prepared for increasing the rent level due to increased environmental quality and higher design and construction costs in certified buildings. However, as stated by some respondents, there is a prevailing trend in the market among companies (for example IT companies in particular), paying much more attention to the wellbeing of their employees and using sustainable aspects of a building in which their office is located in as triggers for attracting and keeping skilful workforce. The main important decision making factors about an office building for a tenant were seen as location, amenities in the neighbourhood and architecture; however some companies (usually big multinationals) are pushed from their mother companies to value the building's certificate as well, and this way enforce their corporate social responsibility and company's image.

Tenant's perspective																		
General profile (N=11)						Tenant profile (N=4)						"Others" profile (N=7)						
	round 1		round 2				round 1		round 2				round 1		round 2		
sustainability factor	mean	rank	mean	rank	change	sustainability factor	mean	rank	mean	rank	change	sustainability factor	mean	rank	mean	rank	change
rent level	3,73	1	2,91	1	=	rent level	4,8	4	2,5	1	↑	rent level	3,1	1	3,1	1	=
operating costs	4,45	2	4,55	2	=	building's quality	3,3	1	3,8	2	↓	operating costs	4,3	2	4,1	2	=
productivity	5,09	3	4,82	3	=	productivity	4,8	3	4,0	3	=	staff happiness & satisfaction	5,6	6	5,3	3	↑
building's quality	5,18	4	5,09	4	=	operating costs	4,8	2	5,3	4	↓	productivity	5,3	4	5,3	4	=
staff happiness & satisfaction	5,73	6	5,64	5	↑	staff happiness & satisfaction	6,0	8	6,3	5	↑	maintenance costs	5,1	3	5,3	5	↓
maintenance costs	5,36	5	5,73	6	↓	maintenance costs	5,8	5	6,5	6	↓	staff health	5,9	7	5,6	6	=
staff health	5,91	7	6,09	7	=	staff health	6,0	6	7,0	7	↓	comfort	5,9	8	5,7	7	=
comfort	5,91	8	6,27	8	=	knowledge of sustainability	6,8	9	7,0	8	↑	building's quality	6,3	9	5,9	8	=
image & marketing	6,36	9	6,91	9	=	comfort	6,0	7	7,3	9	↓	image & marketing	5,4	5	6,3	9	↓
interest in sustainability	9,09	10	8,64	10	=	image & marketing	8,0	10	8,0	10	=	interest in sustainability	8,6	10	8,7	10	=
knowledge of sustainability	9,18	11	9,36	11	=	interest in sustainability	10,0	11	8,5	11	=	knowledge of sustainability	10,6	11	10,7	11	=
Kendall's W	0,267		0,302		0,035	Kendall's W	0,299		0,327		0,028	Kendall's W	0,368		0,392		0,024

Table 4 Comparison of the rankings from tenant's perspective (own ill.)

Several respondents mentioned an important aspect, omitted in the list of sustainability factors, which is the influence of the personalities in the management of the tenant company. When a local manager is not being led by a mother company but has a power to decide, his personal opinion on which location and which building he prefers plays a crucial role in the decision making. Moreover, his standpoint towards sustainability may prescribe the way the company as whole acts in the market. The difference in motivations of the company management and the employees were also pointed out during the interviews, although the trend today leads towards paying more attention to the needs of employees. This trend of emphasizing wellbeing and satisfaction of the occupiers is also triggered by the organizations publishing the certifications, as for example the new 2016 version of BREEAM values category Health & Wellbeing higher than the previous version.

The gathered rankings can also be further investigated via box-plots provided in Appendix B. The box-plots allow investigating, whether higher consensus was reached for certain variables than for others. In case of developer's perspective as well as investor's perspective it may be concluded that there is a higher consensus on lowest ranked (most important) variables such as return on investment as well as highest ranked factors (least important) being the knowledge of sustainability, lower consensus may be observed in the middle of the ranking. These observations lead to a conclusion that some factors are really important, some matter a bit and some do not really matter, although these differences may not have direct impact on

the ranking itself. The box plots of the tenant perspective presents an unclear consensus, which aligns with the low coefficient of concordance reached from this perspective.

Stages of sustainable office development

The interviews were focusing on understanding the green office market in Prague in its current state as well as its past and future development. From the information gathered, several stages of the sustainable office development may be drawn and are presented in Figure 6.
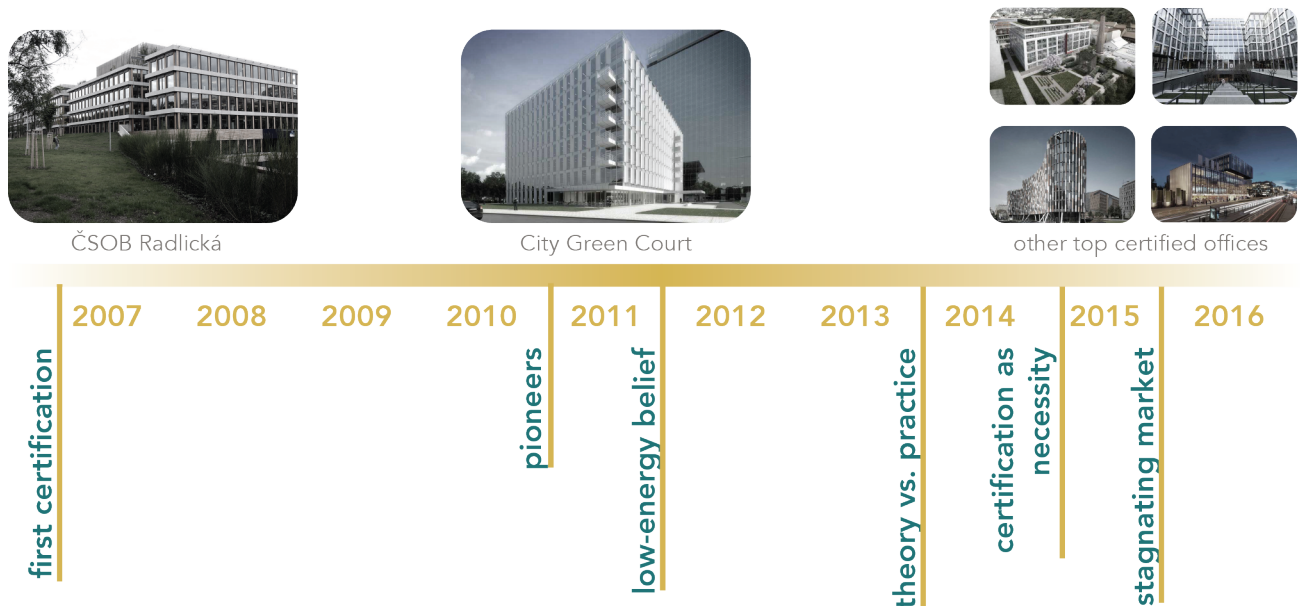

ČSOB Radlická   City Green Court   other top certified offices

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016

first certification · pioneers · low-energy belief · theory vs. practice · certification as necessity · stagnating market

Figure 6 Stages of sustainable office development in Prague (own ill.)

The respondents' perception on the future development of the sustainability in the Prague market was also discussed. Some respondents mentioned an on-going focus on good architecture, smart and creative design of office layouts, flexible workspaces or emphasis on building or neighbourhood community. Also a trend of new versions of the certifications being more difficult than the previous ones is assumed to be continuing. Moreover, more flexible contracts between owner and tenant, for example under terms of green lease, or continuation on digitalization of buildings and monitoring and optimization of the building's operations through smart systems, will probably become more important. In general, the majority of respondents agreed that the upcoming trend of sustainable offices (or buildings in general) would continue in the future, however not at very high speed.

Conclusion

The literature review showed focus on quantifying the sustainability and its reflection on the asset price and rent level as well focus on the wellbeing of the office occupiers. The additional Delphi study with expert interviews clearly showed similar factors seen as important also in the local context of the city of Prague. In cases of investors and developers, the finance-driven standpoint was drawn from factors as return on investment, asset price or exit yield ranking very high in the Delphi. The financial aspects as rent level or operating costs were also very important for the tenant. On the other hand, factors as interest in sustainability and knowledge about sustainability ranked at the bottom of the list in all the perspectives, showing not much emphasis being given to these factors in the decision-making. The often-stated barrier of an insufficient education and a reluctance of market actors to understand the issue of sustainability thoroughly are linked with these rankings.

The starting point of this research was the Cadman's circle of blame (referred to in RICS Europe, 2008). Building up on this concept, the triangle developer-investor-tenant has been a red threat of the whole research and understanding the influence of various sustainability actors on the relations between these actors reflects the aim of the study. It was suggested by the literature as well as by the respondents that the tenant may break this circle of blame, as the markets are usually tenant-driven. However, a more plausible option would probably be that if an accelerated development of sustainable offices was aimed for, the push would have to come from all the involved actors simultaneously and they would thus influence one another in the decision making through adjusting demand and supply.

Reading guide

This research aims to answer the following 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?

The thesis is divided into five parts.

Part one consists of the general introduction to the researched subject and the research proposal. In the proposal the aim of the research is explained together with the way, how the research questions have been constructed. Moreover, the research methodology is presented pointing out methods of answering the main research question.

Part two presents the context of the research; it summarizes the findings gathered through the literature review. More specifically it describes the problem field of the sustainable office development and the theories behind the drivers and barriers for sustainability in the office market.

Part three describes the main focus of this research: the empirical study consisting of the Delphi panel combined with the semi-structured interviews. Firstly, the local context of the Prague office market is elaborated, followed by a description of how the empirical research was set up and performed. Finally, the findings gathered through the empirical research are presented, explaining the current state of the art in the Prague office market in regard to sustainable office buildings.

Part four concludes the research. The reflection on the research strategy is given as well as recommendations for follow-up research.

Finally, part five presents the list of references used in the research together with the relevant appendices, presenting further information about the ways the thesis research was constructed and performed.

PART I
INITIATIVE

CITY GREEN COURT - LEED PLATINUM

CHAPTER 1
RESEARCH DEFINITION

Chapter 1: Research definition

Problem field

Building's sustainability

The sustainability of the built environment has become a hot topic of past years, because buildings account for significant part of the human ecological footprint. 50% of all raw materials and 40% of all energy use is related to the built industry (Haas, as cited in van den Dobbelsteen, 2015). In the commercial office sector, the building's sustainability is mostly measured by third-party environmental certifications that define an extent, to which a particular building or area comply with the predefined criteria. Based on this comparison a building achieves a certain amount of points based on which a certain level of the certificate is awarded (BREEAM, n.d.; USGBC, 2016a). The most well-known types of these certifications are BREEAM and LEED (Suzer, 2015).

Motives for developing sustainable offices

A vicious circle of blame (Figure 7) is a concept presented by Cadman (referred to in RICS Europe, 2008) and reshaped by RICS Europe (2008) showing the interrelations between the key market players regarding development of sustainable buildings. In the vicious circle actors blame each other in sequence for the failure to adopt sustainability in the building practice. RICS Europe (2008) by turning the circle into a positive manner suggested, how the sustainable development could be facilitated. Therefore, in order to understand the ways, how the sustainable development of buildings, more particularly of offices, could be improved in practice, an overview of all the drivers and motives of the stakeholders needs to be done. This overview should be placed into a local political and cultural context, as it may be of significant influence on the behaviour and decisions of the mentioned actors.
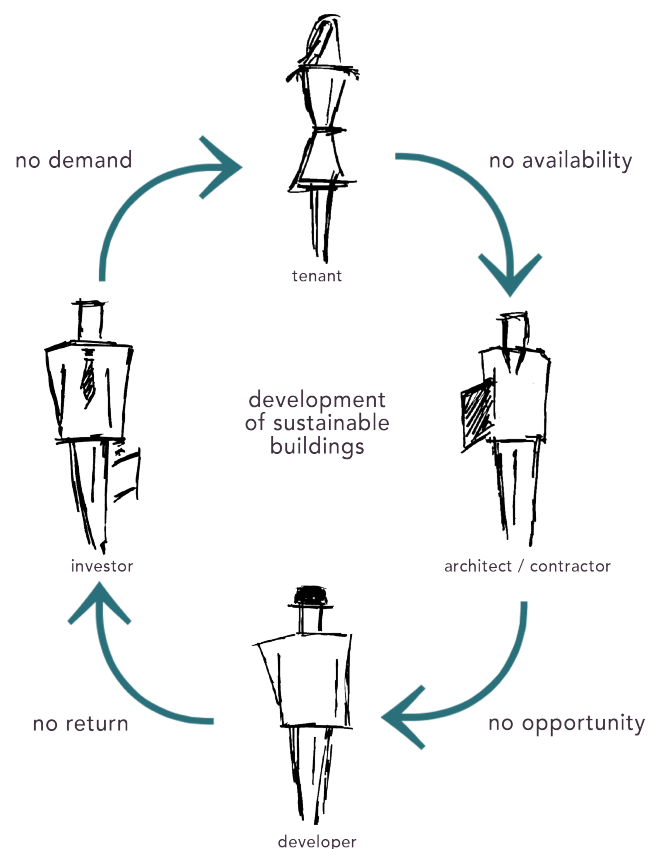
Figure 7 Circle of blame (RICS Europe, 2008)

Current situation in the Czech Republic

The sustainable built environment is a vibrant issue and emerging topic in the Czech Republic, where until now most of the practice has been focused on the Prague office sector and is mainly driven by private parties; developers, investors and tenants. In case of the office development, the focus of recent years has been on environmental certifications, mostly LEED, BREEAM or SBToolCZ (Czech Green Building Council, 2016a), especially in the office sector (Figure 8). In the current Prague office market the developers seem to be "obliged" to aim for a certain green certification when developing a new office building in order to stay competitive and demandable in the market. Investors do also acknowledge some benefits of certified, more ecological, office buildings as well as certain tenants (mostly international prime tenants) specifically require their offices to be certified (P. Hajná, personal communication, 14 December 2015). However, as the issue

remains emerging in the Prague market, a general overview of all the involved actors' sustainability drivers and their behaviour is partially missing.

The development of green office buildings also differs if considering the owner-user market, in which the office building is developed for a specific user known upfront. The motives for a building under ownership to build more sustainably, thus ecologically and socially friendly, are more tangible as it may be considered that the occupant company looks at the development with more long term vision and thus consider the issues of long term sustainability. The rental market is however even more important part of the Prague office market and most of the offices in Prague start to be developed on speculative basis, without any or with only a few future lease agreements (Knight Frank, 2016). The reasons for investing into sustainability become less tangible and harder to grasp in such speculative developments.
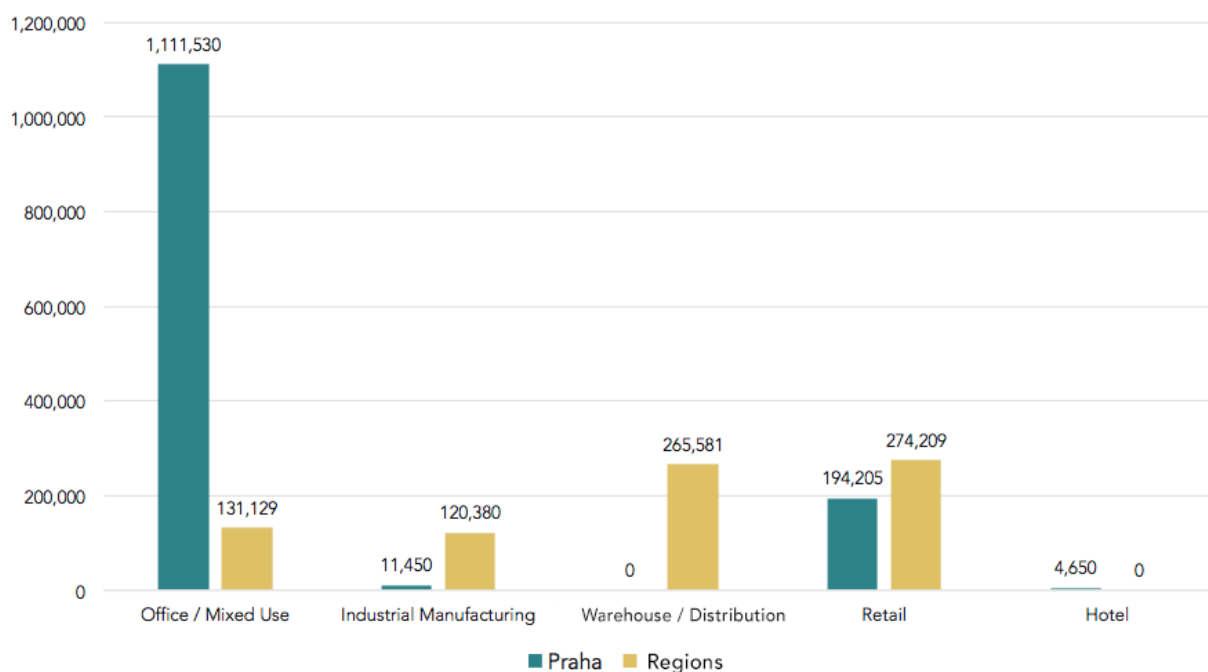
Figure 8 Comparison of square meters of certified buildings in Prague and other regions of the country (CZGBC, 2016)

Problem statement

In Prague, the sustainable awareness is increasing and currently practically all the newly built office buildings are environmentally certified (Czech Green Building Council, 2016b). However, very intertwined motivation drivers of all the stakeholders involved are present in this development. The key players are defined as the developer building for future tenants, preferably gaining tenants already during construction phase and selling the building to an investor as soon as possible; the investor as having longer-term vision on the building operation and keeping the building for at least 5-10 years; and the tenant having a standpoint of a companies' management. It could be seen that the developers in Prague are not yet financially rewarded for building green buildings as well as the investors are not rewarded for owning them, at least in the direct financial returns. The benefits are seen in higher occupancy rates and for developer shorter time to sell the building, however these aspects could not be such easily quantified (P.Hajná, personal communication, 14 December 2015).

To understand the development of sustainable offices in Prague, the motivations and barriers of each of these stakeholders need to be clear. Thus firstly the theory on the sustainability drivers is examined, so it can be subsequently compared with the situation in Prague. Creating an overview on this issue in the

Prague context may help to spot the opportunities for speeding up the development and allows the comparison of the Prague market with other countries, where more research on this topic has already been done.

Aim of the research

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 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.

Relevance of the research

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. To name a few similar researches to this research, for example Hakkinen and Belloni (2011) investigated the drivers and barriers in the context of Finland followed by Eerikäinen and Sarasoja (2012), who established marketing strategies for green buildings in Finland; Rehm and Ade (2013) also used a qualitative method in form of interviews in combination with a quantitative analysis of available datasets, however focusing only on comparing construction costs of green and common buildings in New Zealand; Feige et al. (2013) measured the impact of Swiss buildings' sustainability on office occupant's comfort and productivity; Fuerst and McAllister (2011) or Pivo and Fisher (2010) focused on quantifying the benefits of sustainable buildings as rent or asset value premium, with focus on the U.S. properties. Other analysed articles are to be found in the theoretical review chapter of this report and show a focus on sustainability mostly within the western part of the world.

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.

While analysing the scientific articles within the theoretical framework of this research, the attention is paid to the research methods used. It is notable that most of the researchers were using quantitative methods such as hedonic regression to draw the conclusions of their researches. On the contrary, for this research a more qualitative research approach was chosen instead, due to several reasons:
- The focus of this research is broader than most of the analysed articles. The articles were usually focused on only a few sustainability factors and these were explored in depth. On the contrary, this research explores the broader context, incorporating perspectives of different actors.
- Big amounts of gathered data, needed for quantitative methods such as hedonic regressions or surveys, have been unavailable for this research. This is mostly caused by the fact that the research location differs from the study location. Moreover, it is questionable, to what extent has such data in Prague been already gathered and are accessible for public.
- Lastly, in the Czech Republic the topic of sustainability in the built environment in the commercial sector still remains quite a new topic and the overall knowledge of the market players is expected not to be that high. Thus more explorative research is favoured.

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, only Hakkinen and Belloni (2011) have used expert panels to describe characteristics, roles and tasks of actors in processes of sustainable buildings. Using this alternative approach to the researched problem may thus unravel some new important information about the field.

Personal motivation

The personal goal is to research the sustainability awareness in Prague from different perspectives existing in the market and discover the (potential) drivers to speed up the sustainability movement in the city. On

the way I hope to better understand the drivers of the developers to act or not to act sustainably and to what extent these drivers hold in Prague, the system and implication of sustainable certifications and the importance of certification for the tenants and investors.

In a long term, I would like to be part of the Prague sustainable strategy creation, managing and implementing such strategies in the city and spreading the knowledge to the rest of the country. However, I am convinced that in order to understand the city level as well as the district level, one must first thoroughly understand the sustainability aspects on a building level. For these reasons I not only chose the thesis topic, but also based on this assumption I envision my first job in the industry as a project manager in a development company focused on the sustainability aspects of buildings. I believe that knowledge gathered during my thesis research may be of a great help and advantage in this matter.

Objectives

At the beginning of this chapter, the aim of the research was described as mapping the current state of a the sustainability readiness of the Prague office market and evaluating the sustainability awareness and corresponding behaviour of the market actors. While aim is seen as a long-term goal to be accomplished, the objectives are more concrete attainments how the aims can be achieved (Thompson, 2014). These objectives are further translated into research questions, described below.

The objectives of this research are:
- to understand the theoretical drivers and barriers of office owners, developers and occupiers to own/build/occupy the sustainable office buildings
- to explore the current state of the Prague office market in regard to sustainability
- to compare the worldwide theoretical drivers and barriers with the current market state in Prague
- to identify the main sustainability drivers and barriers in the current state in Prague
- to establish possible future directions of the research on this topic

Research questions

Main research question

The main question of this research is:

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?*

Hypotheses

Based on the preliminary findings from the literature and scope interviews, several hypotheses for this research bound to the Prague office market were defined. These could be seen also as preliminary answers to the research question and sub-questions. The hypotheses are as follows:

Hypothesis 1   The Prague office market currently finds itself in a position of increasing awareness towards green certifications of the (newly-built) office buildings, however, the real understanding of the issue of sustainability is lacking.

Hypothesis 2   The main sustainability drivers for the developer are lowered design and construction costs and increased return on investment. In Prague, it is more costly to build a top-certified sustainable office building compared to a common one, however, such price difference is not yet either reflected in the asset price of the building, or in the increased rent.

Hypothesis 3   For investors the main sustainability drivers are risk mitigation and increased asset value of a building. Investors in Prague do prefer to have sustainable office buildings in their portfolios, but do not differentiate between different types of certifications.

Hypothesis 4   The sustainability of the office building is an added value for the tenants through lowered operating costs and increased productivity and wellbeing of the employees. However in Prague, it is not the main factor in deciding about the offices and tenants are thus not yet willing to pay higher rent for occupying a sustainable office.

These hypotheses will be further discussed, approved or rejected in the concluding part of this report, based on the findings gathered from the theoretical and empirical researches.

Positioning the research

Scope

This research focuses on the office market segment, within the commercial real estate market in Prague, the Czech Republic. Within the office segment, the thesis focuses on sustainable or so-called green office buildings, which are for the purpose of this research defined as office buildings that have been certified by one of the available environmental certifications as LEED, BREEAM, etc. The perspective taken is integral, however focusing on three main actors being occupier (tenant), developer and investor, subsequently combining and comparing these three given perspectives.

Research target group

The findings of this research may be of importance for several groups: academic researchers, investors and developers, and municipality of Prague. It introduces new knowledge to the field of academia by conducting a research in the area of Central Eastern Europe in a field of sustainability of the built environment, where not much research on similar topics has yet been done, compared to similar researches executed with focus on Western Europe. For the developers and investors the research gathers knowledge about the current state of the Prague market and investigates the potentials in the further development of the green office buildings. For Czech municipalities, namely the municipality of Prague, it brings insights into corporate drivers for the development of sustainable offices and how this development may be better facilitated by various policies and regulations.

CHAPTER 2
RESEARCH METHODOLOGY

Chapter 2: Research methodology

Type of research

The answer of the research questions is based on mixed research methods; both qualitative and quantitative aspects are present in the research. Structured and unstructured approaches are used to answer all the research questions (Kumar, as cited in van Oel, 2015). The more structured quantitative part of the research, exploring the importance of various sustainability factors from perspectives of tenants, developers and investors, will be explored using Delphi method. Moreover, theories about the overall perception of sustainability in the Prague market in present and future are generated and tested within this research using semi-structured interviews.

Methodology

There are several research methods used during the thesis research. These were chosen in order to provide thorough answers to the stated questions of the research. Different steps of the research are described below as well as the expected results gained from each step of the research. The research comprises a desk research and a field research. The desk research consists of a literature review, both in the phase of problem definition and in the phase of establishing a theoretical framework. The field research is conducted in Prague and consists of series of interviews with various experts in the field as part of Delphi method.

In the research, several determinants were identified and fully described in the theoretical framework. These concepts are also relevant in order to answer the main research question. The identified determinants are: corporate social responsibility, design & construction process, risk mitigation, market value, life cycle and staff wellbeing. Evaluating these determinants unravels the overall perception of the stakeholders in the Prague commercial market regarding sustainability, current initiatives in the direction, and predictions for this process for the future. The research is thus twofold; firstly comparing the importance of the before-mentioned determinants and secondly establishing theories about the Prague office market. These two aspects are interlinked and the research is thus not linear; the importance assigned to the determinants is based on the market perception.

Literature study

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 order to be fully prepared for the empirical part of the research, a thorough literature review is needed in order to explore the main concepts in the field. 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 is conducted until each of the previously mentioned categories (in this case the determinants or clusters) is well developed in terms of its properties (Bryman, 2012, p. 421).

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

For collecting the relevant supporting articles, mostly Scopus and Google Scholar were used. Using such search engines helped to discover relevant articles in the field and explore additional articles through the references section, which could be also interesting for the researched topic.

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 in December 2015. 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. For that reason two of the interviews were planned with representatives of development companies, operating in the Prague market; one from the perspective of a sustainability manager and second from a project manager's point of view. The last interview was performed with the representative of the Prague Institute of Planning and Development, an organization related to the Municipality of Prague, in order to understand the municipal position towards sustainable development in the city.

Delphi method

While deciding on the most suitable method for collecting expert opinions, several research methods were considered. One of the main criteria was the size of the sample (number of respondents) that was possible to reach. Based on this consideration the methods as questionnaires, where high amount of respondents is needed, were omitted. Furthermore, methods as focus group, group interview, individual interview, etc. were looked into. Through evaluation of the advantages and disadvantages of each method finally the conclusion was reached to use a Delphi method in combination with semi-structured interviews.

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 (Delbecq, as cited in Koppels et al., 2007). The Delphi method together with other consensus methods such as brainstorming or nominal group technique helps to make effective decisions in situations where there is contradictory or insufficient information (Hasson et al., 2000). 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 (Hsu & Sandford, 2007; Koppels et al., 2007).

Okoli and Pawlowski (2004) as well as Hasson et al. (2000) have recognized several advantages of using Delphi approach in a research. Firstly, it consists of panel of experts and thus the opinion of the panel is more appropriate than any individual's opinion. Secondly, although it is organized as a panel, it does not require the respondents to meet physically in person. Especially in case of this research while pursuing the empirical research in different country than writing the thesis, it was seen as one of the main advantages of the method. This method also allows the participants to be recruited from different locations and different backgrounds. Not meeting in person also prevent the danger of one participant of the panel being more persuasive than others and thus turning the consensus in his/her way. Thirdly, the size of the panel does not

need to be big; a usual number of respondents is between 10 and 18. However, the more panellists are reached, the more solid the reached consensus becomes. Fourth, the selected experts do not need to function as a representative sample; significance is based on the qualities of the experts and the group dynamics. And lastly, non-response in this method is usually quite low as the researchers often assure the participation personally, as is also case in this research.

While using the Delphi method for a research, the question of reliability is at stake. Reliability is the extent to which a procedure produces similar results under constant conditions in all occasions; in other words, would the same result be obtained if different set of experts participated in the panel (Hasson et al., 2000)? To overcome this dilemma, a use of participants, who have the knowledge and interest in the topic as well as pursuing several rounds, may increase the content validity of the Delphi (Goodman, as cited in Hasson et al., 2000). However, the validity of the results is ultimately affected by the response rates obtained in all rounds (Hasson et al., 2000). More specific information regarding the guidelines of the Delphi method used in this research is to be found in the Part 3 of this report.

Semi-structured interviews

In this research, the Delphi method was used for ranking of the sustainability factors in combination with the semi-structured. The interviews with practitioners were performed in order to gather qualitative knowledge about the topic, and to be able to establish some general conclusions about the researched issue. It is however acknowledged that interviews are not an objective research method as the outcomes depend on the subjective opinions of the chosen respondents. They provide qualitative information, which is very useful for widening the knowledge about the topic, however reliability of such findings cannot easily be proven. Moreover, different professionals have different expertise and thus the questions for the semi-structured interviews were adjusted based on their expertise. The results of these interviews were subsequently combined for the findings.

The overview of the research methods, their interrelations and the partial findings is to be seen in Figure 9.
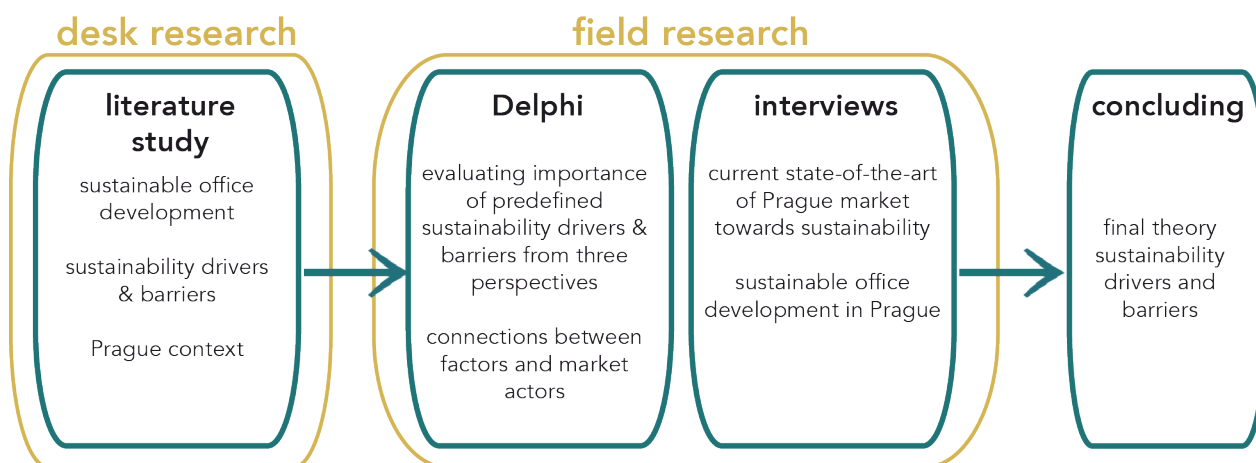
Figure 9 Overview of the research mathods (own ill.)

Sampling

In general the qualitative research tends to revolve around the notion of purposive sampling. Purposive sampling is a non-probability form of sampling; researcher does not seek to sample research participants on a random basis. The goal is to pick participants in a strategic way, so that the samples are relevant to the posed research questions (Bryman, 2012, pp. 416-418). For the Delphi method, the sampling is of great

importance and thus a rigorous procedure to identify and select relevant experts should take place (Delbecq in Koppels et al., 2007). McKenna (as cited in Hasson et al., 2000) refers to the participant of Delphi as "a panel of informed individuals", hence the title "experts" is often used. Importantly, the commitment of the participants to complete the several rounds of the Delphi panel is often related to their interest and involvement in the examined research (Hasson et al., 2000).

In this research a snowball sampling method in combination with an opportunistic sampling method were used to reach the respondents of the panel. Snowball sampling is a technique, in which researcher samples initially a small group of people relevant to the research questions, and these participants further propose other participants with experience and interest in the research topic (Bryman, 2012, p. 424). Opportunistic sampling occurs when the researcher makes sampling decisions during the process of collecting the data, in this case during the field research. Such approach is an important feature of the qualitative sampling, particularly when the research being conducted is exploratory in its nature (Cohen & Crabtree, 2006). Follow up on the selection of experts in the panel is to be found in the introduction of the empirical research.

Expected results

The result that this research aims to bring is the knowledge of the most important factors in implementing sustainability in the Prague office market. Moreover, the empirical part of the research shows, which of the sustainability factors are particularly in Prague context perceived by the actors more as drivers and which are perceived more as barriers for sustainability; in other words which of the factors are already fully developed and acknowledged and which still need some time to be potentially developed and acknowledged in the future. These new findings building up on the Prague context potentially allow comparing Prague with other (western) cities, in which more research in the field of sustainable built environment has already been done.

Planning

In Figure 10 the planning of the research phases is shown. The whole research lasted 13 months, from September 2015 until October 2016, from which approximately 11 months were devoted to the thesis. The first two periods, P1 and P2, were devoted to defining a problem and writing a research proposal; in this stage also the first literature study was performed. The subsequent period P3 started with a more focused literature research, thanks to which the theoretical framework was finalized. Also a revision of the proposed research methods and evaluation of their suitability for this particular research was done. Later in the period, the two rounds of Delphi panel were organized; the interviews were performed during two weekly visits in Prague in April and May 2016. The P4 period was devoted to analysing the gathered data from the interviews and drawing conclusions and theories from this data. The final P5 period was meant for final revisions based on the feedback received while presenting the conclusions in P4 presentation.
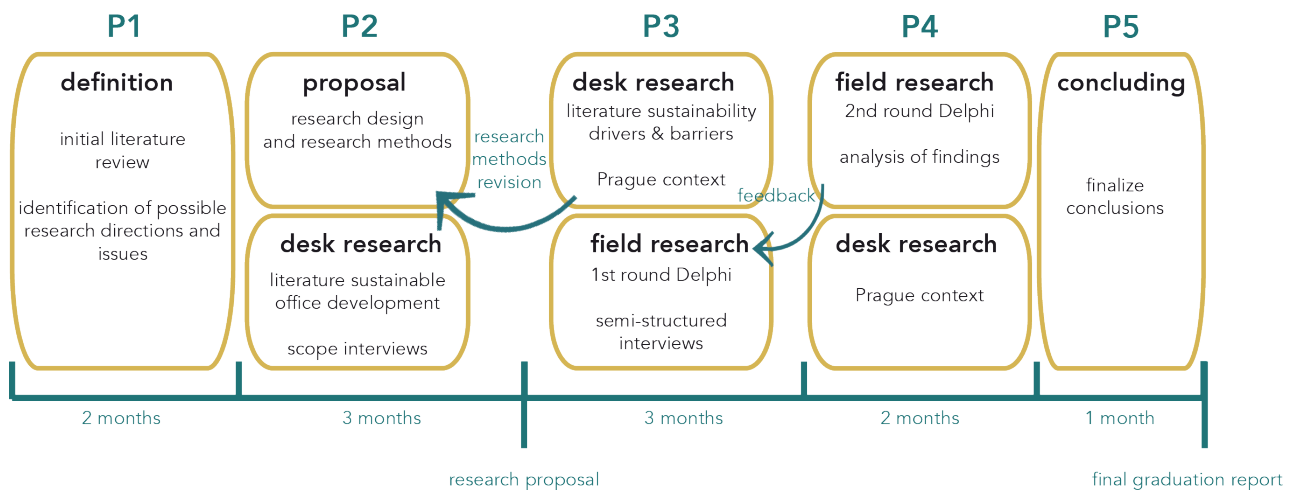
P1	P2	P3	P4	P5

definition

initial literature review

identification of possible research directions and issues

proposal

research design and research methods

desk research

literature sustainable office development

scope interviews

desk research

literature sustainability drivers & barriers

Prague context

research methods revision

field research

1st round Delphi

semi-structured interviews

feedback

field research

2nd round Delphi

analysis of findings

desk research

Prague context

concluding

finalize conclusions

2 months	3 months	3 months	2 months	1 month

research proposal   final graduation report

Figure 10 Thesis time planning (own ill.)

Limitations

The research was part of the Master education and thus was limited by time. This limited the amount of interviews that could have been performed and thus the amount of data, which could have been gathered. The same applies to the amount of analysed scientific articles.

Complication lied also in the research focus elsewhere than in the Netherlands, where the thesis was being written. It was thus important to reach to respondents as soon as possible and try to cluster them in similar timeslots, so it was possible to perform all the interviews and expert panels during my presence in the Czech Republic. Due to this fact some potential interviewees were not reached as they were not available in the proposed times or the set-up interviews were cancelled last minute.

Moreover, as the interviews were mostly done in the Czech language, whereas the thesis is written in English, I had to be cautious about interpreting the questions and answers as precisely as possible. The communication with both the respondents and the tutors and other university personnel needed to be as comprehensive as possible to avoid any miscommunication.

Besides the practical limitations, it is also important to consider the findings of this research. Many different viewpoints were given on the topic during the empirical part of the research, which makes it hard to assure uniqueness and precision in the conclusion of this research.

MAIN POINT KARLÍN - LEED PLATINUM

CHAPTER 3
SUSTAINABLE OFFICE DEVELOPMENT

Chapter 3: Sustainable office development

Sustainable built environment

At the end of the last century the issue of climate change was not yet very much discussed, because people did not yet realized the potential threats and its anthropogenic nature. In last years the awareness has significantly increased mostly thanks to associations as IPCC, pointing out the seriousness of the upcoming situation. However, the biggest social problem is not the change of climate per se, but the depletion of our energy reserves; a social economic problem rather than a technical one. In September 2008, the so-called "peak oil" was achieved, which could be seen as point at which more oil is consumed than produced around the world (Tillie et al., 2009). The use of the fossil fuels, running our today's economies, results in an exponential growth of carbon dioxide emissions launched to the atmosphere. Our dependency on the easy supply of energy is enormous and we must start rethinking the ways we use and produce the energy (Tillie et al., 2009).

It is clearly visible, that with the scarcity of the fossil fuels, burning of which the level of CO_2 emissions increases, together with growth in the energy demand as well as increasing number of overall population, such energy situation is not sustainable in its current state. As the Nobel Prize winner Frederick Soddy wrote already a hundred years ago: "If the supply of energy failed, modern civilization would come to an end as abruptly as does the music of an organ deprived of wind" (Hajer & Dassen, 2014, p. 157). The approaching climate change threat will thus soon test our intergenerational morality and inevitably alter our current way of life and the way our economies run today (Tillie et al., 2009).

The discussion about the importance of sustainability started already in 1987, when the Brudtland Commission stated in their report *Our Common Future* a well-known definition of sustainability: *"Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (Barlund, n.d. ; United Nations Headquarters, 2010). Although this definition enhances sustainability in its all complexity and vagueness, in the built environment the issue of sustainability is mostly bound to the decrease of energy demand, financial feasibility, material reduction and wellbeing of users and as such is discussed in this report.

Buildings represent the largest sector of primary energy consumption and the biggest contributor to the world greenhouse gas emissions. Natural gas and oil, in the built environment primarily used for heating, cooling, but also for generating electricity, play an important role in the amount of CO_2 emissions in atmosphere (Popescu, Bienert, Schützenhofer, & Boazu, 2012; Tan, Yavuz, Otay, & Çamlibel, 2015). To talk in numbers, the built industry in the European Union is responsible for approximately 40% of the total energy consumption and 36% of the CO_2 emissions (European Comission, n.d.). While new buildings generally need less than 3 to 5 litres of heating oil per square metre per year, the consumption of the older buildings is usually much higher; in average about 25 litres (European Comission, n.d.). Regarding other resources, the usage of 50% of raw materials and 30% of water worldwide is related to the built industry as well as 36% of all waste is produced by the built industry (Haas, as cited in van den Dobbelsteen, 2015). The issue of the sustainable buildings thus goes far beyond discussion of only the energy efficiency.

Retrofit potential

Types of energy

In order to better understand energy in buildings, one must take into account that there are several types of building energy flows, which are shown in Figure 11.
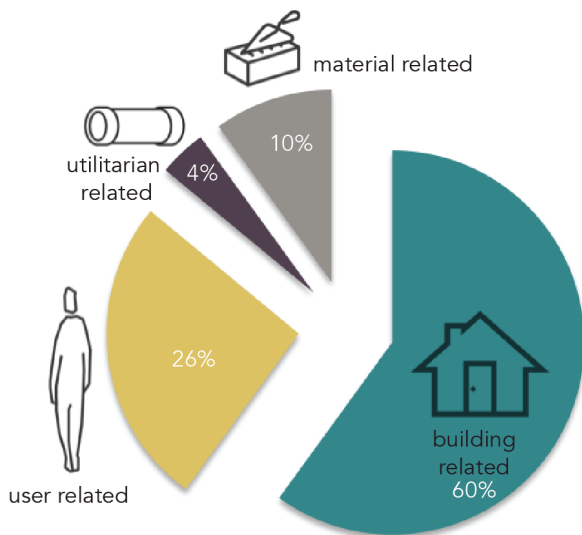
Figure 11 Types of energy present in a building (Broersma, 2015)

In discussions of sustainability and energy-efficiency of buildings, the building related energy is often mentioned. It is an energy spent on heating, cooling, ventilation (HVAC), electrical installations and lightning. In the average existing building (non-renovated 1990's building) usually around 2/3 of overall energy is used for these technical installations (Broersma, 2015). This energy demand may and should be best decreased through smart design of the building, which is well functioning combination of different energy systems in the building. The user related energy is energy spent by the occupants of the space by e.g. electrical appliances. This energy is in general very hard to decrease, because almost no leverage exists to force the users to change their habits and demands. The material related energy is the energy spent on the building establishment as mining, manufacturing, transportation, assembling and disposal of the materials. This energy is particularly important when talking about retrofit of buildings, because through retrofit this energy demand could be (partially) avoided. Last, the utilitarian related energy is energy for public lighting and drainage (Broersma, 2015).

Retrofitting the existing buildings

A lot of focus in the research and in the practice is on the concepts connected to sustainability; concepts as "circular economy" or "cradle-to-cradle" are emerging and vibrating. However, these concepts mostly focus on the newly-built, starting the cycle from the point of production (Figure 12). Different approach to improving sustainability is to focus on the existing stock by increasing its energy efficiency (Tan et al., 2015). A need to retrofit and adapt buildings and to reduce their environmental footprints becomes more pressing over time as the CO_2 emissions continue to increase; the sustainable retrofit may be seen as a potential to mitigate the emissions and decrease the energy demand by reducing the need for the new construction (Ma, Cooper, Daly, & Ledo, 2012; Wilkinson & Remøy, 2011). Adaptation of buildings decreases the embodied energy and construction waste due to reuse and recycling of building material (Damwijk, 2015). Retrofitting the existing buildings is considered to be a very efficient way of achieving sustainability in the built environment at relatively low cost and high uptake rates (Tan et al., 2015).

What makes the case for retrofit even more interesting is that approximately 80% of our buildings are already built today and these are quite frequently far from being energy efficient and sustainable (Tillie et al., 2009). Currently about 35% of the EU's buildings are over 50 years old and at the time they were built or even reconstructed, the sustainability and energy efficiency have not been an issue. By improving the energy efficiency of such buildings, the reduction of the total EU energy consumption could be of 5-6% and the decrease in the CO_2 emissions could reach about 5% (European Comission, n.d.).

Figure 12 Circular economy scheme (Collaborations for Circular Economy, n.d.)

Many theories of what is the best way of pursuing retrofit of building have been developed, some of them following the so-called three step strategy: Reduce – Reuse – Produce (Tillie et al., 2009). The first step is lowering the energy demand as much as possible, usually through good insulation and air tightness of the building. The next step is reusing the waste energy streams (as waste heat, water and material); there are many ways and technologies already known, how this could be achieved. The third step is to produce the remaining energy needed by sustainable sources (Tillie et al., 2009).

A question remains, whether sustainable retrofit may ever achieve the same level of quality as the newly-built. This question cannot be answered directly, as retrofit depends on location and building factors such as the current physical state of the building, type of construction, etc. Some researches as Damwijk (2015) developed a step-by-step framework, which supports the decision makers in assessing whether the building is more favourable to be retrofitted or demolished and built new. Important factors within this assessment are Location, Building design, Material use, Energy and Services together with the demand for the intended function, which needs to be in accordance with the policy documents. All these issues then determine, whether retrofit is indeed more feasible solution to choose, although it may be desirable from the environmental perspective. The issue however requires more thorough research, which is not within scope of this report.

Sustainable office buildings

Environmental certifications

An assessment of buildings' performance from the aspects of their environmental impacts has been a fundamental issue for the sustainable development. For this reason a numerous third-party environmental certifications, evaluating the performance of a building and in some cases also the impact of the building on the surroundings, have become well-known and often used (Suzer, 2015). These certificates try to account for all the aspects of environmental, financial and social sustainability of a building within several categories, on which the projects are evaluated. The two most often used types of environmental certifications are LEED, Leadership in Energy & Environmental Design, developed by the U.S. Green Building Council, and BREEAM, Building Research Establishment Environmental Assessment Method, developed by the Green Building Council in the United Kingdom. Both are accepted as tools for guidance and evaluation of green buildings throughout the life cycle worldwide and are based on point system – the building with higher amount of points receives higher label (BREEAM, n.d.; USGBC, 2016a). Figure 13 present comparison of LEED and BREEAM reach over the world in 2013.
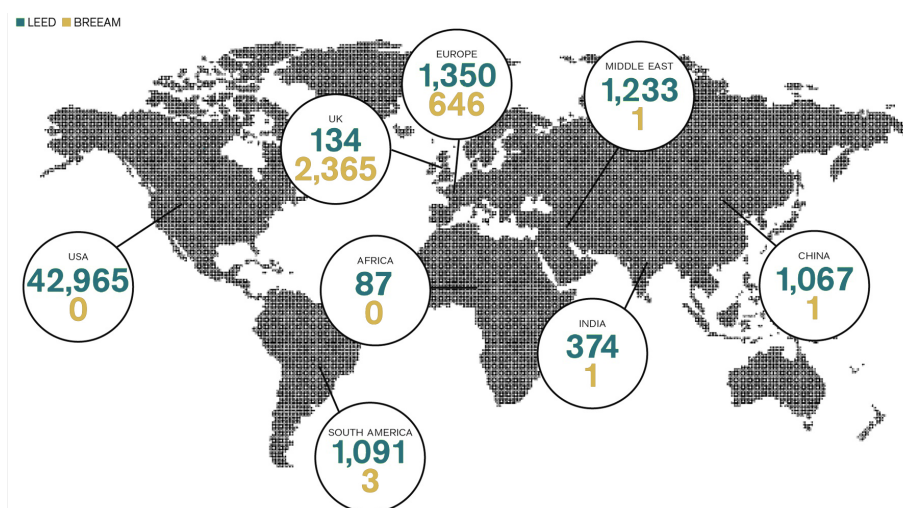
Figure 13 Projects certified or in the process of certification around the world till 2013 (The Architect's Journal, 2013)

LEED has recently presented its 4th version, which is designed to be more flexible and improves the user experience. Various types of buildings may strive for the certification as the certificate is offered in different project types from Building Design and Construction, through Interior Design to Neighbourhood Development (USGBC, 2016b). The LEED system scores from Certified, through Silver and Gold with the highest award being Platinum. In the office market, the most common type of the certificate pursued is Building Design & Construction. This certificate evaluates the project based on several criteria, namely Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation, and Regional Priority (USGBC, 2016b).

Figure 14 LEED certification (USGBC, 2016)

The BREEAM assessment process also evaluates the procurement, design, construction and operation of a development against pre-defined benchmarks. In BREEAM buildings are certified on a scale Pass, Good, Very Good, Excellent and Outstanding. The categories in which the project is evaluated are Energy, Health & Wellbeing, Innovation, Land Use, Materials, Management, Pollution, Transport, Waste and Water. Moreover, BREEAM can also be used for new construction as well as building in-use or for area development (BREEAM, n.d.).

Figure 15 BREEAM certification (BRE, 2011)

Main difference between these two certifications may be seen in the way the building assessment is approached. BREEAM projects use a so-called BREEAM Assessor, who collects all the evidence materials and suggests the points in a produced report, which is then audited by BRE, the organisation behind BREEAM. LEED seem stricter, with all the credits reviewed directly by USGBC. Another difference may be the fees for such certifications or the soft and hard costs attached to the certification process. Whether LEED or BREEAM system is used more often depends on the country market determining, which certificate is more recognized and valued locally; moreover, there are also other local or less known certifications being used in the practice.

Defining a sustainable office

By taking various concepts into account, Lutzkendorf and Lorenz (as cited in Feige et al., 2013) presented following definition of a sustainable building:

A sustainable building is meant to be a building that contributes – through its characteristics and attributes – to sustainable development. By safeguarding and maximizing functionality and serviceability as well as aesthetic quality, a sustainable building should contribute to the minimization of life cycle costs; the protection and/or increase of capital values; the reduction of land use, raw material and resource depletion; the reduction of malicious impacts on the environment; the protection of health, comfort and safety of workers, occupants, users, visitors and neighbours; and (if applicable) to the preservation of cultural values and heritage.

Sustainable construction usually means building in a way that meets certain criteria and the degree to which these criteria are fulfilled can be used to determine a building's sustainability rating, its greenness. For that evaluation structures for sustainable buildings, such as previously described LEED, BREEAM, DGNB and many more, already exist and are quite often used (Feige et al., 2013).

By overlooking the office market it can be concluded that if an office building has been built in a sustainable standard, it has also attained some kind of environmental certification, in the market used as a "marketability tool". As developers are mostly profit-oriented market players, it is assumed that if their

developed office building scores high in the sustainability criteria, they would like to obtain tangible declaration of their achievements to have a written proof of the building's performance to attract potential clients. Therefore in this research term "sustainable office building" or "green office building" is used for a building, which has acquired a certificate of LEED Gold or Platinum, BREEAM Excellent or Outstanding or same level of other similar certification. However, as LEED and BREEAM are the most commonly used environmental certifications in the Czech Republic, the focus will lie on them. Moreover, both terms "sustainable office building" or "green office building" are used in this report. In practice "green building" relates more to looking at a building from environmental perspective (for example energy efficient building), "sustainable building" includes also social aspects in its terms (Lupíšek, 2009). Within this report these these two terms are mostly used as synonyms.

CHAPTER 4
THEORY OF SUSTAINABILITY DRIVERS AND BARRIERS

Chapter 4: Theory of sustainability drivers and barriers

A vast amount of literature has already been written about the potential business case for green offices, about the drivers and motives of all the actors involved in the process. This part of the report brings an overview of the available literature on the topic, summarizing the potential economic and social value of sustainable offices. The main conclusions will function as a basis structure for the follow up empirical research, in which will be examined if and to what extent this theoretical value is perceived in the Prague market.

Vicious circle of blame

In 2000 David Cadman (referred to in RICS Europe, 2008) introduced a concept called the "vicious circle of blame" discussing the development of sustainable buildings, in which he suggested that investors, developers, occupiers and contractors/designers blamed each other sequentially for the failure to adopt sustainability in the building practices. Cadman suggested that the involved parties influenced each other in a loop, as constructors did not want to build environmentally friendly buildings because developers did not demand them; investors did not want to pay for them as there was no demand and occupiers did not demand such buildings because these were not available (Figure 16). Moreover, he claimed that the circle could have been broken by the occupiers' demand, as the markets are usually tenant-driven (bopro, n.d.; RICS Europe, 2008).
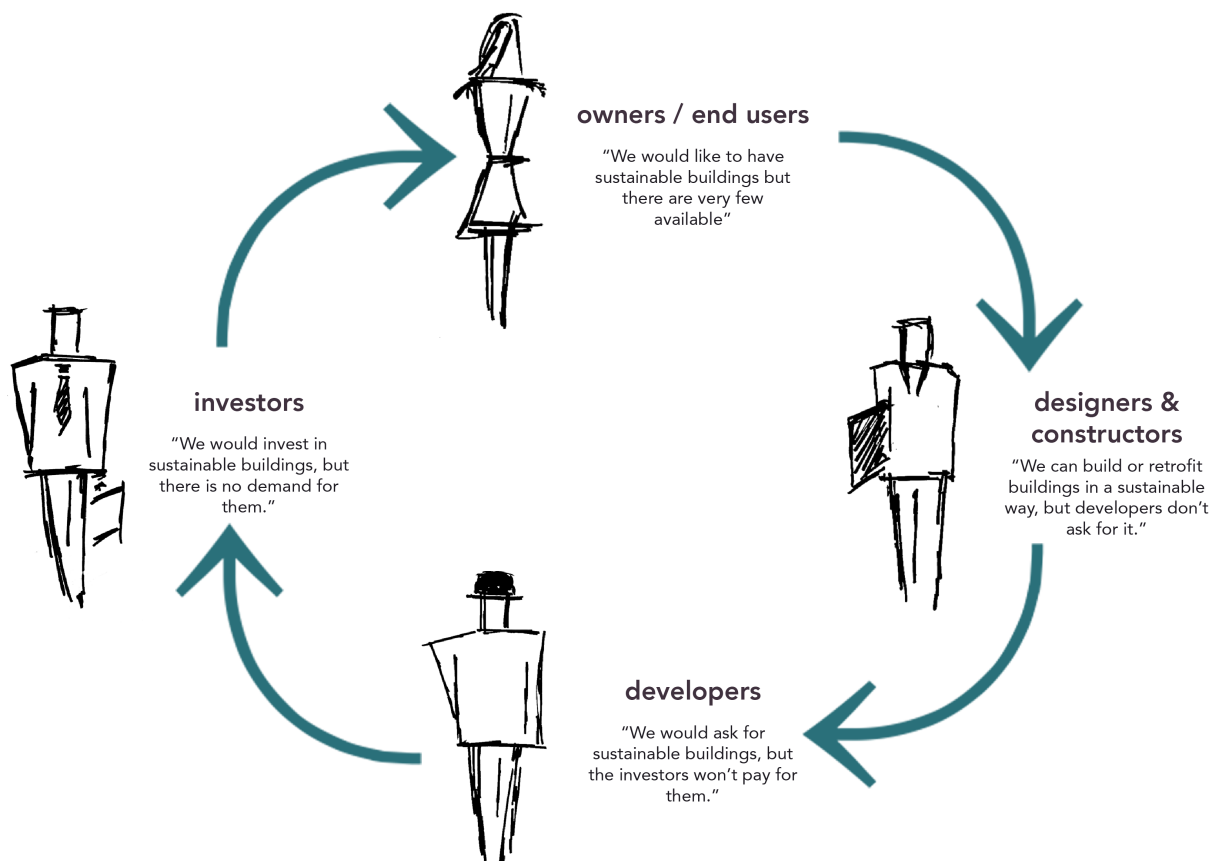
Figure 16 Vicious circle of blame (RICS Europe, 2008)

The Royal Institution of Chartered Surveyors (RICS) followed the idea of the vicious circle of blame in 2008, and turned the presented statements into a positive meaning and thus "broke" this vicious circle. RICS also

came up with a statement that not "going green" may lead to a buildings' obsolescence, as over time all the actors will probably prefer sustainable buildings to the common ones. The current situation in the Prague market seems to confirm this conclusion (bopro, n.d.; Eretová, 2015; RICS Europe, 2008).

In the following arguments of this paper the "designers and constructors" as actors within the circle are omitted. It is assumed that the technological knowledge of how to build sustainably already exists and that the role of an architect and a constructor is very much connected with the role of a developer. The architect/contractor in the perspective of this paper does not function as a decision maker. Thus further focus will be on the 3 remaining actors: end users/occupants/tenants, developers and investors.
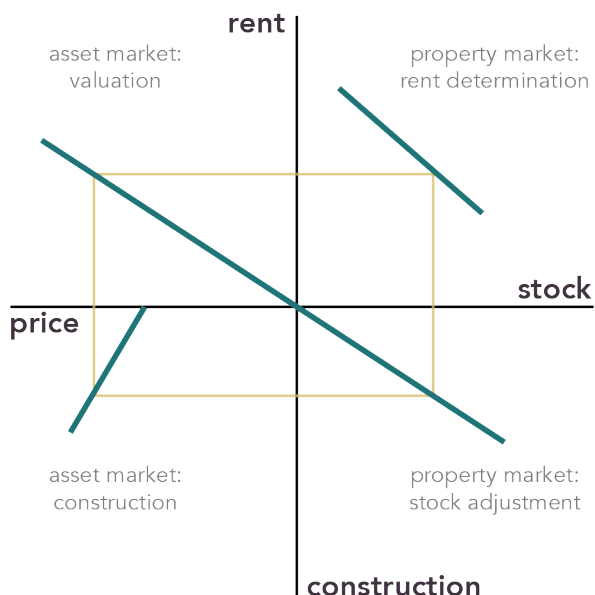
Figure 17 DiPasquale-Wheaton 4Q Model (Geltner, 2011)

In the economic terms, the vicious circle of blame shows similarities with DiPasquale-Wheaton Four Quadrant Model (Figure 17) as the interrelations among the actors in the circle of blame correspond with the interrelations among different markets. The Four Quadrant Model explains connections between demand and supply. It presents effects of various factors, such as how much are people willing to pay for an asset, on the price, stock supply and rent, the variables in the model. The rectangular, connecting all the markets, represents the equilibrium, a point, which all the markets always try to work towards (Geltner, 2007).

In their report RICS Europe (2008) also presented a step behind the previously explained vicious circle of blame, shown in a Figure 18, called the Virtuous Loops of Feedback and Adaptation, where relationships of all the other involved actors are presented. RICS claim that in order to turn the situation of the market, feedback mechanisms would need to be fully put in place, which would then encourage and facilitate change. All the involved actors should then acknowledge the benefits of sustainable buildings (RICS Europe, 2008).
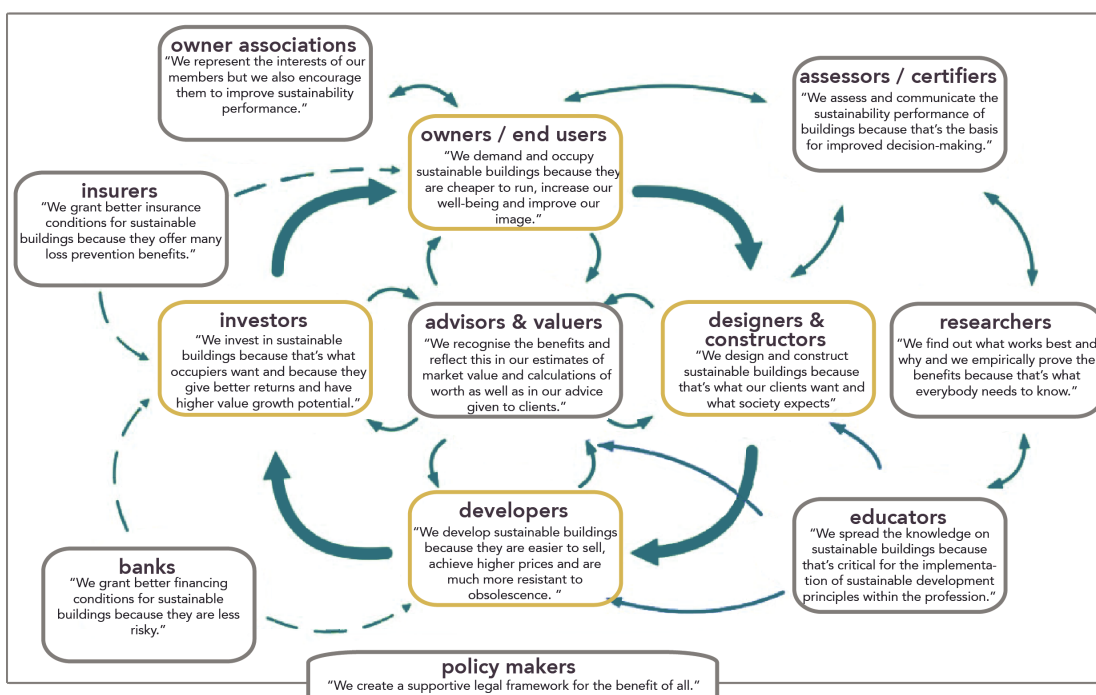
Figure 18 Virtuous loops of feedback and adaptation (RICS Europe, 2008)

Sustainability factors

A range of reports from both industry and academia has discussed the individual elements of the cost and benefit analysis of the sustainable buildings from different perspectives. The World Green Building Council (2013) in their report try to explore the business case for green buildings by summarizing all the costs and benefits for investors, developers and tenants, therefore, looking at the business case from the general perspective. This particular report thus functioned as a good starting point for defining the theoretical framework of this research, although it mainly focused on the potential drivers and slightly omitted the barriers.

While looking at the available literature discussing the different factors of sustainable offices, it has become obvious that the drivers and barriers are very much intertwined, mostly in a way, that the potential driver is not reflected in the practice or has practical downsides. Thus the structure of the following overview is based on so-called " sustainability factors" in which the potentials and the barriers of each are separately discussed. These factors are further described in this chapter and are grouped into clusters. These clusters are: corporate social responsibility, design & construction process, market value, life cycle, and staff wellbeing (Figure 19). These clusters were only used to help structure the theoretical part of this research. In the follow-up empirical research only the sustainability factors play an important role in the Delphi ratings, the clusters are omitted.

corporate social responsibility
- interest in sustainability
- image & marketing
- knowledge of sustainability

market value
- return on investment
- time on market
- occupancy
- rent level
- asset value
- selling price
- exit yield

design & construction process
- design & construction costs
- building's quality
- financing
- legal obsolescence

life cycle
- functional obsolescence
- maintenance costs
- operating costs

staff wellbeing
- staff happiness & satisfaction
- productivity
- comfort
- staff health

Figure 19 Sustainability factors grouped into clusters (own ill.)

The "sustainability factors", aspects connected to developing sustainable offices, were defined based on vast literature review and through several scope interviews. In the already mentioned report of the World Green Building Council (2013) called "*Business Case for Green*", the Figure 20 was presented, which shows an overview of the possible benefits of the green offices, and which functioned as a basis for the conceptual model of this research. Throughout reviewing the literature, some more factors were added and some were omitted. Although all the efforts were put into creating a complete list of factors, it may be always argued that some factors could have been added, some are redundant or too much connected with others. The choice is partially subjective and it is what makes each research unique.
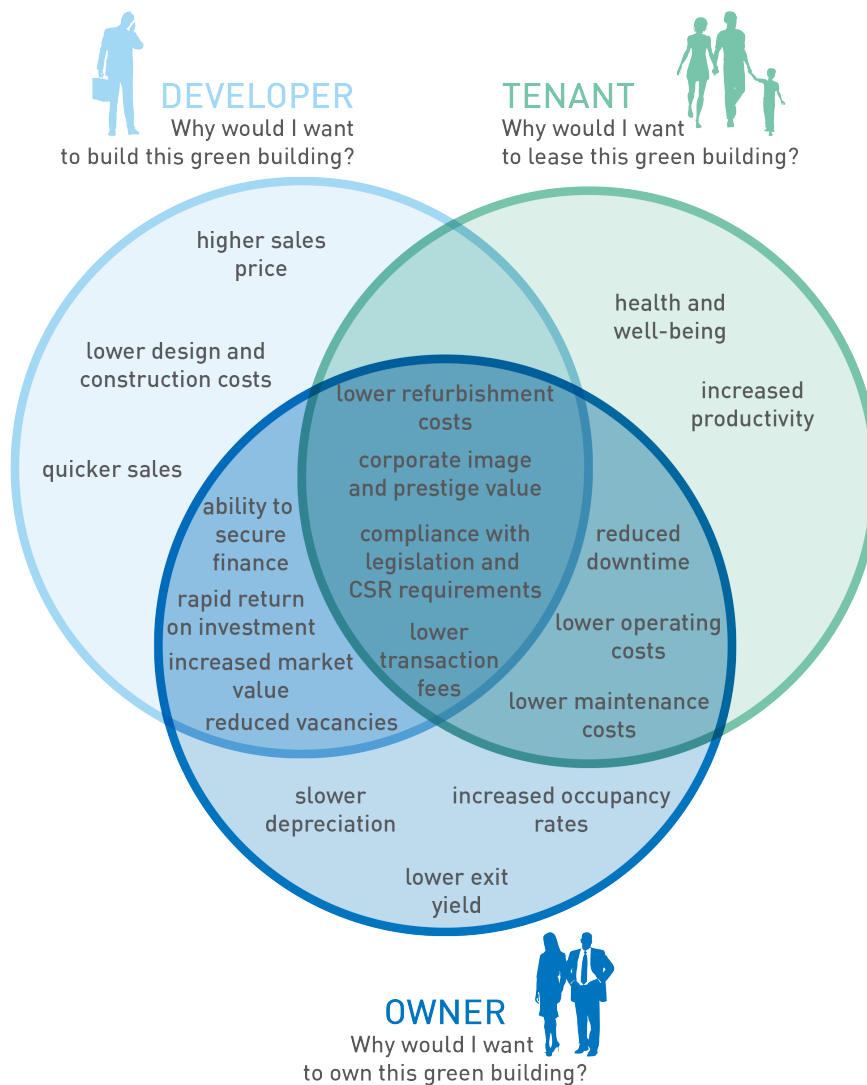
Figure 20 Benefits of sustainable buildings (WGBC, 2013)

Overview of the analysed academic literature

An overview of the academic articles, that were analysed in order to gather the theoretical knowledge on the topic, could be found in Table 5. Later each of the defined sustainability clusters is described in detail.

cluster	author	article	year	sustainability factor
corporate social responsibility	Bansal & Roth	Why companies go green: A model of ecological responsiveness	2000	image & marketing; interest in sustainability
	Eichholtz et al.	Ecological responsiveness and corporate real estate	2016	image & marketing; knowledge of sustainability
	Nappi-Choulet & Decamps	Can sustainability enhance business district attractiveness?	2013	image & marketing; interest in sustainability
	Thompson & Ke	Whether environmental factors matter: some evidence from UK property companies	2012	interest in sustainability
	Hakkinen & Belloni	Barriers and drivers for sustainable buildings	2011	knowledge of sustainability
design & construction process	Brotman	Green office construction: a discounted after-tax cash flow analysis	2014	design & construction costs
	Feige et al.	Impact of sustainable office buildings on occupant's comfort and productivity	2013	design & construction costs, buildings's quality
	Rehm & Ade	Construction costs comparison between green and conventional office buildings	2013	design & construction costs, building's quality
	Bhardwaj & Malhotra	Green banking strategies: Sustainability through corporate entrepreneurship	2013	financing
	Pedro et al.	Comparison of building permit procedures in European Union countries	2011	legal obsolescence
market value	Leishman et al.	The Impact of carbon emission reducing design features on office occupiers' choice of premises	2012	time on market; occupancy
	Levy & Peterson	The effect of sustainability on commercial occupiers' building choice	2013	time on market; occupancy
	Pivo & Fisher	Income, value, and returns in socially responsible office properties	2010	return on investment
	Eichholtz et al.	Doing well by doing good? Green office buildings	2010	rent level; asset value; selling price
	Fuerst & McAllister	Green noise or green value? Measuring the effects of environmental certification on office values	2010	rent level; asset value; selling price
	Gabe & Rehm	Do tenants pay energy efficiency rent premiums?	2014	rent level
	Bonde & Song	Is energy performance capitalized in office building appraisals?	2013	rent level
	Newell et al.	Assessing energy rating premiums in the performance of green office buildings in Australia	2014	asset value, exit yield
life cycle	Bonde	Difficulties in changing existing leases - one explanation of the "energy paradox"	2012	operating costs; maintenance costs
	Aune et al.	The missing ling which was already there	2009	operating costs; maintenance costs
	Bonde & Song	Is energy performance capitalized in office building appraisals?	2013	operating costs
	Remøy et al.	Keeping up appearance	2009	functional obsolescence
staff wellbeing	Smith & Pitt	Sustainable workplaces and building user comfort and satisfaction	2011	productivity; comfort; staff health; staff happiness and satisfaction
	Rashid & Speckelmeyer	Green buildings, environmental awareness, and organisational image	2012	staff happiness and satisfaction
	Armitage et al.	Green offices in Australia: a user perception survey	2011	productivity; comfort; staff health; staff happiness and satisfaction
	Feige et al.	Impact of sustainable office buildings on occupant's comfort and productivity	2013	productivity; comfort; staff happiness and satisfaction

Table 5 Overview of the analysed articles as part of theoretical overviews (own ill.)

Corporate social responsibility

Figure 21 CSR cluster (own ill.)

Improving the corporate image of a company is probably one of the most important drivers regarding sustainability, as the current beliefs are that companies have philanthropic responsibilities towards society and that it is in firm's interest to contribute to the advancement of the society (Drucker, as cited in Thompson & Ke, 2012). Corporate social responsibility (CSR) has become normative standard describing firms' choices about inputs, internal processes and publicity. CSR is defined and demonstrated in number of ways, as for example in the Pyramid of social responsibility by Carroll in Figure 22 (as referred to in Thompson & Ke, 2012), which demonstrates a hierarchy of importance of companies' responsibilities. Companies with well-defined CSR policies may outperform others due to improved corporate reputation, less intrusion from activists and governmental organizations, reducing threat of regulation, and improved profitability by lower input costs and higher employee productivity (Eichholtz et al., 2010; World Green Building Council, 2013).

Figure 22 Pyramid of social responsibility (Carroll, as referred to in Thompson & Ke, 2012)

In their research Bansal and Roth (2000) defined corporate ecological responsiveness, one of the viewpoints on CSR, as *"a set of corporate initiatives aimed at mitigating a firm's impact on the natural environment"*. These initiatives can have various forms: changes to the firm's products, processes and policies. Examples could be reducing an energy consumption and waste generation, using ecological resources and implementing an environmental management system. There are three main motivations for the ecological responsiveness, which are competitiveness, legitimation and ecological responsibility (Bansal & Roth, 2000). Competitiveness stands for the potential for ecological responsiveness to improve the long-term profitability. This issue is tangled with the products of the firm, however also describes the building management such as energy and waste management. In case of developers this notion may be used for "green marketing" and pays attention to the cost-benefit analysis. Others claim that CSR is not direct linked to company returns, as CSR neither harms nor improves returns, claiming that "*companies can do good and do well, even if they don't do well by doing good*" (Margolis & Elfenbein, as cited in Pivo & Fisher, 2010). The next motive, legitimation, refers to a desire of a firm to improve the appropriateness of its actions within an established set of regulations, norms, values and beliefs (Suchman, as cited in Bansal & Roth, 2000). In corporations internal environmental policies are often established to keep up with regulations, however sometimes they exceed them, usually hoping to achieve higher competitiveness. Ecological responsibility stands for a belief that firm has its social obligations and values; this shows an ethical aspect rather than a pragmatic one. Examples of responsible initiatives could be a redevelopment of a previously used land to green areas, donations to environmental interest groups, a use of recycled paper, etc. The short-term benefits of this ecological responsiveness were high employee morale as the staff sees the initiative as "the right thing to do" (Bansal & Roth, 2000). Research of Thompson and Ke (2012) discovered by comparing the annual reports with the actual performance of listed companies in the UK that firms with good performance

(return on assets) are likely to invest more in the sustainability. Moreover, larger firms have usually better-defined CSR.

The decision of implementing internal environmental policies and occupying a green office is also connected with the business the company is in. Surprisingly, oil industries are together with bank industries and non-profit organizations among the most prominent green tenants. Also companies in the mining and construction industry as well as governmental and government related organizations are more likely to lease a green office than a conventional one (Eichholtz et al., 2016). For most of the service companies the corporate real estate, the building in which their office is placed in, is the only tangible aspect in which such ecological responsiveness could be implemented and thus also the service companies may be more likely to rent a green office space than firms in other sectors (Eichholtz et al., 2016). Nappi-Choulet and Decamps (2013) observed the rising importance placed on sustainability aspects concerning the office location decisions especially among listed companies. They discovered that the ownership of the office or the headquarters seems to be the major reasons for putting more emphasis on sustainability aspects in the office building. Moreover, the use of the green office space may signal that a firm has a long-run commitment to the environment, which may hereinafter translate to an improved reputation, which is important for the investors (Eichholtz et al., 2016).

The most important actions to promote sustainable buildings are the development of the awareness of clients about the benefits of the sustainable buildings, the adoption and development of methods of management, the mobilization of needed tools, and the development and implementation of new concepts and services (Hakkinen & Belloni, 2011). As explained already in the research definition, the knowledge about sustainability, going hand in hand with the actual interest in sustainability of the real estate sector is gradually improving in Europe, with the Western and Northern European countries taking the lead in this matter. Organizations such as Green Building Council focus on national implications of sustainability goals within the sector through their activities. However, in some countries such as the Czech Republic, although the issue of the sustainable built environment is becoming more and more important, the data and the knowledge of the costs and benefits of sustainability in the local context are still lacking (Czech Green Building Council, 2013).

Design & construction process

design & construction process

design & construction costs
building's quality
financing
legal obsolescence
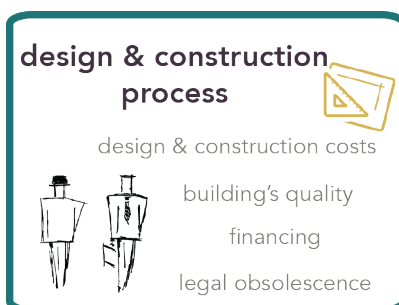
Figure 23 Design & construction process cluster (own ill.)

An important variable for the developer, on which he bases his decision of whether or not to invest in constructing a green building, is the level of additional construction costs and assurance whether he could receive his money back by increasing the selling price of the building through the green certification. Therefore, the additional investment costs are perceived by the industry as one of the main obstacles of the sustainable development. It is however very difficult to identify the exact cost increase of sustainability as it does not lend itself to a straightforward recognition (Feige et al., 2013). Higher planning, construction and material costs for a sustainable construction are a major factor in the development of such buildings. Although a life-cycle analysis may show a payback for such investments within a reasonable time, such time span is often too far in the future and thus not considered by the developers (Meins et al., as cited in Feige et al., 2013). This brings the issue back to the circle of blame; the buildings are often approached as investment, whereas real estate in reality needs a life-cycle approach. The relevant objection to higher construction costs may be lower running costs, however such leads to the so-called split incentive problem, as the saving on the operating costs are not usually attributed to the developer, who invested more in the energy efficient technology in the buildings, but to the occupiers (Feige et al., 2013). The split incentive problem will be discussed more in detail in one of the following sections.

The uncertainty of the design & construction payback could be thus seen as the reason for quite slow acceptance of some of the developers to build sustainable buildings and seek green certifications. To address this issue Brotman (2014) developed a discounted present value model for the cost-benefit analysis to prove a feasible business case for sustainable buildings. However, his findings result in negative net present value and high payback periods (even with using a quite low weighted average cost of capital as 6,4%), indicating that increased rents, tax credits for the present value loss and/or property tax reduction are needed as an incentive to commercially build in a green standard. In other words, in current market (in case of Brotman's research in the United States) the demand does not yet respond to the supply. Thus, at this point, the sustainable features may not be profitable unless there are other financial benefits put in place. Such benefits could occur through capital and rental value premiums, higher occupancy rates, reduced operational costs or a reduced risk premium (Feige et al., 2013).

Other researches show, that building green does not necessarily in every case need to cost more, especially when all the strategies as cost strategies, environmental strategies and program management are integrated in the development process right from the beginning, the concept stage. However, there still could be some additional costs associated with the development of a green building compared to the conventional one, these are however usually smaller than many developers would think (World Green Building Council, 2013). Rehm and Ade (2013) while comparing construction costs of green and conventional buildings concluded, that the construction costs of green buildings are in average slightly higher across all the researched types of buildings, but that the statistical difference was not significant. On the other hand, older researches show green building cost premiums ranging from 0-15% for LEED Gold or 0-21% for LEED Platinum; in general over time the reported cost premiums for green buildings tend to decrease (Rehm & Ade, 2013; World Green Building Council, 2013). The results of different researches thus vary a lot. This may be caused either by using different techniques for calculating the construction costs and assigning different financial value to "soft" aspects of sustainability, by the increasing effectiveness of the construction sector or by researchers selecting cases to reach their preferred answers. In order to make good estimation of the financial added value of a green building, a thorough life cycle cost analysis is needed.
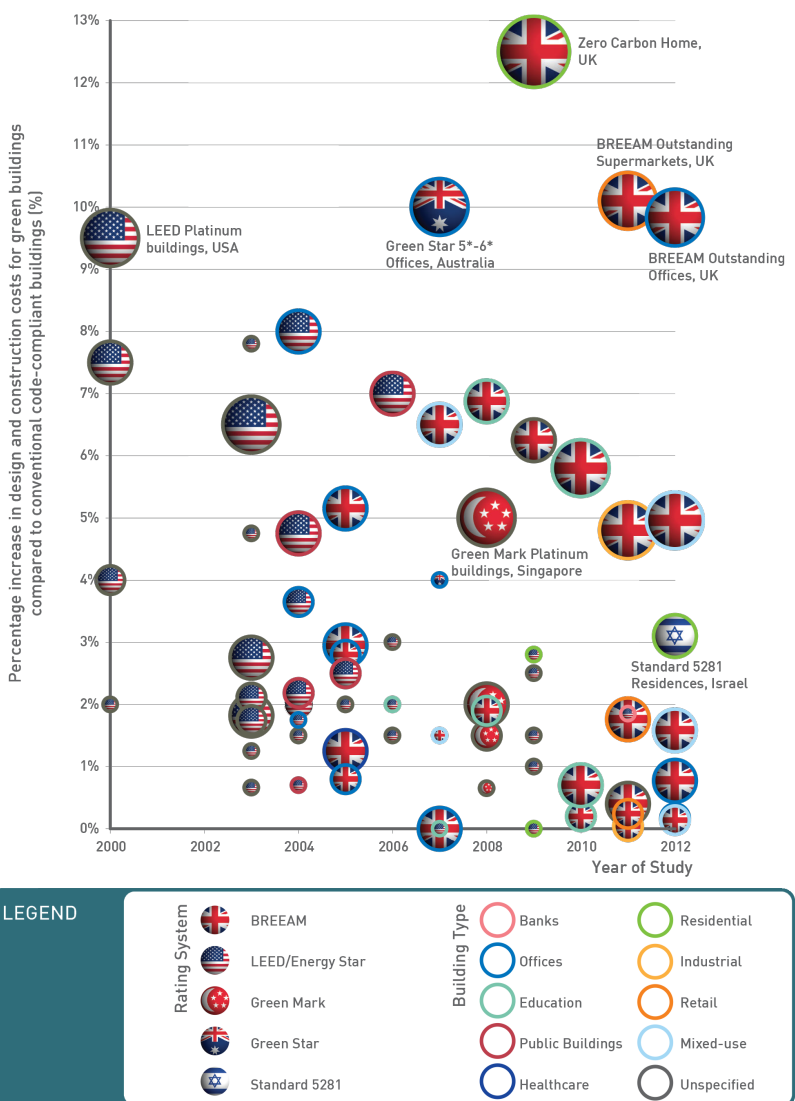
Figure 24 Actual cost premiums in various certified projects (WGBC, 2013)

The finance issues are also considered by the developer while deciding about the "greenness" of the construction. Several private and public incentives exist, which may support developers in their decision-making in favour of building sustainably. Firstly, various subsidy programs exist. In the Czech Republic, programs like "Zelená úsporám", initiated by the Ministry of the Environment help the owners of the residential buildings to refurbish their buildings in a sustainable manner (Nová zelená úsporám, n.d.). However, for office buildings, not many subsidy programs exist as the market is seen as commercial one and thus should be solved by the market itself (V. Žabka, personal communication, 18 December 2015). Another possibility is a tax relief for a green construction and green retrofit, which for example functions in Belgium and USA; however this is more of a support than a real direct motive to build in a green standard (Baker & McKenzie, 2016). In past years also a trend of "green banking" has arisen. It is described by Bhardwaj and Malhotra (2013) in their research about green banking strategies as follows: "*Green Banking, is an effort by the banks to make the industries grow green and in the process restores the natural environment. This concept of green banking will be mutually beneficial to the banks, industries and the economy*". Not only will green banking ensure the greening of the industries but it will also facilitate improving the asset quality of the banks in the future. This upcoming green banking results in a higher percentage of sustainable projects getting funded by engaged investors who strive for sustainable results (Bhardwaj & Malhotra, 2013). In the ideal situation in real estate, banks should thus grant better financing conditions to sustainable buildings, because they are less risky and thus allow for higher return on investment (RICS Europe, 2008). Such is already visible in some countries as Germany, the Netherlands or Romania, in which state-owner or private banks offer "green mortgages" to the developers; a possibility to build green for a lower interest rate and/or a possibility to obtain a higher loan (Baker & McKenzie, 2016). An example could be given by Triodos Bank, operating in several European countries, which promotes itself as one of the leading sustainable banks with mission of making money work for positive social, environmental and cultural change (Triodos, n.d.). The concept of green banking thus also relates to the previous chapter of corporate (bank) image and ecological responsiveness. Lastly, other possibilities related to the financing of the building such as energy performance contracting or green leases exist, and these will be elaborated in the life-cycle cluster of this theoretical overview.

The legal perspective is another very important aspect to consider. In all the European countries, there is a building regulatory system encompassing the regulations and the building control system. The building regulations set minimum requirements to ensure the safety, healthiness, energy-efficiency and accessibility (Pedro et al., 2011). The building law defines the interrelationships between the property developers and local authorities, as the developers with their plans need to comply with the land use plan defined and agreed on by the municipalities. The Netherlands, for example, with its mature system of land-use planning always draws attention from abroad (Hobma & Jong, 2015). A lot of general similarities could be seen across the European planning practices, as the regular building permit procedure is similar in the EU countries. However, there are many differences among countries regarding the procedural aspects of a building control (Pedro et al., 2011). The major importance for the developer is the smoothness of the permit process and the time needed for achieving the permit for the construction. In some countries as for example the Netherlands, such process could take only several months; in others, as the Czech Republic, Prague in particular, up to several years (Boháč, Machar, Klapalová, Kolář, & Velemínský, 2016, April). In the Netherlands as well as other European countries a combined procedure for planning and building permit exists, making the process smoother and faster; in the Czech Republic these permit procedures are separated and obtaining a planning permit is not an assurance that a building permit will also be obtained. Moreover, although in majority of the EU countries there is a fixed procedure time in which the permit needs to be issued, in some countries such as the Czech Republic the public authorities may extend the maximum time for special situations up to several years (e.g. listed buildings, buildings located outside the development boundary of a local plan, complex buildings and major cities). Regarding sustainability a long permit procedure is a hindering issue, as once the permit is finally achieved and the developer is allowed to build, the technologies designed in the building, modern and innovative at the time of the design, already

become slightly obsolete. Readjusting the design is however difficult as the developers risks going through the permit procedure again (Deloitte, 2016; Pedro et al., 2011).

Market value

market value

return on investment

time on market

occupancy

rent level

asset value

selling price

exit yield

Figure 25 Market value cluster (own ill.)

The concept of a building's "asset value" could have a different meaning for various stakeholders in the property sector. The most used definition of value is "market value", which is the estimated price at which a building will transact in the market between a willing buyer and a willing seller. This is linked to the rental/capital value that building occupiers are willing to pay for owning or leasing the building. Regarding the asset value, the potential benefits of the green buildings are monitored in these areas: rent/lease rate, operating expenses, occupancy rates, exit yield (World Green Building Council, 2013). All these aspects are discussed in this report although in different sections, only proving that the overall problem definition with its factors is very intertwined.

From the investor's perspective, the impact of the building's sustainability on the return on investment plays an important role. Pivo and Fisher (2010) defined "responsible property investing" as seeking to address social and environmental issues while achieving acceptable financial returns. They examined, that sustainable buildings (in case of their research Energy Start labelled buildings) had net operating income, market values, price appreciation, and total return that were higher or the same as conventional properties, with lower cap rates. Thus the responsible property investing (RPI) may potentially yield higher profits for developers and investors as the RPI property types seem to be 7% to 11% more valuable, are favoured in the capital asset market and that owners are willing to buy these properties at a lower capitalization rate (Pivo & Fisher, 2010).

It is visible in past years that an increase in the individuals' and business' interest is driven by higher environmental consciousness in the asset investing (Ho, Rengarajan, & Lum, 2013). Some empirical researches demonstrate, that green buildings can achieve rental premiums, higher occupancy rates and thus higher asset values for the landlords or investors (Nappi-Choulet & Decamps, 2013). For market-based solutions to be successful, prices need to reflect environmental costs and benefits (Fuerst & McAllister, 2011). The "greenness" of the building may be used as a good marketing tool and thus, as many researches around the world show, the green buildings more easily attract tenants and could thus command higher rents and sale prices. Such does not go only for the top buildings from the sustainability perspective; in markets where building green has become a mainstream, some indicators show that buildings, which are not green, rent or sell for less (World Green Building Council, 2013). A lot of researches evaluating the financial benefits and rent and market value premiums of sustainable offices has been done. The baseline of these arguments was presented by Eichholtz et al. (2010), according to whom the buildings with "green rating" or energy certifications can command rental rates that are roughly 3 % higher per square foot than otherwise identical office buildings; the selling prices of green buildings are in this comparison higher by about 16 %. Fuerst & McAllister (2011) go even further in their premium estimation: for LEED and Energy Star-certified buildings investigated in their research, approximately 4-5 % rental premium and 25-26% sales price premia.

On the other hand, other researches such as one done by Gabe and Rehm (2014) looking at lease contracts in central Sydney or one hedonic regression research done by Bonde and Song (2013) in Sweden discovered no price differentials of energy performance of a building, which led to a conclusion that tenants are not willing to pay for the energy efficiency. In consistency over 85% of gross face rent prices could be according to them attached to either one of the following factors: tenancy floor level, submarket location, proximity to transit, market conditions during negotiations, building quality specification and structure of operating

expenses. In other words the capital value of the real estate is mainly affected by rent levels, changes in vacancy rates, location, "newness" of the property; the energy usage does not seem to have any effect on the values, perhaps due to quite low price for the energy (Bonde & Song, 2013). Surprisingly enough another research from Australia done by Newell et al. (2014), empirically evaluating 200 green office buildings and comparing them with the common office buildings concludes with a net rental premium of 6,6% and 11,8% increase in value for the top energy rated building. Moreover, in this research, also different levels of "greenness" were differentiated.

The main problem of jumping into quick conclusions based on the findings of similar hedonic pricing models is, that the eco-certification is only one of the elements of additional investment creating a market-leading product. The inherent heterogeneity between certified and non-certified building are bound to be imperfect even when applying diligent sample process and comprehensive set of variables (Fuerst & McAllister, 2011). In other words, it is very difficult to pinpoint sustainability aspect of a building without accounting for location, architecture, etc. Moreover, the time period, from which the buildings are evaluated in the researches play an important role and may lead to different results.

Another very important aspect for an investor directly linked to the market value is the risk mitigation; the sustainability can positively affect the future value of the real estate and thus subsequently affect the return on investment of the asset. Inefficient buildings are in many places of the world affected by regulations against them. Moreover, the tenant preferences and investor risk screening may translate into risk of obsolescence for inefficient buildings (World Green Building Council, 2013). Building and attaining sustainable buildings with the new technologies could be thus seen as a way of future proofing. Sustainable development of buildings is not hindered by a lack of technologies and assessment methods, but is instead usually beset with organizational and procedural difficulties. New technologies are resisted in practice, because they require process changes entailing risks and unforeseen costs. These hindrances can be however reduced by understanding the new kinds of decision-making phases, tasks, actors, roles etc. needed (Hakkinen & Belloni, 2011).

Some researches as one conducted by Leishman, Orr, and Pellegrini-Masini (2012), which assessed the impact of carbon emission reducing design features on choices of office premises, showed that the top priorities for office occupies are the functionality and accessibility, with energy efficiency being seen as not as important. More particularly, lower rents, improved corporate image and the productivity of workers were seen as compensations for energy-efficient attributes of the buildings that potentially limit the internal environment of office buildings (Leishman et al., 2012). Levy and Peterson (2013) argue, that the ultimate driving factor for occupier's choice of premise is the location, and emphasis is also put on other factors as attractiveness to staff, marketing and flexibility. The choice also depends on the type and size of the occupier's company. The energy performance of a building in research of Koppels et al. (2007) was also ranked on 12th place out of 15 evaluated building features. The sustainability of a building per se thus does not play a direct role in occupant's choice; other building and locational aspects contribute to it, which for the developer and developer are reflected in the time on market and occupancy rates. However, these aspects as flexibility or location are also valued in the environmental certifications and thus are very much interlinked with the broader definition of a sustainable building.

Life cycle
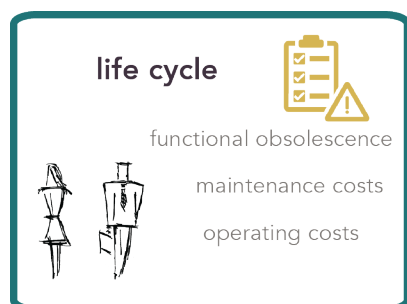
The value of the green buildings for tenants also lies in lowering the energy bill, the operational costs for the energy, leading back to increase in the quality of the building and the value of the building for the investor (Eichholtz et al., 2010). Green buildings mostly thanks to the modern energy efficient technologies have proven to save operational costs through reduced energy and water demand. This advantage is

Figure 26 Life cycle cluster (own ill.)

usually more directly linked to the tenant of the building, who benefits from these cost savings, however, the technical performance is already influenced on the design level. The research shows that the energy savings typically exceed the design and construction cost premiums regarding green solutions within a reasonable payback time. But in order to do so, effective management, robust commissioning and good collaboration between owners and occupiers are needed (World Green Building Council, 2013).

The difference between who pays the costs and who receives the benefits has already been addressed as the split-incentive problem. Therefore, in the real estate sector, it is argued that investments regarding energy efficiency are not being conducted to their full extent, even though they bring about a positive NPV. In theory these obstacles hampering market efficiency as referred to as "market failures" and/or "market barriers" (Bonde, 2012). On example of two office buildings in Stockholm Bonde (2012) in his research investigates, whether green lease could be used to eliminate this problem. The theoretical purpose of green lease is to create economic incentives for both the landlord and the tenant to undertake energy efficiency measures. Moreover, the green lease formalizes the cooperation concerning the property related environmental issues between a tenant and a landlord. However, such efforts could be hampered by difficulties in changing existing leases. Complex contractual agreements involving different parties can easily create split incentives regarding the energy. Another way for developer/investor of achieving a desirable state of the building's quality in terms of operating costs is energy performance contracting. In such case an external company ESCo provides the technological solutions and guarantees the savings on the energy. In the Czech Republic this method is used a lot in the public buildings, in private development it is rather complicated due to problems with accounting (P. Zahradník, personal communication, 20 April 2016).

In a typical office building, 25-30 % of operating expenses derives from energy usage, and that makes it one of the largest and most manageable operating costs (Eichholtz et al., as cited in Bonde & Song, 2013). As a notion it could be understood, that the energy consumption is an indirect consumption; that means that the energy is not consumed directly, but rather as means to reach specific goals such as maintaining comfortable temperatures and air quality, lightning, etc. The end-user's (tenant's) energy consumption is thus more about the comfort, and therefore the challenge is to influence this comfort in a more sustainable direction. The technologies used must be easy to manage by the end-users, the feeling of influence is important. In this sense also facility managers play an important role, while reducing the energy consumption (Aune, Berker, & Bye, 2009).

There is a big variety in ways of how maintenance costs are divided between a landlord (investor) and a tenant (end-user). The two extremes are the gross lease, where the landlord pays all operating and maintenance costs, and the net lease, where all operating and maintenance costs are paid by the tenant (Bonde & Song, 2013). The life cycle aspects are also important for the previously discussed risk mitigation. The better technologies, usually used in the green buildings, should last longer and require less maintenance; therefore, the maintenance costs are in theory lower. Moreover, an important aspect of the building's quality, also focused on in the sustainable buildings is the building's aesthetics, the architecture and the functionality. Briefly explaining, of course the most sustainable building is the one, that is able to function in stable quality as long as possible without major adjustments and retrofits (V. Matoušek, personal communication, 16 December 2016).

As sustainable retrofit and adaptive reuse were already mentioned as an important possibility to approach the sustainability of obsolete office buildings, a functional obsolescence and structural flexibility of a building are also needed to take into account. Moreover, as probably the most sustainable building is the one, that can remain successfully functioning for the longest time possible without significant adaptations, from a sustainable perspective a prolonged lifespan is desired. As in practice new office buildings are developed, older buildings are abandoned by tenants for preferred new buildings and vacancy occurs. The structural vacancy is caused by both quantitative and qualitative mismatch between supply and demand. On top of that, several other building factors such as parking, exterior appearance, space efficiency and

layout flexibility as well as locational factors such as accessibility by car and public transport and location status are important in predicting the structural vacancy of buildings (Remøy, Koppels, & De Jonge, 2009). Moreover, mixed-use areas are important in lowering the structural vacancy as well as are perceived as socially and environmentally more sustainable (Remøy et al., 2009; Steen, 2016).

Staff wellbeing

staff wellbeing

staff happiness & satisfaction

productivity

comfort

staff health

Figure 27 Staff wellbeing cluster (own ill.)

The intangible effects of the building's environmental label play also an important role in the decision of the building occupiers, of where they rent. Sick building syndrome and poor indoor air quality, usually associated with older office buildings, are contributory factors to ill health and reduced productivity (World Green Building Council, 2014). Sustainable buildings use resources such as energy, water, materials and land more efficiently, have more natural light and a better air quality and thus they contribute to improved health, comfort and productivity (Palanivelraja & Manirathinem, as cited in Smith & Pitt, 2011). The staff costs usually account for the highest part of the companies' expenses (up to 90%) and thus improving the indoor environment for workers has impact on the financial performance of an organization by improved productivity. Achieving better health and productivity of the building's occupants, employees, can thus provide a sound business case for the sustainable offices (Clements-Croome as cited in Armitage et al, 2011; Eichholtz et al., 2010; Smith & Pitt, 2011; World Green Building Council, 2014). The relationship between financial means of the company and staff comfort, satisfaction and productivity is shown in the Figure 28.
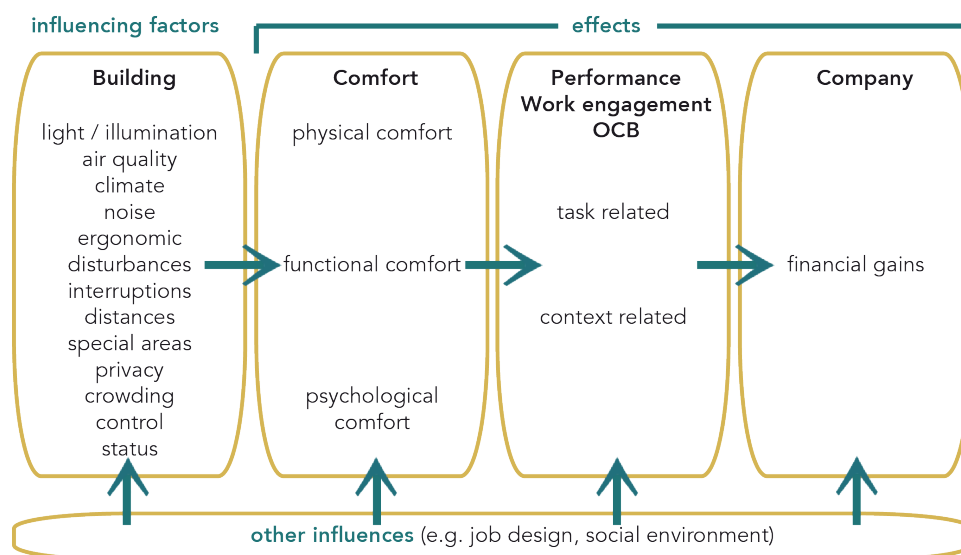
Figure 28 Influencing factors and effects in sustainable construction (Feige et al., 2013)

"*Whilst the shift towards green buildings is undisputed, what is currently still not fully established –nor yet not fully acknowledged – is how these green workplaces actually are liked by the people occupying them*" (Armitage et al., 2011). Overall the researches show positive results regarding the happiness and productivity of the workers occupying green buildings. This increased satisfaction, productivity and overall health in green buildings are mainly results of improved thermal comfort and lighting, as well as better airflow, use of less-toxic building materials and furnishing, lower noise levels, reduction of glare and individual controllability of systems (Armitage et al., 2011). However, another correlation needs to be also taken into account and that is between perceived personal control over the physical environment and self-reported job satisfaction. Where people are tied to workplaces in open space layouts, where they have to comply with needs of more co-workers, or for other reasons they are not able to adjust their indoor

environment themselves, their happiness and satisfaction decreases. On the other hand, although people appreciate the ability to correlate their workplace environment, too much choice can annoy them, as it is time-consuming (Leaman & Bordass, as cited in Smith & Pitt 2011). The staff satisfaction thus goes hand in hand with the architectural and technological design of the office building.

A research of Armitage et al. (2011) by surveying both the management and employees of companies occupying green office buildings in Australia found out that there is a certain gap between perceived value of green buildings by the management on the satisfaction of the workers and the self-assessment of the workers themselves. Employees were highly satisfied with their workplace, however the study did not fully confirm the theory that green workplaces directly create healthier or more productive staff as the employees were not convinced about their increased productivity; however vast majority of the employers believed in positive impact of green offices on both productivity and health.

In the same study the employees ranked the best aspects of their office being natural light, open plan and location, view; and the biggest complaints about the office were triggered to air temperature and lack of privacy (Armitage et al., 2011). In their literature review, Smith and Pitt (2011) summarized different elements of workplace contributing to productivity such as: personal control, privacy, interior planting, personalization, colour and windows and lightning. Needed to say that these factors, although valued in green certifications, are not sustainable in energy-saving meaning per se, they are more linked with the overall design and architecture of the office. It is thus very difficult to differentiate the impact of solely the "greenness" of the office building, without factoring in other aspects of the buildings such as location or architecture. Thus more research in this area is needed in order to prove the direct impact on the productivity.

Feige et al. (2013) draw a differentiation between productivity and work engagement. While productivity is not directly correlated to comfort levels, the work engagement is. More specifically, building has a clear impact on the comfort level of the occupant, which then increases his satisfaction and work engagement. However, the link between comfort and productivity might not be as strong and direct (Feige et al., 2013). Rashid, Spreckelmeyer, and Angrisano (2012) also investigated the mechanisms for the direct and indirect effects of environmental design features of green buildings (LEED certified building) on occupants' environmental awareness and organizational image. In the description of the problem, they also mention the organizational image with connection to the employees, as it is important for them to enhance pride of the organization they work in. Since organizations with a good image are also considered good employers, it is likely that employees will hold positive perceptions towards their work. A good workplace may send a message of quality, stability, power, vitality and pride of the organization to all employees (Gatewood et al., as cited in Rashid et al., 2012; Riordan et al., as cited in Rashid et al., 2012). However, the performed study did not find any evidence for direct relationship between occupant's assessment of an individual workspace and department space features and their assessment of organizational image and environmental awareness. On the other hand, indirect effects as occupants' satisfaction with good design features of the building were spotted. This outcome may help the organizational leaders by showing that by providing the "green" workspaces the environmental awareness may be improved through employees' satisfaction, however, there is no guarantee that it also helps to improve the organizational image (Rashid et al., 2012). This notion goes thus back to the corporate image discussed above.

Evaluation framework

The theoretical overview has proved that the drivers and barriers of the sustainable office development are very intertwined and the overall context is rather complex. A lot of factors influence the decision making of the involved actors in relation to sustainable offices. The arrows in Figure 29 represents the influencing relationships between the clusters of the sustainability factors, which were in length described this chapter.
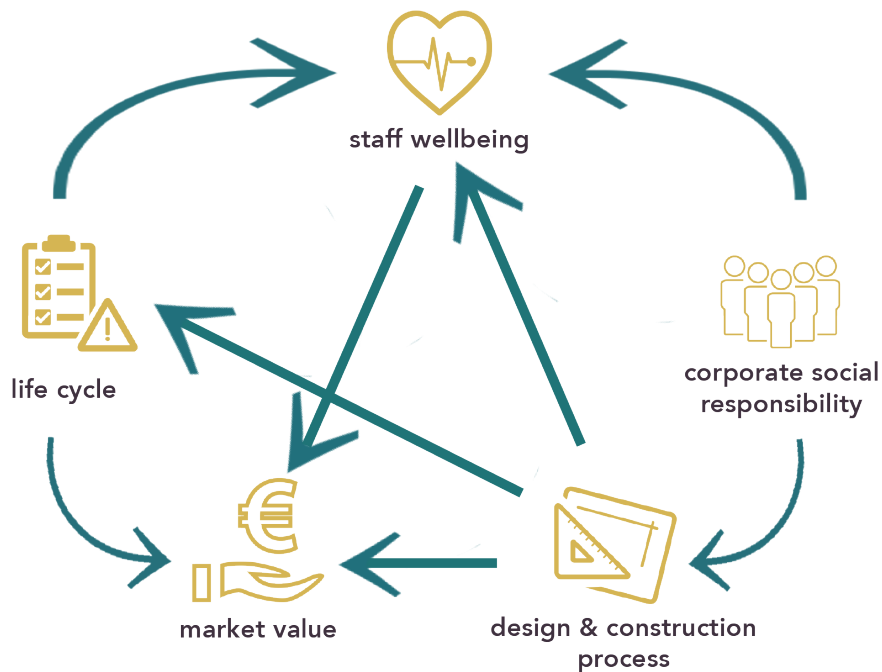
Figure 29 Relationships between sustainability clusters (own ill.)

In the literature some issues have been given more importance and space than others. It may be concluded that the impact of sustainability or energy- efficiency of a building on the market value and the rent level of a building seem to be the most vibrant issue and a lot of theoretical research has been done on the topic, mostly in form of hedonic pricing studies. However, as already discussed above, the findings of such researches vary. The staff wellbeing and corporate social responsibility also seem to be important issues to consider regarding sustainability as they are a lot discussed in recent articles; the problem with these concepts is that they are both very intangible and thus hard to quantify and measure. Overall, if looking at the People-Planet-Profit triangle, the academic focus regarding green offices is mostly on the economic value of sustainability, with additional focus on the environmental perspective (Figure 30).

Figure 30 Clusters and current academic focus placed in People-Planet-Profit triangle (own ill.)

The theoretical framework presented a review of various factors that are present in the development of sustainable offices. Such was done in general terms as the analysed researches were focused on various countries. One of the aims of the empirical research is thus to compare the outcomes of this theoretical review with the Prague context and see, if or to what extent does the national or local context influence the drivers and barriers for the sustainable office development.

The issue of sustainability in the Czech Republic is however in some ways not as developed as in the countries, in which the analysed researches were performed, although this situation has been changing in past years. Literature shows that a lack of a reliable and comprehensive assessment of green buildings specifically addressing Czech market has been a hurdle for further implementation of sustainability practices locally. The investors as well as financial institutions demand reassurance and justification of the value of green buildings in the local market, before putting their money in projects. In order to improve this issue, the Czech Green Building Council put together a multidisciplinary team, which prepared a cost study specific for the Czech Republic. The report was published in 2013 and is called "Costs, Benefits, and Values of Green Buildings". The study aimed to quantify short and long-term values of new green buildings compared to typical local practices (Czech Green Building Council, 2013). Moreover, as the issue of green offices has become more vibrant in the Czech Republic in past years, real estate agents as for example DTZ have published reports providing insights into the development of the Prague office market going green, proving that the issue has been discussed already several years ago (DTZ, 2011). The Prague context will be explained in the next chapter as an introduction to the empirical research.

Conceptual model

The vicious circle of blame was examined from all the various perspectives in the theoretical framework and finally leads to a conceptual model of this research. Very intertwined motivation drivers of all the stakeholders characterize the sustainable development of offices. The conceptual model (Figure 31) summarizes all the knowledge gathered in the problem definition and in the theoretical framework and serves as a basis for the empirical part of the research. All the sustainability factors have been clustered and attached to the concerned actors, to be able to see the connections among them. The sustainability clusters are presented in the conceptual model in form of icons. Moreover, the national context is assumed to have an influence on the importance of specific sustainability factors, thus the context of "public parties" is added to the conceptual model and will be further described in the introduction of the empirical research.
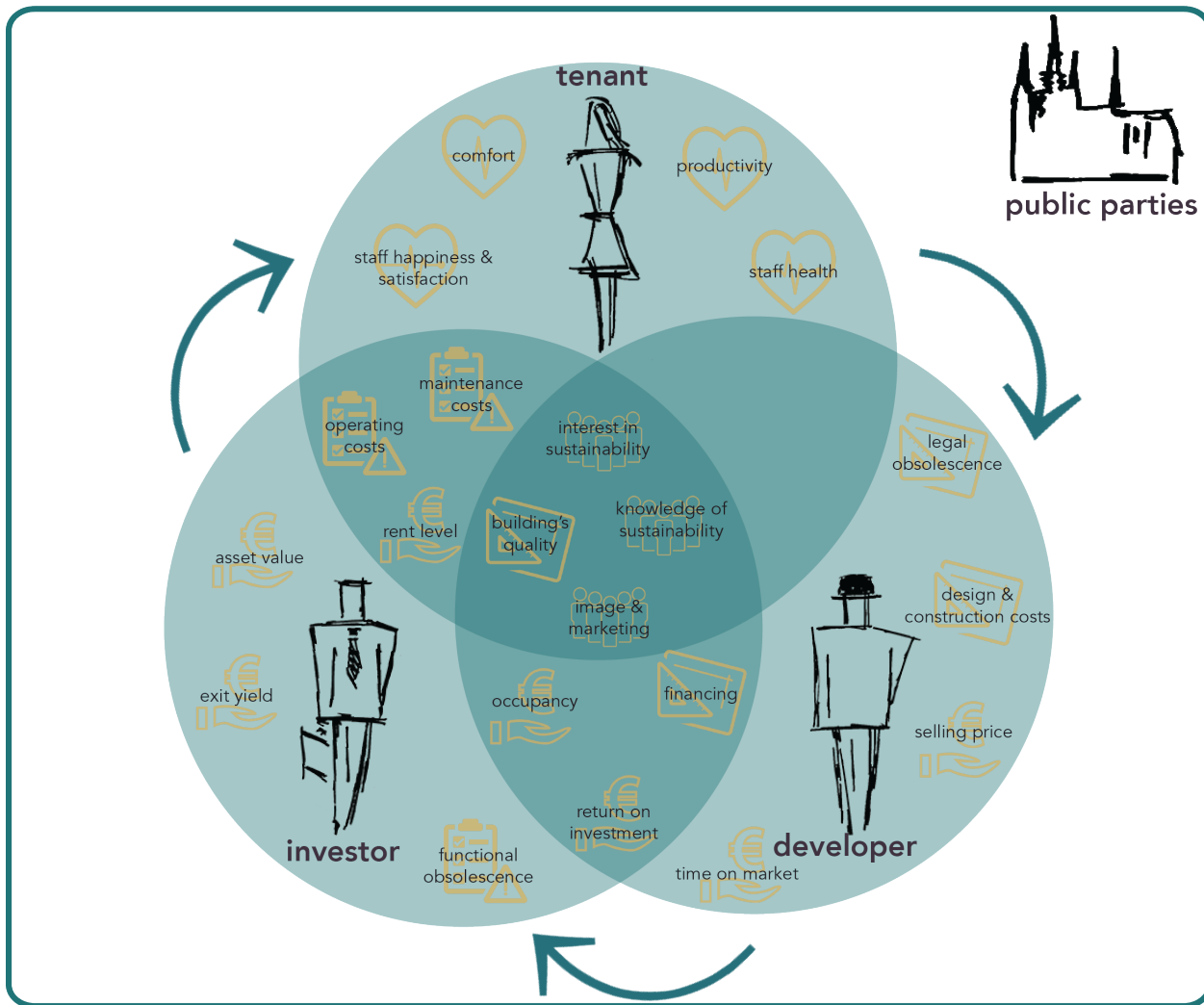
Figure 31 Conceptual model of this research (own ill.)

PART III
EMPIRICAL RESEARCH

CORSO COURT - LEED PLATINUM

CHAPTER 5
PRAGUE LOCAL CONTEXT

Chapter 5: Prague local context

In the previous chapter a theoretical overview of the drivers and barriers of the sustainable office development was presented. The empirical researches from the analysed articles took place in various countries, however a prevalent focus on the Western and Northern Europe together with the United States and Australia could be spotted. As the national context may be of influence on the drivers and barriers for the sustainable office development, the Prague context, in which the practical part of this research takes place, will be established in this chapter.

Sustainability visions and legislation

European Union

Over the past years, many national and regional governments in Europe have implemented policies leading towards sustainable development of buildings. Members of the European Union are currently following the Europe 2020 strategy, which has set climate goals that Europe as a whole should reach at the end of this decade: reduction of the greenhouse gas emissions of about 20% (or even 30% if the conditions are favourable) compared to year 1990, increase in the share of renewable sources of energy to 20% of the total supply, and reduce the energy demand of about 20% (European Commission, n.d.-b). Moreover, in order to tackle the question of the energy efficiency, regulations are being implemented in the European Union; namely the 2010 Energy Performance of Buildings Directive and the 2012 Energy Efficiency Directive being the EU's main legislation regarding reduction of energy consumption of new as well as renovated buildings (European Comission, n.d.). On top of that, calls for proposals in European funded programs as Horizon 2020 and FP7 have also been focused on the climate actions, sustainable/smart city development, resource efficiency, and so on (European Commission, n.a.-c, n.a.-d).

Based on international agreements and regulations of the European Union, municipalities of various European cities have designed their Sustainability Strategies or Sustainable Energy Action Plans (SEAPs). Such strategies usually promise decrease in carbon emissions and energy demand as well as using more renewable sources of energy (Covenant of Mayors, n.d.). However, municipalities and other public bodies have only limited resources and little power to turn these strategies into being; basically they are usually not the ones who at the end make the changes to the buildings and infrastructure. For green practices to be successfully adopted in real estate industry, a joined effort of the end-user (consumer), market players and the government (municipality) is required.

Regulations and visions in the Czech Republic

In the Czech Republic buildings stand for 65% of the total heat consumption and approximately half of the total electricity consumption (Průkaz na dům, n.d.). To address this issue and move further in the direction of sustainability, some major developments in policy interventions are already taking place in the country. However, based on the report of Baker & McKenzie (2016) "*Global Sustainable Building Index*", comparing different countries worldwide in their efforts towards sustainability, countries like Germany, the United Kingdom or the Netherlands by far overrun the Czech Republic in this regard, thanks to their on-going efforts in CO_2 reduction and renewable sources implementation. The summary of results, the countries' comparison, could be seen in Table 6, differentiating several categories according to countries' overall score in different parts of the research.

	Green Certification	EPC & MES	IGR	CO2 & Energy Targets	Renewable Energy	Regulation	Financing	Planning	Green Leases	Total	Rank	Band
Germany	2	1	2	1	1	1	1	1	2	12 (=)	1	
United Kingdom	2	1	3	2	1	1	1	1	1	13 (↓)	2	Category 1
Netherlands	2	1	1	1	2	2	1	2	2	14 (=)	3	
France	2	1	2	1	1	2	2	2	2	15 (↓)	4	
Italy	2	1	1	1	1	2	2	1	4	15 (↑)	4	
Belgium	2	1	1	1	3	2	2	2	2	16 (NEW)	5	
Singapore	1	1	1	2	4	3	4	1	1	18 (=)	6	Category 2
Spain	2	1	1	1	1	3	3	3	3	18 (=)	6	
Canada	2	1	3	2	1	2	3	3	1	18 (↑)	6	
United States	2	2	2	1	2	3	2	2	2	18 (=)	6	
Australia	2	3	2	3	2	3	2	2	1	20 (↑)	7	
Brazil	2	3	3	2	3	3	2	1	3	22 (↑)	8	
China	2	2	2	2	3	3	2	2	4	22 (=)	8	
Czech Republic	3	2	3	2	1	2	4	3	2	22 (↓)	8	
Sweden	2	1	4	2	1	2	3	4	3	22 (NEW)	8	Category 3
Ukraine	2	3	3	3	3	3	2	2	3	24 (NEW)	9	
Taiwan	2	3	3	3	2	3	4	1	4	25 (NEW)	10	
Hong Kong	2	1	4	2	4	4	4	3	3	27 (↑)	11	
Poland	2	2	4	3	3	4	4	2	3	27 (NEW)	11	
Russia	2	3	3	3	3	3	3	3	4	27 (NEW)	11	
Colombia	3	3	4	3	4	2	2	3	4	28 (NEW)	12	
Mexico	4	4	3	4	2	3	2	4	3	29 (↑)	13	
Malaysia	2	3	4	3	4	3	4	4	3	30 (NEW)	14	Category 4
United Arab Emirates	2	4	4	3	3	4	4	4	4	32 (=)	15	
Chile	3	4	4	4	4	4	4	4	4	35 (NEW)	16	

Table 6 Summary of results from report Global Sustainable Index, 2nd edition (Baker & McKenzie, 2016)

In accordance with the previously mentioned EU directive of Energy Performance, all EU members have to undertake an energy assessment of the building stock. However, the directive does not specify any levels of energy performance, these performance levels need to be determined by each country's national government (Bonde & Song, 2013).

Based on the European directive 2010/31/EU a new legislation regarding the energy demand of buildings was implemented in Czech law in assignation §6a of the law no. 406/2000 Sb., about the energy treatment. In 2009 the Ministry of Industry and Trade of the Czech Republic presented legislation about a compulsory certificate of the building's energy efficiency, which was further specified in 2013. It serves as a quantification of building's energy demand and rates the building on scale A-G (Figure 32). The certificate in its rating includes all energy needed for running the building, as for heating, hot water preparation, cooling, air conditioning, and lightning. It is necessary to obtain such certificate if a new building is being built, if an existing building is retrofitted, if a public body uses a building, or if a building (or its part) is being sold or rented (Ministry of Industry and Trade, 2014; tzb-info, n.d.). These efforts were also recognized in Baker & McKenzie (2016) report in the second column "Energy Performance Certificates & Minimum Energy Standards", where the Czech

Figure 32 Czech energy certificate for buildings PENB (Průkaz na dům, n.d.)

Republic scored rather high in the ranking. Regarding the commercial buildings, the demand for the energy certificate is summarized in the Table 7 (Průkaz na dům, n.d.-b).

commercial building	description	energy efficiency requirement	energy efficiency certificate	note
newly-built (category 1)	describes also construction increasing the calculated area of the building of more than 25%	cost-optimal level	yes, needed	equals approximately to low-energy standart
newly-built (category 2)	calculated area over 1500 m2 from 2018, over 350 m2 from 2019 and from 2020 all buildings	almost zero energy demand	yes	highly efficient building with a possibility to use renewable sources to (partially) cover the energy demand
retrofit	construction not increasing the calculated area of more than 25%	cost-optimal level for the new parts or for the whole building (based on the decision of the developer)	yes, if more than 25% of the facade is renovated and no certificate has yet been done	there is no requirement regarding the size of the retrofit, however requirements regarding the retrofited parts
sale (category 1)	sale of the whole building	none	yes, the energy rating must also be visible in the advertising of the building	
sale (category 2)	sale of an office unit or a floor (sale after 1.4.2013)	none	yes, the energy rating must also be visible in the advertising of the building	only energy certificate for the whole building must be done, such is then used for the separate floors
lease (category 1)	lease of the whole building	none	yes, the energy rating must also be visible in the advertising of the building	
lease (category 2)	lease of an office unit or a floor (new lease)	none	yes, the owner of the office is obliged to provide the agent the graphical part of the certificate	in case of no certificate for the building, the energy consumption of the last 3 years is possible to show instead
lease (category 3)	lease of an office unit or a floor (new lease from 2016)	none	yes, the owner of the office is obliged to provide the agent the graphical part of the certificate, the energy rating must also be visible in the advertising	every office building must have the energy certificate made (see description of the 2nd category of newly built)
no changes				if the building has a boiler over 20kWh or air conditioning unit over 12 kW, regular checks must be done

Table 7 Energy requirements for commercial buildings in the Czech legislation (Průkaz na dům, n.d.)

Apart from the Czech binding legislation, there are voluntary initiatives striving for the building's energy efficiency and/or overall sustainability of buildings. In case of the office buildings, energy certificates such as LEED or BREEAM are often used in Prague and the rest of the country (Czech Green Building Council, 2016a). Moreover, programs and strategies of some cities or their districts start to slowly occur. However, regarding the previously mentioned Covenant of Mayors, only 6 cities in the whole Czech Republic has so far joined the initiative, from which only one of them, Ostrava, has more than 100 000 inhabitants (Covenant of Mayors, 2015).

Regarding the environmental certifications, the first column of Table 6 named "green certification" is of importance. It evaluates whether a certification occurs in a country, is nationally adopted, recognized by industry, and perhaps even mandatory for all new and refurbished buildings. The Czech Republic scored 3 in this part of survey, which belongs to the bottom part of the ranking; a space for improvement in sense of adapting a certain certification to local context (as for example BREEAM NL, adoption of BREEAM certificate in the Netherlands), which will be then widely used in the market, is apparent (Baker & McKenzie, 2016). Although, it is questionable whether it is truly desirable to have a nationally specified certification, because it is uncertain whether it could keep up with the speed of the development in the field of sustainability and could successfully respond to changing circumstances as flexibly as already well established international certification schemes.

Sustainable strategies in the city of Prague

Prague has its general Strategic Plan from year 2000 and currently a new updated version is being formulated by changing the last version from 2010. The Strategic Plan is being developed by the Prague Institute of Planning and Development (IPR), a body representing the city in spatial planning matters and existing under the Municipality of Prague (IPR Praha, n.d.-b). In regard to the energy efficiency, Prague does not currently follow other European capitals in creation of a Sustainability Energy Action Plan as part of EU Covenant of Mayors or any other local Sustainability Agenda (V. Žabka, personal communication, 18 December 2015).

In the on-going proposal for the new Strategic Plan, several articles are bound to the issue of sustainability: 1.3 Beautiful city (Krásné město), 1.4 Healthy city (Zdravé město), 1.5 Sustainable mobility (Udržitelná mobilita) and 3.3 Efficiency and resilience (Úspornost a odolnost). The last mentioned article called "Prague is saving the resources and improving the durability of the city" describes Prague interventions in energy efficiency of buildings as prescribed by the European Directive. However, these public interventions are mostly described on the building level, such as renovations of the public buildings, municipal buildings, buildings belonging to public transportation or public lightning; the discussion does not comprise big urban interventions or changes in the energy systems as it could have been expected from such a public body (IPR Praha, 2015). The Prague municipality believes that by turning some of the buildings in Prague owned by the municipality into energy efficient or passive ones, it will provide pilot examples for the direction of the future sustainable development also for the private developers. Several buildings were already appointed for such retrofit as for example the new building of the Prague magistrate or the seat of the Prague Institute of Planning and Development. In 2015 the needed finance was secured from the "Operation program Prague" and the plans should be executed by 2022 (M. Vácha, personal communication, 25 September 2015; V. Žabka, personal communication, 18 December 2015).

In September 2016 Arcadis introduced their report called Sustainable Cities Index, in which they rated 100 of the world's leading cities based on three dimensions or pillars of sustainability: People, Planet and Profit. These represent social, environmental and economic sustainability to indicate a picture of the health and wealth of today's cities. The cities that were ranked as the top ones in this regard were Zurich, Singapore and Stockholm. Prague ranked surprisingly high in this ranking, reaching 9th position, the best one from all cities in the Eastern Europe. In the Profit category it reached to 7th place, in People category even to 6th place; such great results were however worsened by 31st place in the Planet category (Figure 33) (Arcadis, 2016). This was rather disappointing news for the Prague's municipality and the Institute of Planning and Development, as they believed that there had been a noticeable progress in this matter in past years (L. Makovský, personal communication, 6 October 2016). This could be explained by a fact that areas as energy, air pollution, green house gas emissions or waste management, evaluated in the Sustainable Cities Index, are in Prague overlooked, with bigger focus on "traditional" aspects of environmental sustainability such as amount of greenery.

Figure 33 Prague's ranking in Sustainable Cities Index 2016 (Arcadis, 2016)

It is visible that in question of strategic planning there are still a lot of issues to be improved in Prague in order to keep up with the Western European cities. In a research of Deloitte (2016) 153 respondents consisting of experts in the field were asked to reflect on the strategic planning of Prague. According to their findings, not only the city of Prague, but also the national government, does not facilitate well the development of the built industry in the country. The policy framework is not found to be clear and understandable and the permitting process is seen as very complex, which makes it very difficult to operate in the market. Regarding the city of Prague, 98% of the respondents agreed to the fact, that Prague is currently missing a long-term strategic vision for its future development. This will hopefully change with the completion of the Metropolitan plan (a new land use plan for the city) in 2022 (Boháč et al., 2016, April). Furthermore, unstable political environment in the Prague magistrate does also hinder the improvement of this situation (Deloitte, 2016).

A similar not that positive situation is also visible regarding any sustainability strategy of Prague, which is currently almost non-existent. However, Prague seems to be aware of this situation and in recent years has shown efforts to be part of projects implementing sustainability in the city. For example in 2014 a European funded program Triangulum, part of Horizon 2020 calls of European Commission, started in which Prague takes place as one of the following cities. That means that Prague will in the horizon of next 3 years follow a strategic development of urban districts in Manchester, Eindhoven and Stavanger and transforming these districts into environmentally sustainable city parts. Based on this knowledge Prague will subsequently develop its own plan for one of the problematic areas in the inner city of Prague (IPR Praha, 2015b). The participation of Prague in the Triangulum project is a very big step forward, because until now the Czech Republic has not really participated in similar consortium-based European projects yet. In the next phase Prague should become a lighthouse city and implement the program prepared in Triangulum (V. Žabka, personal communication, 18 December 2015).

Other projects in Prague have focused on the topic of sustainability, are for example Urban Heat Island researching possibilities of reducing the city heat island, or Urban Adapt implementing plans prepared in Urban Heat Island (IPR Praha, n.d.-c, n.d.-d). The visions and strategies developed in these programs are subsequently projected into the Strategic Plan. As the international awareness of Prague as a city newly participating in the European projects rises, quite many offers have come asking for Prague's participation in various European projects. This is also caused by a good international reputation of Prague. IPR is thus currently planning to develop a conceptual framework for the future projects, based on which it will be selecting new projects for participation (V. Žabka, personal communication, 18 December 2015).

Prague office market

From 1990 until 2015

The Czech Republic, lying on the border of area of former Soviet regime had to face stormy overall transformation in 1990's from socialism and plan economy to capitalism and market economy; since then the country together with other Central and Eastern European countries slowly inclined to development, which had been natural for Western Europe for decades. In 2015 a country with a GDP of 29 805,33 USD per capita, with an annual growth of 4,4% shows a stable market, using its advantage of being the most western country of the Eastern Europe (Figure 34) (Cushman & Wakefield, 2016; Trading Economics, 2015). The Czech economy is one of the best performers in the EU, with consumer spending and investment growth accelerating strongly throughout 2015, boosted by low inflation and monetary policies (Cushman & Wakefield, 2016).

Prague, the capital city of the Czech Republic with more than 1,2 million inhabitants, has been an important city since medieval times. Among the cities of the Czech Republic, Prague has a very unique position; in general the Prague market is on higher level than in any other city in the Czech Republic. This is well known

by foreign companies, which mostly focus their market in Prague if they like to approach the country; especially a lot of service companies obtain their offices in Prague (Cushman & Wakefield, 2015; Praha.cz, n.d.).

Economic activity
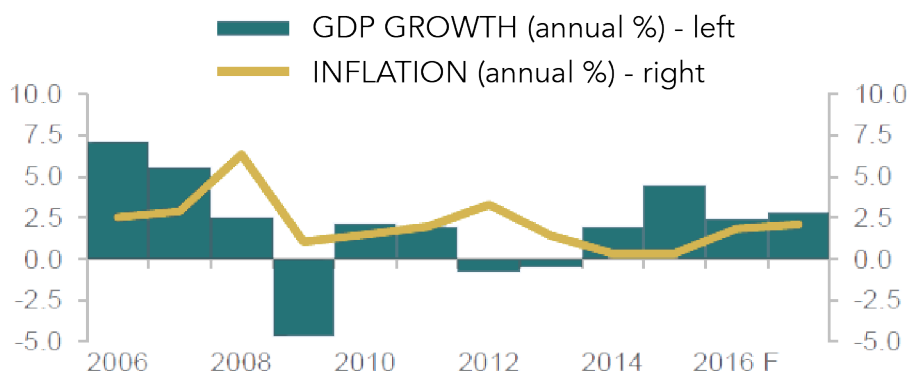
Figure 34 Economic activity in the Czech Republic (Cushman & Wakefield, 2016)

The office market in Prague has since its origin after 1989 gone through several epochs and stabilized in past few years. During this development a decentralization of the offices has been visible and several "business hubs" grew around the historical core. These new complexes with high capacity influenced the market by setting up the rent values and by the newly emerging amenities in the areas made the locations more attractive (Němec, 2009). Developments in these locations are still visible nowadays, new office buildings are being built around the city centre, mostly in "business hubs" as Pankrác (Prague 4), Karlín (Prague 8) or Smíchov (Prague 5) (JLL, 2016). However, after a post-crisis record of new supply of office space in 2015, in 2016 only 55 000 sqm is expected to be delivered, which marks an end to the current construction boom in Prague (DTZ, 2015).

Prague office market nowadays

The office development in Prague has been gradually increasing in past few years with the year 2015 valued as the most successful one from the financial crisis, where total annual take up reached 385 000 square metres. The development activity in the city has been positive in recent years, with some 200 000 square metres newly entering the market in 2015, following on high activity in 2014. Due to this large volume of newly-built office space, the vacancy remains quite high, reaching 17% in Q1/2015 and falling slightly to 14,6% in Q4 (Knight Frank, 2016).

At the end of December 2015 there are 3,22 million square meters of office space in Prague. A-class properties represent approximately 69% of the total modern office stock and 31% are B class properties, top quality AAA class offices represent 13% of the total stock (Best communications, 2016; Štrompf, 2015). In Q4/2015 average vacancy rates in Prague continued to decrease, dropping by 1,8% quarter on quarter to 14,6% by year end. The highest vacancy rates were recorded in Prague 7 of 32,7%, the lowest vacancy was recorded in Prague 8 at 11,1%. The rents within the city fluctuate in between 18,50 and 19,50 EUR/sqm/month in the city centre, from 15 to 16,50 EUR/sqm/month in the inner city and from 13 to 14,5 EUR/sqm/month in the outer city (Best communications, 2016; DTZ, 2015).

Supported by a strong macroeconomic growth in the Czech Republic in 2015, commercial investment in Prague totalled just over 1,4 billion euros. The office sector was the most active throughout the year, taking 43% of the market share, with transactions in Prague rounding up to 618 million euros. Although investment sentiment remains positive due to the strong occupational market, low levels of investment stock in the office market, especially in the central districts, continue to hinder investment activity. Cross-border investment accounted for 56% of the total office volumes in the city, with German investors (such as German fund Union Investment) being most active. The strong investor demand for office buildings

Figure 35 Office hubs and vacancy in the city of Prague (own ill. based on Best communications, 2016)

in Prague led to hardening prime yields, which are now at level of 5,0% (Knight Frank, 2016). The development of the Prague office market is summarized in Figure 36.

The reason why some developers and investors may prefer investing in the Prague office market rather than in other European cities is that the construction costs in Prague are quite low. Prague together with Warsaw is considered to be the most developed office market in Central Eastern Europe and the demand thus remains quite high. Big corporations tend to move to the newly-built modern buildings within the city and leave behind vacancy in slightly obsolete however still rather modern buildings (Colliers International, 2015; Štrompf, 2015). This is visible in the example of the biggest rented space in 2015 being the telecommunication company O2, which rented 29 600 square metres in the newly-built BB Centrum Gamma in Prague 4 (Knight Frank, 2016). With this demand focused on new modern spaces, many owners of office space with higher vacancy are forced to invest into refurbishment in order to remain competitive and desirable for occupiers (Cushman & Wakefield, 2015).
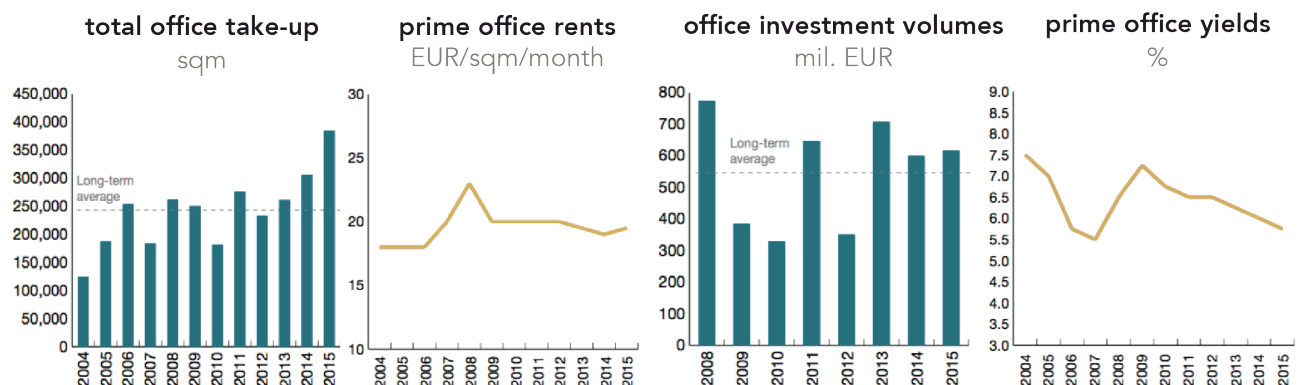
Figure 36 Office market development in the city of Prague (Knight Frank, 2016)

Green certifications

In the Czech Republic, several third-party certifications have been introduced around year 2008 and since then a number of the certified buildings have been increasing every year, especially in the office sector (Figure 37). Most of these newly-built office buildings really put a lot of importance in their "sustainable image" and thus pursue LEED, BREEAM or similar certificates. The number of such certifications has been recently increasing, by far the highest percentage being office buildings in Prague (Czech Green Building Council, 2016b; Šance pro budovy, 2015). Next to the mentioned BREEAM and LEED, which remain the most often used certifications in the Czech Republic, other certificates as SBToolCZ or DGNB are used. SBToolCZ is a local version of the international SBTool, edited to comply with the Czech norms and laws (Czech Green Building Council, n.d.). DGNB is another similar tool, developed by the German Sustainable Building Council (DGNB, n.d.). The database of most of the certified buildings in the Czech Republic is accessible through the website of Czech Green Building Council (Czech Green Building Council, 2016a).
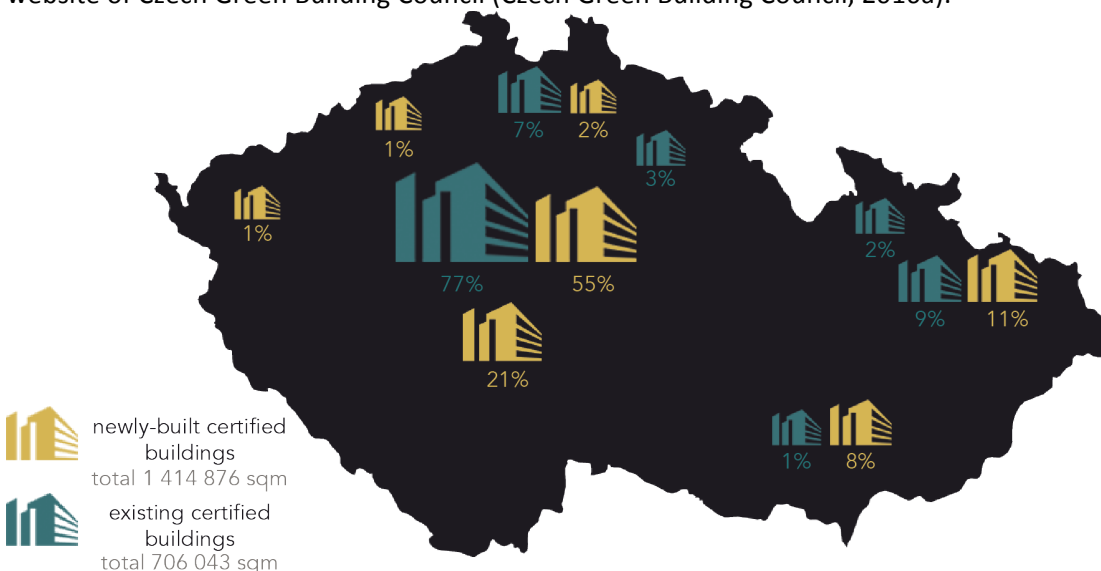
Figure 37 Certified newly-built and existing buildings in the Czech Republic by 2015 (own ill. based on CZGBC, 2016)

The numbers of different types of certificates in the Czech Republic as of October 2016 are:
- BREEAM New Construction: 75 certificates
- BREEAM In-Use: 69 certificates
- LEED Building Design and Construction: 35 certificates
- LEED Building Operations and Maintenance: 5 certificates
- DGNB: 1 certificate

In most cases these energy and sustainability labels are of interest of foreign developers or investors developing big office complexes in Prague, which are again meant for foreign tenants. These tenants are used to high quality of indoor climate, building design, low operation costs and also location with good accessibility (Denešová, 2013). Therefore, regarding the sustainable office development in Prague, the private parties seem rather dominant and leading compared to governmental bodies as the Municipality of Prague (P. Hajná, personal communication, 20 October 2015).

Possibilities of office retrofit

Retrofit of existing office buildings has many challenges and opportunities. The main challenge while considering retrofit is the presence of many uncertainties, which affect the selection of retrofit technologies

and hence the success of a retrofit project. Another challenge is the willingness to pay for retrofits from the position of the building owners, especially if they are not the occupants of the space. The cost of retrofit is thus often the key factor, although it is not completely sure, whether costs of retrofit are lower than costs of building new (Tan et al., 2015). The same is true for the sustainability discussion. The motivation to build green office buildings come from the willingness to pay from the tenant in form of rent and from the investor in form of asset price, who will not pay more if they do not see the advantages of the sustainability in the building.

Currently not many examples of office refurbishment into A-class offices are happening in Prague, however some exceptions are of course visible as office of Economia in Prague 8 in 2013 (Kratochvíl, 2013). However, the refurbishment of existing offices entails a huge potential, mostly due to excellent location of some offices built in 1980's and 1990's in the city centre. Of course, the situation varies case from case, as stated in the problem definition a lot depends also on the construction of the building: the use of columns as bearing structure offers much more flexibility and potential for future adaptive use than wall structures (V. Matoušek, personal communication, 16 December 2015).

Some available office buildings in Prague show visible signs of obsolescence and thus their asset price is not that high as for new buildings. The potential refurbishment thus promises to significantly increase the value of the buildings and moreover, such buildings usually have already some tenants inside and thus the on-going rent generates cash flow for the developer. Another reason why refurbishing may be favourable is the current long-lasting process of receiving permits; usually the whole procedure takes about 7 to 8 years. The permit process for refurbishment is much easier and thus doesn't take that much time (V. Matoušek, personal communication, 16 December 2016). The potential barrier of the refurbishments is the need to find a specific investor, who is not afraid of the possible uncertainties and slightly adjusted process.

Scope interview findings

The following section is divided into three parts based on the three researched perspectives: developer, investor and tenant. Each part presents the related findings gathered from the scope interviews. Several first remarks were made leading to hypotheses, which will be tested in the expert panels in the practical research. Thus the information presented here cannot be seen as final and will be edited based on the results gathered later in this research.

Developer

While building new office buildings nowadays in Prague, a certification, whether it is LEED or BREEAM, is basically a "must have". However, a question of what value does this certification actually have, could be raised. Most of the office buildings built today is of such a good overall quality, that achieving level of LEED Gold has became a standard and the developer does not really have to do much extra effort except the paperwork connected with the certification to receive the certificate. LEED Silver buildings are not even being built and if so, not being certified; LEED Silver is not really perceived as any value. The only level of certification that really matters are the top levels of the certifications, the LEED Platinum or BREEAM Outstanding. Regarding the construction costs of the buildings, and average of 3-3,5% increase in construction costs is estimated for the LEED Platinum, however, such could be received back in form of better marketing of the building.

A barrier for the development of green buildings in Prague is the long permit process, which for a project may take up to 8 years. When the building is permitted and could finally be built, the technologies designed in the building are already out-dated and not the most efficient on the market. Such bureaucratical obstacles thus hinder the speed of the innovation and the development of sustainable buildings in the Czech Republic.

In case of City Green Court, one of the most sustainable office buildings in Prague and the first one achieving a LEED Platinum certificate, the opinion of its developer is, that the sustainable nature of the building helped to fill up the building with tenants quicker and differentiated itself from the competing supply and thus allowed to sell the building already before the end of the construction. Such brought cash flow for the developer early in the process, and the money could be then used in other projects.

Investor

For the investors operating in the Prague market, the certification of a building is an important aspect. Currently almost all the new buildings that are being built have achieved or aim for some level of certification; 85% of projects under construction are pre-certified or applying for it. For the investors such buildings are interesting as they represent a lower risk and higher competitiveness. Also financing banks consider conventional buildings difficult to lease in a long run and therefore as riskier asset.

Investors do feel that they will lease the building quicker, if it has some level of certification, but the influence on keeping the existing tenants due to the certification cannot be yet confirmed due to immaturity of the Prague market. Moreover, investors do not differentiate between various certifications, but do differentiate between various levels of certifications as they try to target the highest levels of certifications possible.

Tenant

In the Czech Republic, however, the impact of the sustainable labels cannot be yet directly projected into the rent increase or higher asset value. This is due to a fact that the tenants in their considerations about their future office do not really calculate with lower operating costs, do not look at the benefits of green buildings in long term. Moreover, compared to the high expenses of the company on the manpower, the employees' salaries, the operational costs of the office does not account for a big part of the overall expenses of the company and thus savings in this matter do not play that important role. The focus is mainly on the rent per square meter and the location, the sustainability is an added value to the building, which may persuade the tenants to choose the particular building. The location still is and most likely will still be the number 1 decision factor for the tenant.

The other factors playing role in the decision making are the architecture of a building, the layout and organisation of the inner spaces within the building, and also the discussed sustainability; however such is important for only a few international companies who have the importance of the sustainable office prescribed in their internal regulations.

CHAPTER 6
INTRODUCING
THE EMPIRICAL RESEARCH

Chapter 6: Introducing the empirical research

The theoretical research presented in Part 2 together with the information gathered through several scope interviews led to the definition of the empirical part of this research. The set up of the empirical research, the performed Delphi method and the semi-structured interviews, will be explained here.

Delphi process

The Delphi method, used in the empirical part of this research, is used when the consensus among the group of respondents (so-called experts) is seeked for. Essentially it consists of series of questionnaires and/or interviews in several rounds, in between the rounds a feedback is provided to the respondents (Hsu & Sandford, 2007).

Delphi organisation

Hypothetically, the Delphi process can be continuously iterated until the desired degree of consensus among respondents is achieved (Hsu & Sandford, 2007). However, usually a Delphi research consists of two to four rounds of questions, the number of rounds depends on the tested data; whether the research starts with open questions or with a list of issues (Hasson et al., 2000; Jones, as cited in Koppels et al., 2007). Traditionally the first round of the Delphi consists of open-ended questionnaires, allowing the respondents to elaborate on the investigated topic, serving as a way of cumulating specific information about the content area from the respondents. The outcome is then converted into well-structured questionnaire used in the second round of Delphi. However, it is also commonly acceptable to use a structured questionnaire already in round 1 if it is based on previous extensive literature review, in which the basic information on the issue is gathered (Hsu & Sandford, 2007; Rowe, as cited in Koppels et al., 2007). The second 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 panel session with each participant started by introduction of the research and its aim, explaining the theoretical framework, the "sustainability factors scheme" (conceptual model) and the research method. After the introduction, the respondent was asked to proceed to the ranking of sustainability factors. The first round was concluded with a semi-structured interview.

The first part of the research consists of ranking the importance of sustainability factors (Figure 38). As the research tries to take perspective of three different actors within the sector, the respondents were asked to take position of each of these actors and rank the factors according to this (imagined) position. Thus the ranking of the sustainability factors was done in three rounds, from three different viewpoints, in each round only the factors concerning the particular actor were evaluated. Of course as seen from the conceptual model, some factors are valid for more than one actor. An overview of all rated sustainability factors could be seen in Table 8.

The questions the respondents were asked differed slightly depending on the viewpoint taken:
- Developer: What are the most important decision-making factors for the developer to build a (sustainable) office building?
- Investor: What are the most important decision-making factors for the investor to invest in a (sustainable) office building?

- Tenant: What are the most important decision-making factors for the tenant to rent an office in a (sustainable) office building?

For that, cards with the sustainability factors and the explanation of the term were created in which both Czech term as well as English translation were included, because some of the terms are used more in the international English version even in the Czech Republic. The respondent then had a chance to think and rethink the order of importance of the factors while moving the cards on the table. Once the respondent made his or her mind about the order, the ranking was reported.

Figure 38 Example card sustainability factors (own ill.)

The second round of ranking adjustment took place in June and July 2016 and was performed by e-mail. The respondents, who in the first round participated in the ranking of the sustainability factors, were informed by a small description and a form created in Google Form website, where the results of the first round were presented. These 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.

Panel composition

The selection of subjects is a very important part of the Delphi study as the appropriateness of the subject and respondents` enthusiasm to participate throughout the process directly relate to the quality of the results (Judd, Taylor & Judd, Jacobs, as cited in Hsu & Sandford, 2007). The selection of experts is largely dependent on the disciplinary area of expertise required by the specific issue (Hsu & Sandford, 2007). Another important aspect to consider is the size of the panel, which however varies according to the scope and resources available (Delbecq, as cited in Koppels et al., 2007). Murphy et al. (as cited in Koppels et al. 2007) suggests that more participants the better, as with the increasing number of experts the reliability of the results increases; however, connected drawbacks are inherent within this technique as potentially low response rate and devotion of large block of time throughout the execution, become apparent. In general, theory recommends a Delphi panel size ranging from 10 to 18 experts producing a reliable data (Okoli & Pawlowski, 2004).

For this study the experts were expected to have significant knowledge about the office market in Prague and the development of sustainability within this market. The expert panel builds up on the conceptual model, which was presented and in detail analysed in the theoretical framework, describing the overlapping sustainability factors for each of the actors; tenants, developers and investors.

As described already in the research methodology section, a snowball sampling together with opportunistic sampling methods were used. Overall thirteen interviews were performed from which elevn took part in the ranking of the sustainability factors. The two remaining interviews were focused on the topic in more general terms, therefore the ranking part did not fit in the content of the interview. The participating respondents were selected as representatives of different groups within the commercial real estate sector in Prague. These are developers, sustainability experts, investors, real estate agents etc. The list of the interviewees could be seen in Table 9.

cluster	sustainability factor	Czech translation	description	developer	investor	tenant
corporate social responsibility	interest in sustainability	zájem o trvale udržitelný rozvoj	Because the aim of market parties is the financial profit, which may not be directly visible in the issue of sustainable buildings, the interest in the sustainable development may be diminished.	✓	✓	✓
	image & marketing	image & marketing	Environmental certification of office buildings is today used by developers and investors mostly as a part of marketing to attract tenants. For the tenant to have an office in a certified office building may help to improve his image among his (potential) clients and business partners	✓	✓	✓
	knowledge of sustainability	znalost problematiky trvale udržitelného rozvoje	Unsatisfactory knowledge of the issue of sustainability may be a barrier in the development of sustainable buildings.	✓	✓	✓
design & construction process	design & construction costs	cena návrhu a výstavby	There is an increase in the design and costruction costs when developing an office building certified with the top levels of LEED or BREEAM certifications.	✓		
	building's quality	kvalita budovy	While certifying a sustainable building, an importance is also given to aspects as location, architecture, functionality and used technologies. The overall quality of a sustainable building may thus increase.	✓		
	financing	financování projektu	It is possible that developer or investor receives easier or higher financial means for the development or purchase of sustainable office building, because the investment into a sustainable building is seen as less risky.	✓	✓	
	legal obsolescence	právní záležitosti a povolení	Too slow permit process may be a barrier in the implementation of sustainable buildings as at the moment the permit is obtained, designed technologies in the building may be partially obsolete.	✓		
market value	return on investment	návratnost investice	Assuming that the market value of a sustainable building is higher and that the design and construction costs are comparable to common building, the return on investment increases.	✓	✓	
	time on market	doba prodeje	Some developers believe that a certified building is easier to sell; it is more attractive to investors. Whether this statement is true due to sustainable or other aspects of the building (e.g. architecture, location) is unsure.	✓		
	occupancy	obsazenost budovy	Some developers believe that a certified building is easier to lease; it is more attractive to tenants. Whether this statement is true due to sustainable or other aspects of the building (e.g. architecture, location) is unsure.	✓		✓
	rent level	výše nájmu	Some researches show, that the rent level of a sustainable building is higher than of a comparable common building. It is however questionable, to what extent it is possible to extract the "sustainable aspects" of a building from other important aspects such as location or architecture.		✓	✓
	asset value	hodnota budovy	Some researches show, that the asset value of a sustainable building is higher than of a comparable common building. It is however questionable, to what extent it is possible to extract the "sustainable aspects" of a building from other important aspects such as location or architecture.		✓	✓
	selling price	prodejní cena budovy	Due to the fact that design and construction costs are usually higher when developing a sustainable building, the investment is advantageous for a developer when these higher costs are reflected in the selling price of the building.	✓		
	exit yield	exit yield	Due to the fact that an investment into sustainable buildings may be seen as less risky, the exit yield used for obtaining net present value of the investment may be lower.		✓	
life cycle	functional obsolescence	funkční zastaralost budovy	In sustainable buildings focus is also put on flexibility, long life-span and a possibility to adapt the building to a new function.		✓	
	maintenance costs	náklady na údržbu	In sustainable buildings new more reliable technologies are often used; these require less maintenance. The maintenance costs thus decrease.		✓	✓
	operating costs	provozní náklady	An important aspect of sustainable buildings is lower energy demand, thus lower operating costs. However, a split-incentive problem plays a role in this regard; better technologies used in a building are financed by developer, whereas the benefits are received by tenant.		✓	✓
staff wellbeing	staff happiness & satisfaction	spokojenost personálu	Some researches show, that the staff is more satisfied in sustainable buildings. This factor, although very important for any company, is however very difficult to prove directly.			✓
	productivity	produktivita práce	Some researches show, that in sustainable buildings thanks to better indoor climate the productivity of employees rises. This factor, although very important for any company, is however very difficult to prove directly.			✓
	comfort	vnitřní komfort	It is assumed, that better indoor quality together with the workspace design increase the comfort for the occupier of a sustainable building.			✓
	staff health	zdraví personálu	Some researches show, that in sustainable buildings thanks to better indoor climate the staff health is improved. This factor is very important for most of the companies as the staff expenses are the highest expenses of a company.			✓

Table 8 Overview of all rated sustainability factors (own ill.)

Disciplines	category	Delphi	interview
developer	developer	3	3
developer-investor	investor	1	1
real estate agent	tenant	3	3
contractor	developer	1	1
development/construction consultant	developer	1	2
not-profit organisation	tenant	1	1
academia	-	0	1
energy auditor	-	1	1
Total number of experts	-	11	13

Table 9 Expert panel composition (own ill.)

Desired degree of consensus

Before the panel was interviewed, a required degree of consensus needed to be defined. The measure of consensus achieved can be described by Kendall coefficient of concordance, W. It measures the degree of association among k sets of ranking; in this case the degree of consensus within the expert panel regarding the perspectives of developer, investor and tenant. The Kendall W can take values between 0 and 1, while the value of 0,7 and higher is considered as strong agreement and the ranking is considered to be of high confidence (Schmidt, as cited in Koppels et al. 2007). This Kendal W= 0,7 is thus taken as a desired degree of consensus to be reached in the panels (Table 10).

Kendall W	interpretation	confidence in ranks
0,1	very weak agreement	none
0,3	weak agreement	low
0,5	moderate agreement	fair
0,7	strong agreement	high
0,9	unusually strong agreement	very high
1	complete agreement	very high

Table 10 Interpretation of Kendall coefficient of concordance W (Koppels et al., 2007)

Semi-structured interviews

The subsequent semi-structured interviews were based on the rankings done in the first round and were built up on the reasons why the respondents gave various level of importance to different terms. As was explained in the theoretical framework, it is very hard to distinguish pure drivers and pure barriers while discussing the sustainability factors of green offices. The paradoxes and connections were thus further explored in the semi-structured interviews as well as which of the sustainability factors were perceived by the respondents more as drivers towards sustainability and which were perceived more as barriers against implementing sustainability.

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. More concrete questions about the respondents' company, their position, their predictions of the future development of the sector, etc. were asked. Moreover, the topic of building retrofit was mentioned.

The description of different expertise of respondents follows in the report, with focus on the Prague office market.

Tenant perspective

The semi-structured interviews with several real estate agents operating in the Prague office market were done. Through these

Figure 39 Interior of Corso Court office building, certified LEED Platinum, in which two of the interviews took place (own ill.)

interviews, the development of the green office market in Prague was examined as well as behaviour of the tenants in practice.

Hereby questions for semi-structured interview for experts of the tenant's perspective:
- What are the main decision making aspects regarding moving into a new office? What role does in this decision making the building's sustainability play, e.g. building owns an environmental certificate?
- How do the tenants perceive different levels of environmental certification?

Investor perspective

The interviews with experts on the investments in the Prague office market were aimed to be organized in order to find out the importance of having certificated office buildings in their portfolio, as well as investors' driver and motives to buy and own green office buildings.

Hereby questions for semi-structured interview for experts of the investor's perspective:
- What are the main decision making aspects regarding investing into a new office building? What role does in this decision making the building's sustainability play, e.g. building owns an environmental certificate?
- How is the sustainability nature of the building reflected in the market value and the rent level compared to the common office building (provided that other aspects are same)?
- How do the investors perceive different levels of environmental certification?

Developer perspective

Through such interviews, the drivers and motives of the developers to build green office buildings were examined, together with the behaviour of the developers in practice. Moreover, questions regarding barriers of building sustainable office buildings or to (sustainably) retrofit the already existing office buildings were asked.

Hereby questions for semi-structured interview for experts of the developer's perspective:

- What are the main decision making aspects regarding building a new office building? What role does in this decision making the building's sustainability play, e.g. building achieving an environmental certificate?
- What is the difference between the design and construction price for a green office building compare to a common one? How is this price different regarding different levels of certification? Is this price differentiation reflected into a higher asset value of the building or in higher rent level?
- What is the current trend on the Prague market regarding building's retrofit? What are the main drivers and barriers towards retrofitting in Prague? Is retrofit seen as sustainable?

General perspective

Some interviewees such as members of the Czech Green Building Council or academia are considered to have general overview on the problem area. Thus the interviews with these people were led in broader terms, exploring the market development as a whole.

The following general questions were asked to all the respondents, no matter the expertise:

- What is in your opinion an overall perception on sustainability in the Prague office market? How has this notion evolved in recent years and how does it differ from other countries?
- What are the main obstacles against implementing sustainable solutions in the Prague office market? How do these differ for the residential market?
- What role does the Czech and Prague legislation play in the field of the sustainable built environment?
- What role does education play in the field of the sustainable built environment?
- How may the perception on sustainability in the Prague office market change in the upcoming years? Which of the actors (developer, investor, tenant) play the most important role in this matter and why?

CHAPTER 7
FINDINGS

Chapter 7: Findings

Importance of sustainability factors: Delphi findings

Quantitative data analysis

The aim of the quantitative part of the research was to determine the value of importance of each of the predefined sustainability factors in the current office market in Prague. A Delphi method was used, the panel members were asked to make separate rankings from each of the three selected perspectives: developer, investor, and tenant.

In total two rounds of Delphi were performed: first a face-to-face round combined with semi-structured interviews and then a second round done via e-mail. After collecting the first round rankings of all panellists an analysis was performed using programs Microsoft Excel and SPSS Statistics 22, where several datasets summarizing the rankings from each of the researched perspectives were created and separate analyses were then performed on each of the data sets. All the ranks were defined as ordinal variables, because both the categories and the ordering are present in the variables, however the differences between the achieved values are unknown (Field, 2009, p. 9).

In order to obtain the results of the first round, mean, median, range and standard deviation per each factor were calculated. Doing so, the average rankings of the first rounds were determined from all three given perspectives and these were used to construct an average panel ranking, the main outcome of the first round. If a "tied rank" occurred (the means were equal), the standard deviation was used in order to determine the appropriate sequence; the item with the lowest standard deviation received the lowest rank. Moreover, the Kendall W coefficients were determined by running an analysis in SPSS.

Figure 40 One of the Delphi panel experts when rating sustainability factors (own ill.)

In second round an individual online form was created for each panellist, reporting the mean rank and the highest and lowest rank for each sustainability factor together with their responses from the first round. Panel members could thus compare their previous responses from the first round with the average ranking and then revise their own ranking. As the respondents` fatigue was anticipated, using application Google Forms was selected, as it is well-known, user friendly and often used in practice. Although creating an individual questionnaire form for each participant was rather time consuming for the researcher, it made it as simple as possible for the panellists to review their answers from the first round; going through the questionnaire did not take more than ten minutes. Despite that, only four out of eleven panellists took opportunity in the second round to revise their answers from the first rounds.

When all the revised data was again collected after the second round, the whole analysis with descriptives was repeated and new adjusted mean ranks were determined. After two rounds the polling was stopped due to time restrictions and evident fatigue of the respondents.

Developer perspective

In the first round, each panellist assigned a rank to each of the sustainability factors from the developer`s perspective, ranging from 1 to 11. The question posed for the ranking was: *What are the most important decision-making factors for the developer to build a (sustainable) office building?* The sustainability factors considered to be of the highest importance in the decision making process of a developer received the lowest rank (rank one), the least important factor received the highest rank (rank eleven).

After the collection of the data from the first round, an analysis was performed in which Kendall W was calculated (Table 11). For the analysis two separate groups of respondents were created: respondents active in the field of the building`s development being the first group and the remaining respondents creating the second group (named "others"). Moreover, a general profile combining answers of all the respondents was determined. For the general panel profile, the Kendall W was 0,493 in the first round, which signifies almost weak agreement, however being very close to the moderate panel agreement threshold. After the second round, where the respondents were given a possibility to revise their responses from the first round, the Kendall W slightly increased to 0,503 right above the moderate agreement threshold, which signifies a fair confidence in the ranking. For the developer profile after the second round, the Kendall W coefficient indicated a strong agreement (0,782), which signifies high confidence in ranks. For the "others" profile, the Kendall W is fairly low with value of 0,407 after second round, signifying low confidence in ranks and weak agreement among respondents.

Developer's perspective																	
General profile (N=11)						Developer profile (N=5)						"Others" profile (N=6)					
sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change
	mean	rank	mean	rank			mean	rank	mean	rank			mean	rank	mean	rank	
return on investment	1,91	1	1,55	1	=	return on investment	1,0	1	1,0	1	=	return on investment	2,7	1	2,0	1	=
selling price	3,00	2	2,55	2	=	selling price	2,6	2	2,2	2	=	selling price	3,3	2	2,8	2	=
occupancy	4,73	3	4,55	3	=	design & construction costs	4,6	3	4,2	3	=	occupancy	4,5	3	4,0	3	=
design & construction costs	5,36	4	5,73	4	=	occupancy	5,0	4	5,2	4	=	financing	4,8	4	5,5	4	=
financing	5,55	5	5,91	5	=	time on market	5,6	5	5,4	5	=	design & construction costs	6,0	5	7,0	5	=
time on market	6,45	6	6,55	6	=	building's quality	6,4	7	6,2	6	↑	building's quality	6,7	7	7,0	6	↑
building's quality	6,55	8	6,64	7	↑	financing	6,4	6	6,4	7	↓	interest in sustainability	8,5	10	7,0	7	↑
image & marketing	6,45	7	7,27	8	↓	image & marketing	6,6	8	7,2	8	=	image & marketing	6,3	6	7,3	8	↓
legal obsolescence	7,00	9	7,55	9	=	legal obsolescence	7,0	9	7,4	9	=	time on market	7,2	9	7,5	9	=
interest in sustainability	9,36	10	8,55	10	=	interest in sustainability	10,4	10	10,4	10	=	legal obsolescence	7,0	8	7,7	10	↓
knowledge of sustainability	9,64	11	9,18	11	=	knowledge of sustainability	10,4	11	10,4	11	=	knowledge of sustainability	9,0	11	8,2	11	=
Kendall's W	0,493		0,503		0,010	Kendall's W	0,728		0,782		0,054	Kendall's W	0,364		0,407		0,043

Table 11 Comparison of the rankings from the developer's perspective (own ill.)

In the two rounds, minor changes occurred between the rankings, especially in the general and developer profile, a bit more significant changes occurred in the "others" profile. The main changes were noted in image and marketing and legal obsolescence going down two ranks, and interest in sustainability going up three ranks. These changes within separate rounds for the "others" group signify heterogeneity in the opinions, resulting in lower Kendall W compared to the developer profile. For the general profile in the second round the building's quality became more important, whereas the image and marketing lost on its importance. The rankings are presented graphically in the box-plots for all the three viewpoints in both rounds in Appendix B. The box plots show high consensus among respondents regarding the highest and lowest ranked factors, and lowest consensus regarding middle factors. Especially the return on investment and selling price in general and developer profile were ranked the highest by almost all the respondents, as well as the knowledge of sustainability as the lowest; such factors are thus important to take into account in case of developers.

When the three profiles are compared one to another, there are some noteworthy similarities to be spotted. For all three profiles the two top ranks stayed constant, being the return on investment in the first place and selling price in the second place; moreover, in all three profiles in both rounds, the knowledge of sustainability was ranked the lowest from all the factors. It is visible that the financial factors such as return

on investment, together with selling price, occupancy, time on market or design & construction costs, which are all closely related to the return on investment, are seen as the most important factors in the decision making process. This leads to sustainability being viewed mostly from the economical perspective: the developers do invest into sustainability when they expect increase in the selling price as demand of the investors together with the increase in the demand of the tenants resulting in the increase of developer's profit. The demand from the investors (measured by the selling price) seems more important than the demand from the tenants (occupancy and time to sell), which may however seem rather short-sighted as a fully-occupied building, which is chosen by the future occupiers preferably already during the construction, has much higher value for the investor than a half-occupied building.

Interesting issue can be observed in the factor image & marketing, which ranked on eighth position in all three profiles. From the theoretical overview it became obvious that developers have often used the sustainability of a building and/or received environmental certificate as a useful marketing tool. In that sense it would be expected that the image & marketing would rank higher. This lower position may be explained by the current "saturation" of the Prague office market with the environmental certifications, where basically every new building has to receive one in order to stay competitive and thus the individual certification (if not reaching the highest levels of the certification as LEED Platinum or BREEAM Outstanding) is not that important any more as image carrier.

The legal obsolescence was ranked also low although in interviews it was stated several times that the long two-staged permit procedures together with changing the Prague land use plan result in an unfriendly environment creating a lot of problems for developers in their business in Prague. This low rank may be potentially caused by the unfamiliarity with the used term in the rankings, or by an assumption, that when developer considers all the researched factors, he has already settled the legal obstacles as permitting, or perhaps the connection of sustainability with legal obsolescence was not clearly visible for the respondents.

The interest in sustainability ranked low in developer profile as well as first round of the "others" profile, where surprisingly though it went up three ranks in the second round. It is possible that the respondents in the final stage of the research felt more familiar with the topic and perhaps became even more interested in the topic and imprinted this notion into their opinion about the market. As will be shown later, the interest in sustainability ranked low in all the perspectives, it then signifies a prevailing finance-based approach towards development of office buildings, with not much importance being given to thorough education in the upcoming field of sustainability. From the interviews and observation, it seems that for most of the actors in the field, the sustainability is limited to earning points in the environmental certification systems, not giving too much additional time and effort to understand the field in a more systematic way. This reasoning is also connected with the knowledge of sustainability, which also rank low in most of the profiles in all perspectives.

Investor perspective

From the investor´s perspective, in total thirteen sustainability factors were ranked from 1 being the most important to 13 being the least important. The Delphi was seeking to answer the question: *What are the most important decision-making factors for the investor to invest in a (sustainable) office building?*

Unfortunately, although three interviews were planned with real estate investors operating in the Prague office market, two of them were cancelled, and thus it was not possible to gather a lot of knowledge from the investor's side of the development spectrum for the Delphi. Only one remaining respondent could be seen as a representative of this perspective as he acts as an investor-developer in the Prague market. However, Kendall W coefficient reaching 0,512 (Table 12) after the second round in the general profile signifies the highest consensus (although still a moderate agreement) among the three perspectives, even though the investors are not really present in Delphi panel. This may either signify investors being almost

solely financially focused as the financial factors rank the highest in the panel or it may on the other hand reflect a stereotypical thinking about the profession of an investor, whereas the professionals may be already looking at the sustainability field differently. A further research focused particularly on investors in the Prague market could help clarifying this issue.

	Investor's perspective																
General profile (N=11)						Investor profile (N=1)						"Others" profile (N=10)					
sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change
	mean	rank	mean	rank			mean	rank	mean	rank			mean	rank	mean	rank	
return on investment	1,64	1	1,36	1	=	return on investment	1,0	1	1,0	1	=	return on investment	1,7	1	1,4	1	=
asset value	3,64	2	3,36	2	=	asset value	2,0	2	2,0	2	=	exit yield	3,4	2	3,5	2	=
exit yield	4,00	3	4,09	3	=	operating costs	3,0	3	3,0	3	=	asset value	3,8	3	3,5	3	–
occupancy	5,82	4	5,45	4	=	maintenance costs	4,0	4	4,0	4	=	occupancy	5,3	4	4,9	4	=
rent level	6,27	5	6,00	5	=	functional obsolescence	5,0	5	5,0	5	=	rent level	6,1	5	5,8	5	–
operating costs	7,55	6	7,91	6	=	building's quality	6,0	6	6,0	6	=	financing	8,0	8	8,1	6	↑
maintenance costs	8,36	10	8,27	7	↑	image & marketing	7,0	7	7,0	7	=	operating costs	8,0	6	8,4	7	↓
image & marketing	8,36	9	8,36	8	↑	rent level	8,0	8	8,0	8	=	image & marketing	8,5	10	8,5	8	↑
functional obsolescence	7,73	7	8,36	9	↓	interest in sustainability	9,0	9	9,0	9	=	maintenance costs	8,8	11	8,7	9	↑
building's quality	8,09	8	8,55	10	↓	exit yield	10,0	10	10,0	10	=	functional obsolescence	8,0	7	8,7	10	↓
financing	8,45	11	8,55	11	=	occupancy	11,0	11	11,0	11	=	building's quality	8,3	9	8,8	11	↓
interest in sustainability	9,64	12	9,18	12	=	knowledge of sustainability	12,0	12	12,0	12	=	interest in sustainability	9,7	12	9,2	12	–
knowledge of sustainability	11,45	13	11,55	13	=	financing	13,0	13	13,0	13	=	knowledge of sustainability	11,4	13	11,5	13	=
Kendall's W	0,471		0,512		0,041	Kendall's W	-		-		0,0	Kendall's W	0,505		0,556		0,051

Table 12 Comparison of the rankings from the investor's perspective (own ill.)

As the investor profile is not represented in the Delphi, it is very difficult in this case to make comparisons in between groups. Therefore, the focus will be mostly on the general profile of investor's perspective. Only minor changes in the centre of the ranking are visible between first and second round. Maintenance costs went up three ranks, image & marketing one rank; functional obsolescence and building's quality both declined two ranks. The tangible technical, aesthetical and locational aspects, represented in the factors of building's quality and functional obsolescence seem not to be of significant importance to the respondents. This is however only partially true, as these aspects influence other factors as asset value, maintenance costs or occupancy, which rank higher.

The return on investment ranked first, which is same for the developer perspective. Both actors are clearly perceived as profit-driven market players, in case of investors is this notion supported also by other factors ranking high in the list being asset value, exit yield, occupancy or rent level. This high agreement on the top part of the ranking list is probably caused by close connection between these factors as one is usually influenced by others. These connections were also pointed out several times by the respondents while performing the Delphi. For example, due to high occupancy level in a building, the asset value of a building increases, leading to higher return on investment and influencing the exit yield. The exit yield is also influenced by external factors as prevailing trends in the market; in case of the Prague market the yields remain rather low due to strong investor demand for high-quality assets, which most of the office buildings discussed in this research by no means are.

Operating costs ranked slightly higher than maintenance costs, which may seem surprising as traditionally the maintenance costs are assigned to investor/owner of the building, whereas the tenant pays the operating costs. The difference is however quite low and it proves that most of the respondents did not differentiate much in between these two factors. The image & marketing ranks eighth place, which reflects not much importance being given to this particular factor. Such is reflected in the market, where terms as "green developer" or "prime-tenant" are often used, whereas investors are usually not as visible. In the investment market the investment transactions are of importance, the particular buyers not as much. For that perhaps the investors do not emphasize the image and need for marketing. The environmental certification of a building is in investor's perspective a necessity, although not much importance is given to the particular level of certification, in today's market it may not be seen as anything extraordinary, which should be particularly marketed. An exception could be however seen in the highest levels of certifications, which are still rather scarce in the market.

Financing is placed at the bottom of the ranking, probably due to a fact that once the investor starts considering investment into (sustainable) office buildings, the financing means are usually already secured. Concepts as "green mortgages", in which an investment into sustainable buildings is seen as less risky and is thus offered more beneficial conditions as lower interest rate or higher loan, are only starting in the Czech Republic and are thus not yet well spread. The interest in sustainability and the knowledge of sustainability are again perceived as the least important, not having much influence in the decision making process.

Tenant perspective

The tenant perspective shows by far the lowest consensus among the respondents. After the first round, the Kendall W for the general profile reached only 0,267 signifying very low agreement and almost no confidence in ranks. The coefficient slightly increased in second round, after which the Kendall W was 0,302 that reveals weak agreement and low confidence in ranks. An interesting notion may be seen in the groups, where both the tenant as well as "others" profiles achieved higher Kendall W than the general profile; this leads to conclusion that a disagreement in between these two groups occurred in the panel. After the second round, the tenant profile reached Kendall W coefficient of 0,327 whereas "others" profile reached even higher coefficient of 0,392; both however still fall within the weak agreement category.

Tenant's perspective																	
General profile (N=11)						Tenant profile (N=4)						"Others" profile (N=7)					
sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change	sustainability factor	round 1		round 2		change
	mean	rank	mean	rank			mean	rank	mean	rank			mean	rank	mean	rank	
rent level	3,73	1	2,91	1	=	rent level	4,8	4	2,5	1	↑	rent level	3,1	1	3,1	1	=
operating costs	4,45	2	4,55	2	=	building's quality	3,3	1	3,8	2	↓	operating costs	4,3	2	4,1	2	=
productivity	5,09	3	4,82	3	=	productivity	4,8	3	4,0	3	=	staff happiness & satisfaction	5,6	6	5,3	3	↑
building's quality	5,18	4	5,09	4	=	operating costs	4,8	2	5,3	4	↓	productivity	5,3	4	5,3	4	=
staff happiness & satisfaction	5,73	6	5,64	5	↑	staff happiness & satisfaction	6,0	8	6,3	5	↑	maintenance costs	5,1	3	5,3	5	↓
maintenance costs	5,36	5	5,73	6	↓	maintenance costs	5,8	5	6,5	6	↓	staff health	5,9	7	5,6	6	=
staff health	5,91	7	6,09	7	=	staff health	6,0	6	7,0	7	↓	comfort	5,9	8	5,7	7	=
comfort	5,91	8	6,27	8	=	knowledge of sustainability	6,8	9	7,0	8	↑	building's quality	6,3	9	5,9	8	=
image & marketing	6,36	9	6,91	9	=	comfort	6,0	7	7,3	9	↓	image & marketing	5,4	5	6,3	9	↓
interest in sustainability	9,09	10	8,64	10	=	image & marketing	8,0	10	8,0	10	=	interest in sustainability	8,6	10	8,7	10	=
knowledge of sustainability	9,18	11	9,36	11	=	interest in sustainability	10,0	11	8,5	11	=	knowledge of sustainability	10,6	11	10,7	11	=
Kendall's W	0,267		0,302		0,035	Kendall's W	0,299		0,327		0,028	Kendall's W	0,368		0,392		0,024

Table 13 Comparison of the rankings from the tenant's perspective (own ill.)

Several reasons may lie behind the low consensus in the tenant perspective. Firstly, it is much more complicated to define "tenants" as one homogeneous group than to aim for the same in case of investors or developers. Tenants consist of various companies operating in different fields, by which they are strongly influenced. This was for example suggested by one respondent, who specifically pointed out the IT companies are the ones investing a lot into staff comfort and happiness to attract talented workforce. Tenants also vary from big international corporations to small local companies. All these aspects make defining "tenants" as a group rather difficult. Secondly, the Delphi panellists were due to practical reasons not tenants themselves, but real estate agents, which stand for their clients, the tenants, in most negotiations with developers and investors. However, still a mismatch between what tenants value and what real estate agents believe they value, may occur. Thirdly, in this research in the perspective of tenant the standpoint of the company's management as the decision making body was taken. Some respondents however found it difficult to distinguish between "employer" perspective (the one aimed for) and the "employee" perspective, while it is quite obvious that these two differ significantly as the employer pays much more attention to financial aspects of the company's operations, whereas the employee focuses mostly on his own benefits. Lastly, as was the case in all the perspectives, some factors may have been too connected, making it difficult to rank them in concordance. The divergence in opinions of respondents may be also observed graphically in box-plots, presented in Appendix B.

The changes occurring in the general profile in between the rounds are almost negligible, noteworthy changes however occurred in tenant profile as well as "others" profile. The respondents of tenant's profile valued rent level in particular much higher in the second round compared to the first round. As the rent

level ranked first in the overall rating of the first round, this change shows that the respondents indeed changed their opinions based on the average results, as is the aim of Delphi. Another significant change in the ranks in the tenant profile occurred in staff happiness and satisfaction, which went up three ranks in both tenant profile and also "others" profile; this is also the only factor that went up in second round for the general profile. Several other factors show decrease in their ranks for one or two places in the tenant profile. In "others" profile, a significant decline in ranks is visible in case of image & marketing, going down four ranks as well as maintenance costs going down two ranks. A notable dispute between the groups is visible in case of building's quality, which rank second in the tenant profile (even first after the first round) and eighth in the "others" profile. This big difference in opinions may be caused by vagueness of this factor, embracing too many aspects as location, building`s architecture, etc.

It is rather difficult to draw conclusions from the Delphi as the consensus was not strong. However, in general the prevailing focus on the financial aspects of the building's occupation as rent level or operating costs seem to outweigh the less tangible aspects as productivity or satisfaction, although these were also given significant amount of importance. The emphasis on the rent level indirectly shows that the market is not yet fully prepared for increasing the rent level due to increased design & construction costs in certified buildings. The image & marketing factor is again ranked quite low, opposing the findings from the literature that showed that corporate social responsibility and competitiveness of a company is an important aspect in decision making whether to occupy a sustainable building. This may be caused by some multinational companies not actually having a choice in whether or not they will rent in a certified building, because their mother company may impose such rule to them. The interest in sustainability ranking again very low may also support this reasoning, together with knowledge of sustainability not playing an important role in the decision making of tenants.

Cross-analysis

The goal of the Delphi was to reach a consensus in the ranking of the selected relevant sustainability factors in the panel within each perspective. Studies have consistently found that it is however more difficult to reach consensus with the Delphi groups that with ones using direct interaction between participants. This could however be to certain extent prevented as the panel members are deliberately selected by the researcher based on their homogeneity (Okoli & Pawlowski, 2004).

In general, after two rounds of Delphi the Kendall's coefficients of concordance W resulted in lower values than targeted. The desired strong degree of consensus and high confidence in ranks, which would be signified by Kendall W of value 0,7 or higher, was unfortunately not achieved in neither of the researched perspectives. The highest degree of consensus was reached in investor´s perspective, although almost no actual investors were present in the panel. Overall lower degree of consensus than hoped for could have been caused by quite a mixed group of respondents. The respondents were selected based on opportunistic sampling and in few cases they were not that familiar with the topic as expected (e.g. developer who only just started an initiative process of certifying an office building). Moreover, the opinions of a respondent are definitely formed by the environment he manoeuvres in. Professional heterogeneity of the group creates then obstacles for reaching overall consensus, especially when one is asked to imagine himself in different perspectives. Another reason for low coefficients of concordance was mentioned by some respondents even during the interviews and that is that some of the factors were seen as too much connected to one another, complicating the rating based on their importance.

The gathered rankings can also be further investigated via box-plots provided in Appendix B, which are graphical representations of the distribution of ranked variables. The box represents the interquartile range, representing the middle 50% of observations; the longer the box is, the smaller consensus can be observed among respondents. The whiskers sticking out from the box to the top and bottom stick out to minimum and maximum value achieved respectively (Field, 2009, p. 99; Koppels et al., 2007). The box-plots allow

investigating, whether higher consensus was reached for certain variables than for others. In case of developer's perspective as well as investor´s perspective it may be concluded that there is a higher consensus on lowest ranked (most important) variables such as return on investment as well as highest ranked factors (least important) being the knowledge of sustainability, lower consensus may be observed in the middle of the ranking. These observations lead to conclusion that some factors are really important, some matter a bit and some do not really matter, although these differences may not have direct impact on the ranking itself. The tenant perspective presents unclear consensus, which aligns with the low coefficient of concordance reached from this perspective.

The panel compared three different perspectives of three market actors. In the previous sections the answers of the respondents within the field of a particular expertise were compared to those outside of the field. From the collected findings, it is also possible to reflect on what particular actors thought that others would value as important and what these actors actually valued. Such interesting comparison may be drawn for example in between the developer category and the tenant category in order to spot a potential mismatch between perceptions and actual standpoints. This mismatch may also lead back to the blind spot in the conceptual model in the overlap of these two groups. Both of these groups have also been substantially represented in the panels. The results of the cross analysis, presenting the results of the second round of Delphi, are shown in Table 14.

Cross analysis: comparing standpoints and perceptions of developers and tenants											
Tenants' standpoint (N=4)			Developers' perception of tenants (N=5)			Developers' standpoint (N=5)			Tenants' perception of developers (N=4)		
	round 2			round 2			round 2			round 2	
sustainability factor	mean	rank	sustainability factor	mean	rank	sustainability factor	mean	rank	sustainability factor	mean	rank
rent level	2,5	1	rent level	2,2	1	return on investment	1,0	1	return on investment	2,3	1
building's quality	3,8	2	operating costs	3,6	2	selling price	2,2	2	selling price	3,0	2
productivity	4,0	3	staff happiness & satisfaction	4,4	3	design & construction costs	4,2	3	occupancy	4,2	3
operating costs	5,3	4	productivity	4,8	4	occupancy	5,2	4	financing	4,8	4
staff happiness & satisfaction	6,3	5	maintenance costs	5,2	5	time on market	5,4	5	interest in sustainability	5,5	5
maintenance costs	6,5	6	comfort	5,8	6	building's quality	6,2	6	design & construction costs	6,5	6
staff health	7,0	7	staff health	6,2	7	financing	6,4	7	knowledge of sustainability	7,3	7
knowledge of sustainability	7,0	8	building's quality	6,4	8	image & marketing	7,2	8	time on market	7,5	8
comfort	7,3	9	image & marketing	6,4	9	legal obsolescence	7,4	9	building's quality	8,0	9
image & marketing	8,0	10	interest in sustainability	10,2	10	interest in sustainability	10,4	10	image & marketing	8,0	10
interest in sustainability	8,5	11	knowledge of sustainability	10,8	11	knowledge of sustainability	10,4	11	legal obsolescence	9,0	11
Kendall's W	0,327		Kendall's W	0,599		Kendall's W	0,782		Kendall's W	0,445	

Table 14 Cross analysis comparing standpoints and perceptions of developers and tenants (own ill.)

Firstly, I will elaborate on the perception of developers about which factors tenants value and which of these they actually valued. Although the final ranking itself is not distinctly different, the agreement in the developer's groups is almost twice as strong as in the tenant's group; whereas the Kendall W for the tenants is 0,327, for the developers the coefficient reaches 0,599. The quantitative analysis proves the findings of the literature review, that it is quite difficult to get a clear picture of the "tenant" group. This relates back to the overall much higher consensus in the developer group than tenant group, which was discussed in length above. Both groups confirm, that the rent level of a building is the most important decision-making factor for the tenants, which was also confirmed in the interviews. However, from the comparison it seems that developers assign more importance to the financial aspects of the rental conditions, particularly in the height of operating costs, whereas tenants seem to value the other factors such as overall building's quality higher. For the tenant the accessibility, proximity of basic services in proximity and the design of a building are very important. These aspects are of course closely linked back to the rent level as usually modern (certified) buildings are being built in lucrative locations within the city with higher rent levels. Whereas developers saw the operating costs as very relevant, the tenants did not completely align with this thought. Such may be caused by certain tenants' disappointment with the energy efficiency of certified buildings, which at the beginning of the certification era were marketed as low-energy buildings, saving expenses on the energy bill, and this aspect was often later proven wrong in the operation phase of the buildings. Both groups seem to agree with the on-going tendency of tenants to pay more attention to wellbeing and satisfaction and subsequent productivity of their employees as the workforce is usually the biggest expense

of a company. The rest of the rating is very much similar for both groups, with exception of comfort rated higher by developers and knowledge of sustainability rated higher by tenants. It seems that whereas developers do not assign much importance to the knowledge of sustainability, the tenants put much more emphasis in their decision making on this factor. Perhaps this is caused by shifting understanding of concept of sustainability and focus of environmental certifications from energy-efficiency to more social aspects as health and well-being, which as discussed is generally gaining importance among tenants.

The cross analysis was also done for the other combination; what developers see as important compared to what is perceived as important in the opinion of tenants. The Kendall W is again substantially higher for the developers' groups, the coefficient of concordance reached 0,782 for developers and 0,445 for tenants. Interesting notion may be taken that the consensus among tenants about the developers is higher than about themselves, shown by previously stated coefficient 0,327. Same factors being the return on investment and selling price occupy the top ranks in both groups, showing aligned opinions in the high importance level of financial factors for the developers. The design and construction costs are seen as more important by the developers than by the tenants, probably showing not enough insight of tenants into calculation of developers' cash flow, where the design and construction costs are the main cost input. Whereas occupancy is valued high by both groups, surprisingly tenants do not connect it directly with the time on market, which they view as not that important. The same disagreement is visible in case of building's quality, which tenants believe that developers do not value as important as supposedly they do. Perhaps this may be interpreted as an opinion that developers should put more focus into the quality of the buildings in order to meet the tenants´ demand. Tenants view financing as an important factor, whereas in case of developers solving the issue of financing means usually precede the decision making about the actual building. The interest in sustainability together with knowledge of sustainability both rank much higher in the tenant group than in the developer group. In eyes of tenants are developers perhaps the ones, putting the emphasis on the sustainability in the market, by providing the higher-quality certified buildings. This opinion seems not be shared by developers, who usually view sustainability as a tool to higher financial return and believe, that the circle of blame may and should be broken by pressure from the demand side.

Sustainable office development in Prague: interview findings

Qualitative data analysis

The qualitative part of the research consisted of the semi-structured interviews. The interviews were recorded during the interviews and afterwards transcribed. This qualitative data was then carefully read by the researcher and coded in a way that repeating phenomena were searched for, the program Atlas.ti was used for the coding. Only one respondent did not wish to be recorded, thus for coding the particular interview, extensive notes from the interview were used. In reporting of the findings, the anonymity of the panellists was protected.

It is sometimes said that qualitative data can be seen as "attractive nuisance", because of the attractiveness of its richness but the difficulty of finding analytic paths through the richness (Miles, as cited in Bryman 2012, p. 565). As the qualitative data analysis has not yet reached any similar degree of codification of analytic procedure as the quantitative data described above, which many writers find anyway desirable, only broad guidelines from the literature for coding the qualitative data were used (Bryman, 2012, p. 565). In general terms, there are two main strategies of qualitative analysis: analytic induction and grounded theory. Both of these suggest iterative interplay between the collection and analysis of the data; the analysis starts after some of the data have been collected (in this case for example through scope interviews) and the implications of that analysis then shape the next steps in the data-collection process (Bryman, 2012, p. 566). The grounded theory has been defined as theory derived from the data, systematically gathered and analysed through the research process. In this method, data collection, analysis, and eventual theory stand in a close relationship to one another (Strauss & Corbin, as cited in

Bryman, 2012, p. 387). As the analytic induction seems more focused to one problem, whereas in grounded theory phenomena may more easily emerge from the collected data, a grounded theory approach was selected as more suitable to this research for analysis of the collected data.

Coding or indexing in grounded theory entails reviewing transcripts and/or field notes and giving labels (names) to component parts that seem to be of potential theoretical significance and/or that seem to be salient within the area of study. Coding in qualitative research is more tentative, in a state of constant potential revision. The phenomena under a certain category appointed from the data are constantly compared to see which concepts they best fit with. The two phases of coding are initial coding, where a more open-minded approach is taken to generate new ideas which may be compared with the theoretical knowledge already gathered, and focused coding, which emphasizes the most common codes in the data (Bryman, 2012, pp. 568-569).

Findings emerged from the interviews through coding in the form of several subtopics connected to sustainable office development in Prague. The quotes of the respondents on same or similar topic were put together, combined with other adjacent topics and as thus are reported and analysed below. Moreover, some interesting specific quotes from the interviews are mentioned further on, these are however English translations from the original Czech version.

Legislation

A topic, which have been brought up during the interviews many times, was the barriers of the current Czech and city legislation and their influence on the development market in general. A number of respondents criticized the immense length of the permit procedure, which is often prolonged due to a lot of space in the process given to involved parties that often use this power to appeal against development intentions. This procedure may take up to several years. One respondent shared his experience:

We have one project that took almost 13 years to build with all the appeals and courts, even though the plot was not complicated and the land use plan allowed everything we intended to do. But here (in the Czech Republic) such obstructions are simply facilitated by the legal environment.

Such complex procedures not only hinders the development in general, which does not have an easy starting point due to not many vacant buildable plots in lucrative locations in Prague, but result in obsolescence of the technologies designed in the building; and with fear from entering such difficult procedures again the developers are reluctant to make substantial changes to the design. Two respondents even suggested that current Prague authorities have aversion against any development and like to use a word "developer" as a negative term for someone craving only for his financial profit and ignoring the aesthetics and urbanism of a city.

One respondent even pointed out that in theory the legislation is not as problematic as its implementation to practice. Prague is currently working on a new land use plan called Metropolitan plan (Figure 41) being prepared by the Institute of the Planning and Development. The creation of the Metropolitan plan, being worked out already with a time delay of several years, ran into new obstacles in September 2016, where the whole team working on the plan resigned from their job positions, claiming that the political involvement from the side of Prague magistrate was too extensive to work indecently on such an important document. This crisis may cause further delays in the plan delivery, whereas the current land use plan is only valid until the end of 2020 (Novotný, 2016). The sustainability of a city or buildings currently doesn't seem to be a priority on neither national nor local level and is spread across various governmental departments. However, the coming EU regulations in 2020 demand a substantial improvement on the way the buildings are being built in the country. Not many developers today voluntarily comply with these regulations and not

many seem to be willing to do so if not forced, which leads back to the potential difficulties in the permit process once proposing some extraordinary development.
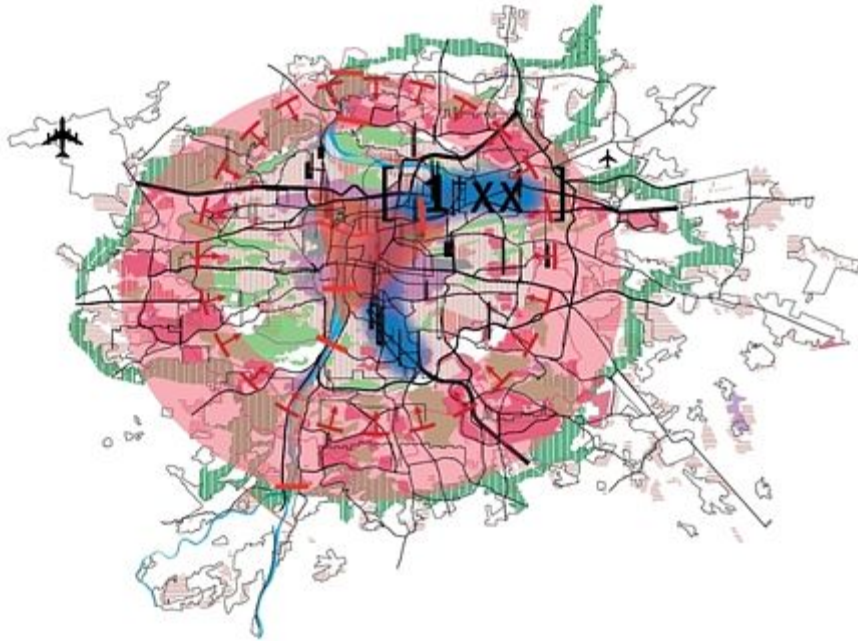
Figure 41 Main concepts of the Metropolitan plan, new land use plan of Prague being prepared (IPR Praha, n.d.)

Some respondents pointed out possible ways of how public bodies and/or implemented legislation would trigger the sustainable development in Prague. One way, which is common in Vienna or Amsterdam, would be that a municipality could own land in the city and thus would have a better position for negotiations with developers about what and how would be built on such plots. This is however not a case in Prague anymore as except a few areas, municipality has already sold land to private bodies. The possible strong public position however goes together hand in hand with other aspect, the appreciation of quality. The public bodies could very well help the development of high-quality or sustainable buildings or construction, if qualitative criteria would be better implemented in the public tendering procedures. As one respondent stated:

When I look at the Green Building Council, the public bodies (as national government or municipalities) do not make any problems, they like to meet and discuss with us, and they perceive the act as meeting representatives of the business. And we would always say: we don't need your legislation, the market will sort things out itself, we need that you implement qualitative criteria in your tenders such as that all new buildings need to be at least LEED Silver.

Unfortunately, the majority of public tenders are based on the lowers price for both project and construction, and some extremely important buildings or infrastructure are not being tendered in a transparent way (such as for example the new metro line in Prague) (Pavlová, 2016).

Green market development

Although the Prague market was also struck by 2008 crisis and has been suffering from the complex legislation, the rise of sustainability in form of certifications in the office market is clearly visible. Pioneers in this upward trend were in year 2006 a building ČSOB Radlická, as the first building, which received a certification (LEED) in the country, followed by the post-crisis building City Green Court finished in 2012 as first achieving the highest level of certification, LEED Platinum. The developer of this building, Skanska Property, used the building as its flagship, testing the willingness of the market for green aspects. As one respondent said:

The City Green Court during crisis, when tenants were cutting their lease contracts and were moving out and almost everyone stopped building, managed to attract the A-class tenants and even got sold before the end of construction; back then in 2011 it was almost a miracle.

From 2012 the sustainability boom in the office sector has been rising, on one hand being pushed by the foreign pressure from the demand side on the other hand the developers providing almost all new office buildings in a certain sustainability standard which rarely goes below LEED Gold or BREEAM Excellent. For many respondents it was unimaginable that a newly-built office building in Prague would not have a similar certificate; such building would not be competitive and investors would not want to purchase it. For this reason, not only newly-built but also existing pre-crisis buildings are being retrofitted and subsequently certified by in-use certificates in order to stay competitive. The certification itself became a standard and thus the early-adopting developers lost their competitive advantage. Therefore, new marketing tools are being developed in recent developments such as apps for monitoring the buildings, or new design elements such as gardens or green atria. The levels of certification are still important as the top levels have not been reached by that many buildings yet. Moreover, the particular credits and building solutions with their impacts on the building users and on the building's operation are promoted.

Figure 42 Interior of City Green Court, first LEED Platinum certified building in Prague (Hejzlar, 2013)

Developer

During the interviews it has become apparent that while considering the Prague market and its approach to sustainability, several different types of developers need to be taken into account. Firstly, a developer constructing a building for a known end-user has much clearer drivers to build in a sustainable standard as the tenant is expected to stay in a building for long term, which is always desirable from a sustainability point of view. For this reason, ČSOB Radlická building could have been built already in 2006 in LEED Gold standard as it was developed specifically for one tenant, ČSOB bank. Secondly although the main driver of a developer is his final return on investment and the office developers have been pushed by the market to certify their office buildings, some developers do it because of their company vision, belief and image, some hope that certification will help them in marketing and others go through the certification process only because of a necessity to keep up with the market demand. This difference between different types of developers is even more significant in the Prague residential market, where company JRD has been a pioneer in building low-energy apartment buildings already for several years, followed by companies as Skanska, PSJ and Horizon Holding, which have just started certifying their projects in BREEAM or LEED standard.

The findings of the theoretical review, showing that the increase in design and construction costs is quite complex to state specifically, have been confirmed by the interviews. Mostly the respondents stated that the increase exists, however its values varied from 2% to 15% for the top levels of the certifications. The project phase in which a developer decides to target LEED or BREEAM was found to be crucial as lots of expenses can be saved by smart and early design, taking place already in the concept stage of the building. Once the decisions take place later in the process, changes to the current design have to take place, which inevitably increases the costs. The cost increase is also directly linked to the targeted certification level. It is

obvious that for sustainable offices to become a truly sound business case from the economical perspective, such relations have to be clearly understood by the developers next to the absolute figures of the cost and profit increase. This cost-benefits analysis is crucial especially in the current Prague market, where the certifications seem to be required by the investors and some tenants, however these are not always willing to pay cost premium for the certificate. Such data is however quite hard to access and often not present; if a developer has it, he usually does not share it due to its sensitivity.
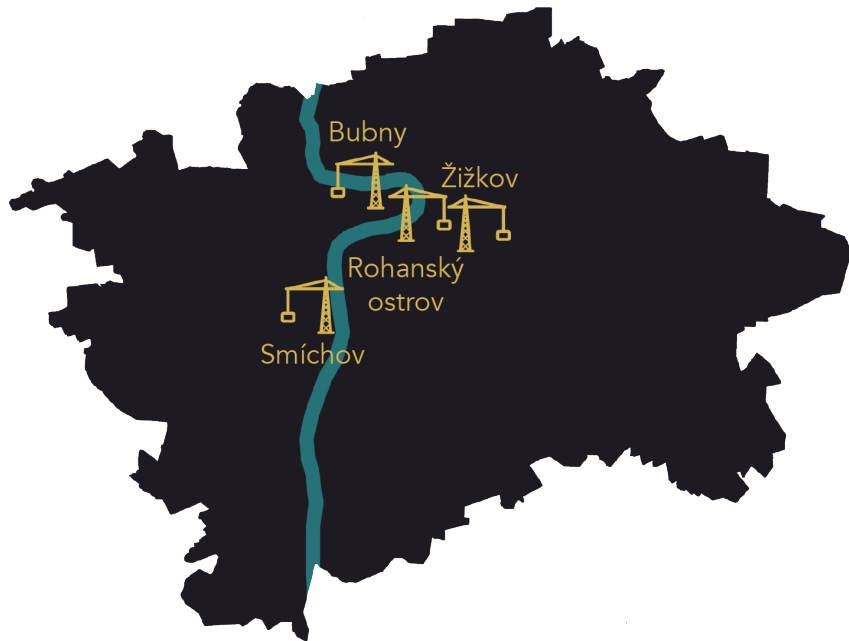
Figure 43 Future development areas in Prague (own ill.)

On the other hand, this is very hard to compare as all the newly-built office building are built in a certain environmental standard and it is thus difficult to state, whether the rent increase is due to certification or just simply because the building is modern.

The question of sustainable retrofit was also discussed during the interviews. The respondents did not seem to agree on whether the retrofit in general can be perceived as more or less sustainable than building new. The issue was mostly approached from two sides; on one hand some respondents believed that from the environmental perspective reusing already existing bearing structures and building on brownfield is a better option than building new, they however admitted that it depends on a fact whether the building has a flexible column structure, which could be easily adapted, or whether a wall structure is present, making the retrofit and usage much more difficult. On the other hand, the increased risks and connected potential extra costs were discussed, as there are many more uncertainties in retrofit than building new construction. However, as one respondent pointed out, lucrative plots in the central parts of the city have already been bought, developed or are under building ban and thus are currently not possible to be developed, some developers may thus be forced to rethink their business models to be able to sustain their business. This situation may however change in the future with an upcoming development of big areas in the city as Rohanský ostrov, Smíchov, Žižkov or Bubny (Figure 43), which is expected to come with the new land use plan in upcoming years.

Investor

As was already discussed above, the investors as pension funds operating in the Prague market currently demand the office buildings in their portfolios to be certified. According to some respondents they believe, that as environmental certifications pay a lot of attention to the energy efficiency, the operating and maintenance costs of the building will be substantially lower and perhaps because of that the rent level for such buildings may increase. Investors also believe that certification as a quality mark may influence A-class tenants to rent in such buildings. This is probably the case especially in the highest levels of certifications, as one respondent stated:

Investor is potentially willing to pay more for LEED Platinum than Gold, but it is again supported by his belief, that this building will be preferred by specific tenants, who appreciate it. Everything is linked together.

Figure 44 ČSOB Radlická, first certified office building in the Czech Republic (Koťátko, n.d.)

The way the building performs in the operating period was found crucial for the investors. One respondent pointed out that the biggest strength of the environmental certifications is their focus on commissioning, which is that the building is rated not only based on its design on paper, but also by its actual performance once already built. The developer is thus not able to cut on certain solutions due to costs and change the planned technologies during the construction phase. Theoretically the certified building should be more energy efficient than ordinary buildings, saving on the costs for operation. Unfortunately, in the Czech practice this was not always proved to be true, potentially due to several reasons given by the respondents. Firstly, the commissioning reports about the building's actual measured energy demand in its first year of operation, which have to be handed in for the certifications, may not be filled in based on measured valued. This subsequently functions as a negative marketing for the certifications. Secondly, one respondent raised a question, whether the technologies prescribed by the certifications are indeed more efficient during their whole life cycle, once accounted for their purchasing costs, maintenance costs or whether the used materials and the production cycle in such technologies are sustainable. Thirdly, at the beginning of the LEED certification, not much emphasis was put on the issue of energy as the demand per capita in the United Stated, origin of LEED, is immense. The first buildings such as mentioned ČSOB Radlická thus perform poorly in energy demand and such examples may cast a shadow on the field among uneducated public. Fourthly, the building users may not be accustomed to or educated about the technologies and may thus not use them in proper energy efficient way. In order to prevent this situation, developing a home user guide is one of the achievable credits in the BREEAM and LEED certificates. Fourthly, it is crucial to have a good facility manager, operating the building, who deeply understands the technologies designed in the building and is able to optimize them. And lastly, sometimes the technologies are not even favoured by the tenants and are thus not used in a way as designed. An example was given by one of the respondents:

In Florentinum (an office building in Prague 1 certified LEED Platinum) there are sensors that adjust the light intensity inside the building based on the light intensity outside – if there is a clear sky, the lights are turned off, once a cloud appears, the lights turn on. This is nice and sometimes it even saves some energy, but the tenants do not like it. If it is cloudy outside, the lights turn on and off quite often based on how the light intensity is evaluated by the sensor. And then the tenants are frustrated, as they have to go and adjust the lights manually anyway. And there are more things like this…

Regarding the ways of financing, not many respondents believed that the banks in the Czech market would currently prefer a green project over an ordinary one and theoretically appraise it as less risky and thus give it higher loan or lower interest rate on the loan. However, some admitted that this trend has slowly started to appear in the market and is assumed to be more relevant especially after 2020, where subsidies from the European Union are expected to reduce. These subsidies are currently mostly meant for retrofit of apartment buildings and for constructions of homes, not for commercial sector, and could be mostly found under program called Zelená úsporám (in translation Green Light to Saving). One respondent specifically stated that if a developer or investor decides to certify his building, it is "*for sure not because of some bank*".

Tenant

Many respondents confirmed the opinion about big multinational tenants pushing the market towards certification of office buildings they occupy. The tenants in Prague usually require a certified office once it is an internal policy of their foreign mother company, which may for example prescribe that all the daughter companies have to rent a building that is at least LEED Gold. Once such tenants decide on the location of their office, many potential offices not achieving such levels of certification are then thus automatically crossed out from the list of choices. These multinationals, staying or coming to Prague due to a favourable market, are then targeted by the developers, which then deliver the certified buildings based on this demand. This development towards "green thinking" is visible often in specific sectors such as IT, using such intangible benefits to keep skilful workers in the company. It was estimated by one respondent that when discussing local Czech companies in this matter, around 5-10% would also appreciate to stay in a certified office building, the motive being their own belief, whereas others decide mostly based on the overall costs as rent level together with operating costs.

Several respondents mentioned one very important aspect, omitted in the list of the sustainability factors, and that is the influence of the personalities in the management of the tenant company. Sometimes, when the local companies are being managed by their mothers located at the other side of the world, this might not be the case, but in cases where the boss of the company responsible for the country or CEE region has a power to decide, his personal opinion on which location of the city he prefers plays a crucial role in the decision making. One respondent-developer summarizes this issue as follows:

We have offered various rents in various buildings around the country, which we needed to rent out and we have had many big companies moving into these buildings. At the end we found out that the company has moved to that particular building, because the boss lived nearby, not because the company would have any particular vision.

This decision about the location, mentioned several times as the most important factor in the decision-making of tenant, is however not only based on the location of the boss's home. The employees are usually used to the particular district and there is a danger of them leaving the company if a change in the office location would be too significant. The management aiming at prospering company cannot risk such a situation to happen.

Other interesting aspect discussed in the interviews was the difference in motivations of the company management and the employees. In this research the standpoint of the management was focused on, however the employees' opinions cannot be omitted as these influence the decision-making of the management as already mentioned with the connection to the office location. In general, the employee usually does not care whether he is located in a top-certified building, whether the toilet is flushed by collected rainwater or whether his computer runs on electricity collected by PVs on the roof. He appreciates good architecture, accessible location, comfort, indoor environmental quality and feeling healthy in the office space. The rent or operating costs are not relevant to the employee as he usually does not even have an idea about their height. In this regard, some respondents pointed out an upcoming trend of putting more emphasis to the comfort and satisfaction of employees as the management understands that compared to the office operating costs or even rent, the costs of workforce are much more significant and thus it is advantageous to keep the employees healthy and satisfied and thus productive. The management and the employee perspective are therefore very interlinked. This trend towards emphasizing the wellbeing in the buildings is also triggered by the organisations producing the certifications themselves, as for example the new version of BREEAM has put more emphasis on Health & Wellbeing rated category, or is even coming with new certificate called WELL, measuring specifically these aspect (L. Matějíčková, personal communication, 25 July 2016).

Stages of sustainable office development

The interviews were focusing on understanding the green office Prague market in past years as well as the current market situation. From the information gathered, several stages of the sustainable office development could be generalized when considering the market itself being the driver of the change (Figure 45):

1. **Pioneers**: a few buildings are built in a sustainable standard, using this uniqueness as a competitive advantage, targeting the A-class tenants. The interest of the market in sustainability steeply increases, although not many actors understand the concept in all its depth.
2. **Low – energy belief**: once the concept of sustainable buildings becomes known among the professionals due to upcoming certifications, it is believed that the certification is a proof of a building not consuming a lot of energy. This may potentially lead to savings on operating costs.
3. **Comparing theory and practice**: after several years of operating the first certified buildings it becomes apparent that beliefs in "almost zero" operating costs are sometimes false and the green office buildings in practice often perform comparably to older renovated buildings regarding their energy efficiency. The developers thus have to start searching for other aspects to promote in certified buildings and this may be the indoor environmental quality and the positive effects of the building on its occupiers.
4. **Certification as necessity**: due to demand from the multinational tenants as well as investors, the developers are pushed to certify every new office building, usually at least in Gold / Excellent standard. Newly-built speculative office buildings, achieving Silver / Good or no standard are frowned upon in the market. However, neither investors nor tenants seem to be willing to pay extra premium for the "sustainability" of a building.
5. **Stagnating market** – although the amount of certified buildings keeps gradually increasing, the interest in the topic seems to fade away. In marketing sustainability, the focus is put on the improved wellbeing of office occupiers leading to increased productivity, however such aspects seem to be hard to measure. The developers of offices have found the "ideal" spot in between the necessity to certificate and not putting too much extra costs into the design and construction, sometimes achieving the credits for certification through soft costs.

ČSOB Radlická   City Green Court   other top certified offices

| first certification | 2007 | 2008 | 2009 | 2010 | pioneers / 2011 | low-energy belief | 2012 | 2013 | theory vs. practice / 2014 | certification as necessity / 2015 | stagnating market / 2016 |

Figure 45 Stages of sustainable office development in Prague (own ill.)

Although this research has been focused particularly on the Czech Republic and therefore the following thought stands slightly outside the scope of this work, these stages may be compared to other countries as well. For example Eerikäinen and Sarasoja (2012) introduced the situation in Finland, and by exploring various ways of marketing green buildings concluded, that *"if the building market will end up in a situation where having a certification is enough in terms of being environmentally friendly, and the greenness is not seen as an efficient differentiation factor, the development of a more sustainable built environment will fail, as no developer will be motivated to be innovative and more sustainable."* This notion clearly relates to the current phase of the office market in Prague, the stagnation. The way out of this loop could for example be a concentration on particular green solutions used in buildings and communicating the benefits of such individual solutions, as communicating the whole complexity of sustainable certifications is too complicated for the end user. Moreover, a combined communication strategy addressing both the emotional and financial benefits of sustainable offices should yield stronger effect (Eerikäinen & Sarasoja, 2012). In general, it can be assumed that similar development of sustainable office development as in Prague may be spotted in other countries as well and thus the previously described stages could be generalized. However, in the Western and Northern Europe the broad development of sustainable offices has most probably started earlier than in Prague, in some countries enforced for instance by an adoption of national scheme operator of BREEAM: BREEAM in the UK was introduced in 1990, transformed into BREEAM-NL in the Netherlands in 2009 or BREEAM-SE in Sweden in 2013 (BREEAM-NL, n.d.; Sweden Green Building Council, 2011). Currently these countries seem to appreciate buildings more often based on qualitative criteria, not only on financial performance as is still the case in the Czech Republic. On the other hand, other countries from the Central Eastern Europe region as Poland, Hungary or Romania seem to be in a similar situation as the Czech Republic; the certifications in the office sector, especially in the capitals, are "must have", however the overall awareness of the benefits of sustainability behind these certifications remains low. In this regard, the Czech Republic, Prague in particular, still seems to be the leader towards sustainability, compared to other countries under the former Soviet regime. Another influence on the stages of sustainable office development may be the involvement level of national and/or local government within the market, shifting the market into a desired direction towards sustainability. As was already stated before, such involvement in Prague currently prevails rather low.

The development on discussed topic has gone through radical changes in past years certainly in a positive direction towards higher awareness and interest in the topic. However, by far the biggest barrier against broader implementation of certifications and concepts of sustainability perceived by the respondents, still remain not sufficient knowledge about the issue in its complexity. Some developers certificate buildings "just for the paper", not putting too many thoughts into the aims and concepts behind the specific points of the certifications. The overall awareness of the general public remains low, as people are not usually quite eager to adjust their way of life if it requires too much effort. This low awareness is especially visible in the residential market, where the certifications have only recently entered the field of interest; the buyers of the apartments look almost solely at the location and price once looking for an apartment and are not willing to invest in supposable long-term benefits of a more sustainable apartment. As the residential market in Prague is currently going through an unsatisfactory supply situation, caused partially by the long permit procedures, the house prices in the city increase, not making the case for sustainability any easier for the residents searching for their home.

Following up on the described stages of the sustainable office development, the respondents were asked about their perception of future; which way may the sustainable office market move in the future. Some respondents mentioned an on-going focus on good architecture, smart and creative design of office layouts, flexible workspaces or emphasizing a community among the building's occupants. Regarding certifications, the respondents confirmed the trend of releasing new versions of BREEAM, LEED and other schemes as more difficult than the previous ones and as such pushing the trend forward. One respondent even mentioned a new certificate being introduced in the United States called Living Building Challenge, which compares a building with a living organism as flower, surviving solely on the environment in close proximity

of the building; although this respondent admitted that he is not sure that the market is and ever will be ready for such implementations on wide range. However, as the common environmental certifications have become rather standard in today´s market, more emphasis will be put on promoting specific solutions, which may be even outside of the scope of certifications (an example could be seen in concept of a running track on the roof of new office building in Prague 7 of Skanska). Other respondents saw future in more flexible contracts between tenants and investors for example as green lease term, or going

Skanska Color Palette™ - Building

Figure 46 Skanska Color Palette, internal tool for measuring sustainability of a building (Skanska, 2011)

further with digitalization of the buildings, monitoring the operations of the buildings and managing them through smart systems in order to optimize the processes. Moreover, a possibly increasing number of developers measuring their buildings through internal environmental comparison tools (such as Skanska's Colour Palette, shown in Figure 46) was mentioned. In general, the majority of respondents agreed that the upcoming trend of sustainable offices and residential buildings will continue, however at not very high speed.

Breaking the circle of blame

The starting point of the conceptual model of this research was the Cadman's circle of blame, where however the architect/contractor role was omitted. This developer-investor-tenant triangle has been a red threat throughout this whole paper. One of the questions asked to the interviewees was where could this circle of blame be broken and which actor would play the most important role in speeding up the sustainable development in Prague.

In this regard the respondents divided themselves into two groups, one claiming that the end-user (tenant) is the most important part of the chain as if he required the buildings to be sustainable, the other actors would have to adjust to this demand. Although the development of the pioneer City Green Court building in Prague was driven by the developer, it was still done under assumption that the attractiveness to the A-class tenants would increase. If, however a tenant is the way out from the circle of blame, the importance of the education and awareness issue gets very important, as tenant is the least professional from the three compared actors and is thus assumed to have the least knowledge about the benefits of sustainability in general. The advisors and valuers thus play a crucial role in this regard by educating the client about the benefits of sustainable office buildings. However, currently in Prague it seems like the advisors are rather demand driven, presenting sustainable offices to client if he shows some interest himself.

The other group of respondents did not provide a clear answer, claiming that the push would have to come from all the sides at once, possibly also from the public side of the government in form of regulations and incentives, although such does not seem to be the case in Prague today at all. One respondent even combined these two standpoints into one:

Theoretically it should come from the tenant, however practically I believe this will not be the case, it would have to go from all the sides at once.

Figure 47 presents an overview of the actors operating in the Prague office market and how are their current behaviour and standpoints performing in relation to speeding up the sustainable office development. The interrelations between actors were based on the figure called Virtuous loops of feedback and adaptation, created by RICS Europe (2008) and presented earlier in this report.
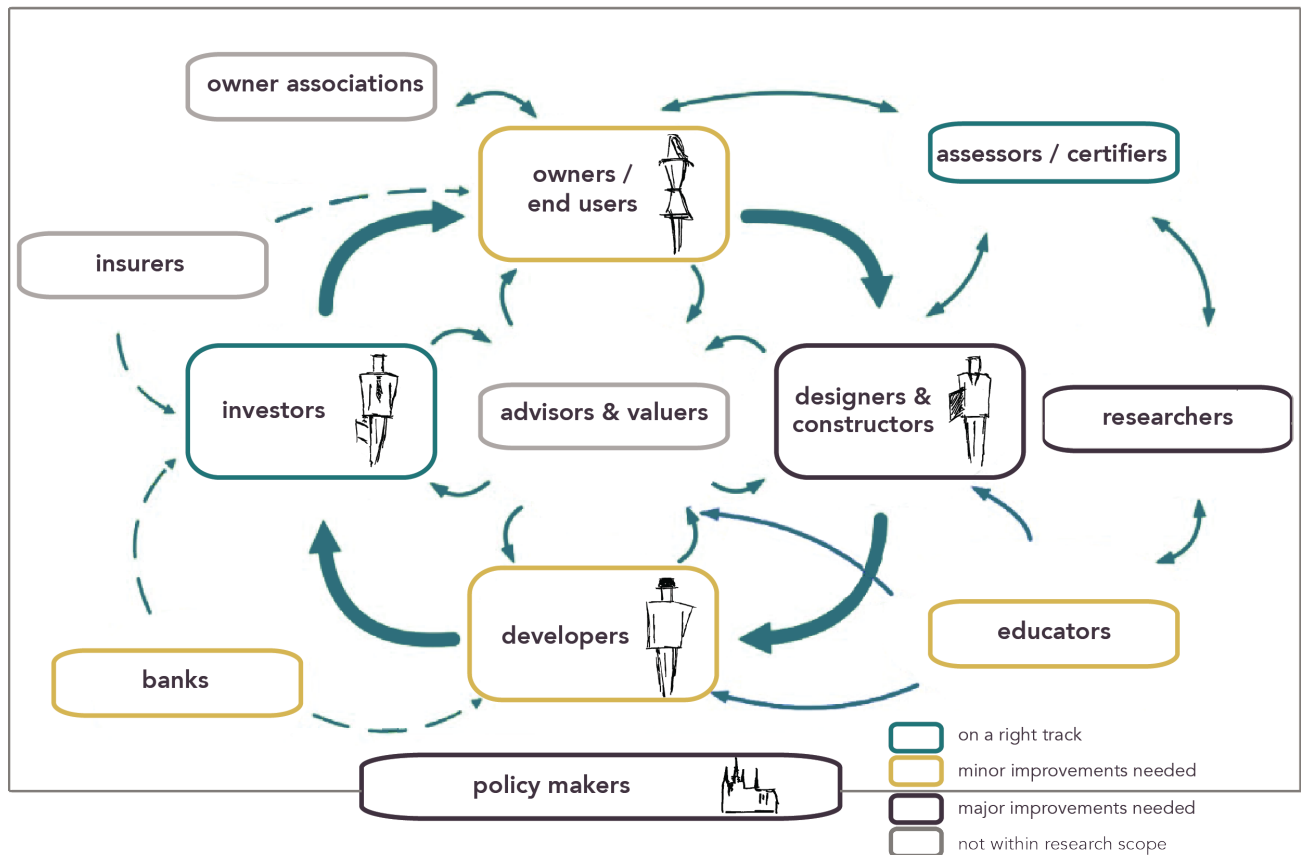
Figure 47 Actors operating in the Prague office market in relation to their current standpoint towards the sustainable office development (own ill. based on RICS Europe, 2008)

The actors that were seen as on a right track in speeding up the sustainable office development were investors and assessors/certifiers. Investors in Prague almost strictly demand the office buildings to be environmentally certified, forcing the developers to deliver a certain sustainable standard. Assessors/certifiers make their living out of the certifications and therefore push the sustainable development forward for their own good. A good assessor also helps client, usually a developer, to understand what lays behind each of the achievable credits within the certification and aims at reaching credits that would truly improve the building's sustainability and quality for the occupiers. The actors evaluated as needing minor improvements in their behaviour are developers, owners/end users, banks, and educators. Forced by the demand, developers currently deliver certified offices, however often the certification is achieved through soft, non-demanding credits. A more thorough understanding of the benefits of the sustainable buildings would be helpful. Some owners/end users demand their offices to be certified, others do not care about building's sustainability at all. Advisors or real estate agents play important role in educating the end-users about the potential benefits of sustainable buildings. Some banks in the Czech Republic are starting to support the sustainable development through green loans or green mortgages, however these efforts still remain quite scarce in the country. Educators as Czech Green Building Council organize many events in which the benefits of sustainable (office) buildings are being addressed. The issue of sustainability can be however better implemented in the curriculum of building faculties in the Czech technical universities than it is today. Designers and constructors, policy makers and researches were evaluated as needing major improvements in their behaviour to support the sustainable development of buildings. Mostly, the designers and constructors do not show much initiative regarding implementing sustainable solutions in

their designs, if they are not specifically asked to do so by their client, the main focus remains on the aesthetics and financial feasibility of a project. The policy makers in Prague currently find themselves in crisis regarding the new land use plan for the city, which was supposed to be finished in 2015 and current estimates about its completion are 2022. Such insecurity does not only hinder development of sustainable offices, but the development in the city in general. Although the importance of the sustainability in the built environment is growing, the amount of researches in the Czech Republic on the topic is not yet significant. The actors outside of the research scope of this research were advisors & valuers, insurers and owner associations. In case of advisors or real estate agents it is acknowledged that they play important role in educating the tenants about the potential benefits of sustainable buildings.

PART IV
CONCLUDING

FLORENTINUM - LEED PLATINUM

CHAPTER 8
CONCLUSIONS
AND RECOMMENDATIONS

Chapter 8: Conclusions & recommendations

This chapter will discuss the main conclusions of this research, combined from the desk research and the empirical research, together with the answers to the research questions. The second part of the chapter will summarize the possible application of the research in practice and the recommendations for further research.

Conclusions

This research aimed at contributing to the existing scientific knowledge by combining the general theory of the sustainability drivers and barriers, gathered through an extensive literature study, and comparing it with the local context of the Prague office market, researched by the empirical research. The trend of building sustainable office buildings, certified by some form of a third-party environmental certification as LEED or BREEAM, has been uprising throughout Europe, with the Czech Republic not being an exception in this matter. This research focused on the motivations behind building, investing or occupying the certified office buildings by approaching the problem from three different perspectives of developer, investor and tenant. This general overview of the market allowed to explore the "readiness" of the Prague office market and also an extent, to which the sustainability awareness of the market actors is determined by the local context they function in. For the identification of the relevant sustainability factors a Delphi panel approach was employed in this study in combination with semi-structured interviews to gather more general knowledge about the topic.

The main research question of this study, which will be answered in this final part, was defined as: *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?*

At the beginning of the research, four hypotheses were defined based on the gathered theoretical knowledge and several scope interviews. The hypotheses relate to the empirical part of this research and assume the current state of the sustainability awareness in the Prague office market. The first hypothesis describes the market in general. The following hypotheses look at the problem from the viewpoint of the three researched actors, and thus also relate to the research sub questions. Therefore, the following part of the report will be structured based on answering the research (sub) questions and confirming or rejecting the stated hypotheses.

Sustainability readiness of the Prague office market

Hypothesis 1   The Prague office market currently finds itself in a position of increasing awareness towards green certifications of the (newly-built) office buildings, however, the real understanding of the issue of sustainability is lacking.

In recent years a steep usually market-driven increase in amount of environmentally certified buildings has taken place all around the Western world and the demand for energy-efficient buildings and their certifications has been increasing. Ideas about sustainable built environment however originated much earlier, particularly in 1970's in times of first oil crisis; but only in the new millennia the general public has also started to pay attention to this issue and terms such as "green building" or "sustainable building" have become very vibrant. A desire to compare buildings among each other led to development of various environmental certifications such as LEED or BREEAM and many others, which evaluate buildings to pre-set criteria. In the Czech Republic these certifications were introduced around 2007 and from then on, a gradual increase in the number of the certified buildings could be noted. By far the highest number (61 out of total 87 certified buildings till 2015) relates to offices, from which the majority consists of the newly-built office

buildings in Prague, as presented in Figure 48. Currently almost all the newly-built office buildings in Prague are being certified, as it is demanded from the investors and some usually multinational tenants.
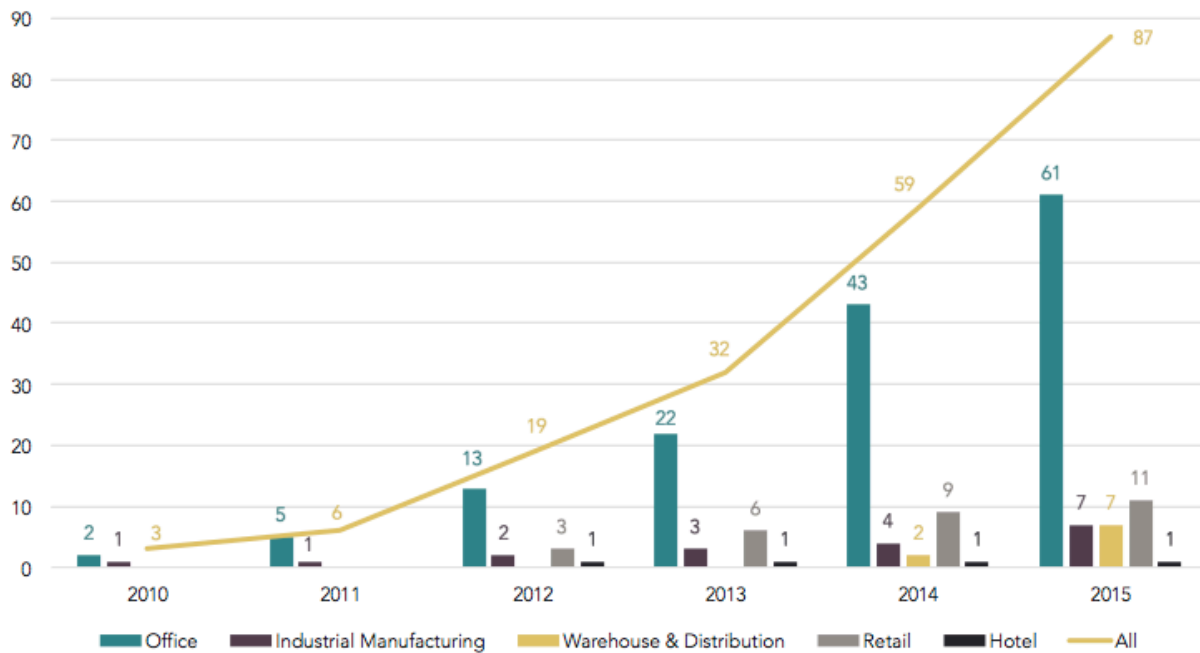
Figure 48 All certified buildings in the Czech Republic from 2010 till 2015 (CZGBC, 2016)

Although the increasing use of the green certifications may seem favourable for the sustainable development of the Prague office market, this increasing use of certifications does not necessarily equal to increasing efforts to create truly sustainable office buildings. The overall awareness of the sustainability issue in Prague remains low both in the public sector, as in case of municipality that lacks to provide any sustainability agenda and currently struggles with the development of the new land use plan for the city and thus blocks the developments, as well as in the private sector, where the market development has currently reached a certain "stagnation" point. The most often mentioned barrier against wider implementation of the sustainability principles by the research respondents was a lack of knowledge of the market actors about the topic. Within the Delphi panel, the factors of "knowledge of sustainability" and "interest in sustainability" mostly remained at the bottom of the ranking showing that these aspects do not play an important role in the decision-making processes, in which the financial perspective is prevailing. At the beginning of the certification trend, tenants and investors believed that green buildings would have had significant lowering impact on the operating and maintenance costs of the buildings. As in some cases this notion was not proved to be true, and the costs remained comparable to renovated non-certified buildings, the enthusiasm about the certifications dropped. Today more attention is being given to intangible aspects of the sustainable buildings such as the impact of the indoor environmental quality on the occupier's health, satisfaction and productivity. As these direct or indirect impacts are very hard to quantify, and their understanding require a bit more detailed knowledge about the problem field, the overall awareness of the benefits of the sustainable buildings remains rather low. Such is also visible in the residential market, where the location, price and architecture remain sole decision-making factors of the potential buyers. The office market being driven by multinational companies, that pay attention to the sustainability as part of their CSR, scores better in this matter.

The first hypothesis may be therefore only partially confirmed. The awareness of the green certifications in Prague steeply increased in 2011 after completion of the successful LEED Platinum certified project City Green Court. However, currently the market has reached a stagnating point where a certification is enough in terms of being environmentally friendly and thus competitive, but the true "greenness" of a building is not well-understood differentiation factor. In order to speed up the sustainable office development, a

better understanding of the overall issue of building's sustainability is needed in case of all the involved actors.

Developer's perception

Sub-question 1   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?

Hypothesis 2   The main sustainability drivers for the developer are lowered design and construction costs and increased return on investment. In Prague, it is more costly to build a top-certified sustainable office building compared to a common one, however, such price difference is not yet either reflected in the asset price of the building, or in the increased rent.

The developers are usually profit-driven market actors, whose drivers for developing anything extraordinary such as sustainable buildings are financial factors as higher return on investment or higher occupancy rate allowing the building to remain shorter time on market and being sold for higher selling price. On the other side of the equation, the costs for design and construction should not be significantly higher, or this price for increased building's quality and sustainability has to be reflected in the selling price. A legal obsolescence is a significant threat for a developer as long-lasting permit procedures may hinder the development and do not allow the developers to respond quickly to the market demand. Some developers build their corporate social responsibility around building top-certified office buildings and connect their external image with this notion. As the top levels of certification of LEED or BREEAM are much more demanding and require higher initial investments, an interest in sustainability and a thorough knowledge of sustainability for such developers are important aspects of their business. As discussed already above, such developer's behaviour is however not usually a standard one; the majority of developers remain prevailingly profit-driven with a certification on "average" level being only one of the issues that needs to be fulfilled within the project.

The increase in the design and construction costs as well as the rental and asset premia of the sustainable or certified office buildings have been researched quite often in recent years. The results of these scientific and market researches however vary. The increase in the design and construction costs for the top levels of the certifications is assumed to deviate from 0% to 13%; the size and the complexity of the project are important variables in this equation together with the stage in which it is decided that the building will become certified. Smart design implemented already in a concept stage of the project can significantly reduce these costs. In the interviews within this research, respondents also varied in their opinions about the cost increase for the top certified office buildings, assuming a 2-13% increase in the costs. The issue of the sales price premia and the higher return on investment of the sustainable or certified office buildings have also been researched by many scientists with big differences in their reported results. These differences probably come from not being able to separate the "sustainability" as one specific aspect of the building that can be measured, as it is very much interlinked with other aspects within a building such as its location, architecture, technologies, etc. In Prague, although investors and big tenants require the certifications, the willingness to pay more for such certifications remains low. For the newly-built office buildings in Prague the certification has become a necessity to stay competitive and demandable. Office buildings with the highest levels of certifications are still not very common; only one office building in Prague has achieved certificate BREEAM Outstanding and eight buildings have achieved LEED Platinum. These are usually rented out and sold quicker, thus positively contributing to the developer's cash flow. The sole top level certifications thus bring certain benefits to the developer or the building owner, however these are not direct financial premia.

The main drivers for the developers to build sustainably are financial factors as a higher return on investment, selling price or occupancy. These factors were pointed out by both the theory and the empirical

research, although the theory has also emphasized the importance of developer's image and his corporate social responsibility. Both the theory and the empirical research have concluded that it is more costly to build top-certified office buildings than common ones, the price difference for lower levels of certification as LEED Gold or BREEAM Very Good/Excellent is however not substantial. The top certifications also require higher involvement of the issue already in the initiation phase of the project, better knowledge and possibly a specific target group of future clients. The most important decision-making factors for Prague tenants remain office location and rent level, and tenants are not yet willing to pay higher rent for sustainability aspects of a building; the sustainability of Prague buildings is on the contrary with some theoretical findings not directly reflected in the asset price. The second hypothesis thus can be confirmed.

Investor's perception

Sub-question 2   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?

Hypothesis 3   For investors the main sustainability drivers are risk mitigation and increased asset value of a building. Investors in Prague do prefer to have sustainable office buildings in their portfolios, but do not differentiate between different types of certifications.

As an investor is in charge of long-term operation of an office building, the balance between the initial and the end investments to the building and the lifecycle costs need to be reached. The asset value of a building together with the exit yield, influenced by rent level, operating and maintenance costs, occupancy, ways of financing, building's overall quality and ability to possibly adapt to other functions, are in theory the crucial variables for investor in his decision making. The main theoretical drivers for sustainable buildings for investor is risk mitigation, capitalized in lowered operating and maintenance costs, caused by innovative energy-efficient technologies used in these buildings. When lower running costs are promised to a tenant, a potential is created for acquiring higher rent from the building. These lifecycle savings have to outweigh the potentially higher initial purchase price in order to make a sound business case and reach the required return on investment. When the amount of environmental certifications steeply increased in the Prague office market, the energy efficiency of certified office buildings was the main incentive for both tenants and investors. However, after several years of operating such certified buildings, the savings did not prove to be as substantial as expected. The reason is that such savings are influenced not only by the technologies used in the building, but also by other soft aspects as behaviour of the building's occupants or ability of facility manager to run and optimize the systems in a building, which may be sometimes difficult to manage.

The certification of newly-built office buildings in Prague has turned into standard and also many operating buildings are being certified by in-use certificates in order to stay competitive. The certification is required by some (mostly international) tenants that use occupation in a certified office building as a marketing tool for business partners and employees, and also by investors who believe that the certification may lead to attracting tenants and lowering the building's running costs. The most important decision making factor for investor is return on investment together with other financial aspects connected as rent level, exit yield, asset value, etc. The experts taking part in this research pointed out the close connection between these financial factors, making it very difficult to explicitly state the single most important factor. Reflecting back on the clusters of sustainability factors, presented in the theoretical overview of this research, it may be concluded, that cluster market value and the sustainability factors within this clusters are the most important sustainability drivers for investors. The first part of the third hypotheses thus can be confirmed.

Some respondents believed that investors do not really differentiate between types of certifications, however they do pay attention to the achieved level of certification. Same outcome was also confirmed in researched theory in general and also specifically in Prague market. As not many investors were

participating in this research, this issue could not be confirmed and so does the second part of the hypotheses. A further research on this topic would have to be performed to reject or confirm this statement.

Tenant's perception

Sub-question 3 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?

Hypothesis 4 The sustainability of the office building is an added value for the tenants through lowered operating costs and increased productivity and wellbeing of the employees. However in Prague, it is not the main factor in deciding about the offices and tenants are thus not yet willing to pay higher rent for occupying a sustainable office.

Tenant, the office occupier, may be the most important actor within the circle, as its author Cadman states already in 2000, that the vicious circle of blame could be broken by occupiers' demand, as the markets are usually tenant-driven. Same conclusion about the importance of the demand side of the spectrum from the potential tenants was reached within the panels, where apart from some exceptions became apparent, that developers certify the office buildings, because of the demand from investor's and tenants' side. However, as the tenant is the least "professional" one from the three researched perspectives and is the least likely to get accustomed to benefits of sustainable buildings himself, advisors and real estate agents become very important as they may educate the tenants about such benefits and thus support the sustainable office development.

The literature review has suggested that companies put emphasis on occupying sustainable buildings, as a way of improving their corporate image. However, as was apparent already from the literature and was later on confirmed within the interviews, it is very difficult to define "tenants" as one homogeneous group and thus it is very difficult to get a clear picture of tenants, their behaviour, drivers, etc. The company's actions are very much defined by the business it operates in, by the management personnel, by relation to its mother company, the country of origin, etc. Due to these aspects, the Delphi panel within this study from the tenant perspective reached the lowest level of consensus from the three cases, which was also caused by the clashing standpoints of company's management (which was the focus of the study), with the standpoint of employee.

The traditional factors as rent level together with operating costs and building's location were determined as the most important decision-making factors in the viewpoint of tenants. Therefore, Prague tenants seem not to be yet willing to pay rent premium for sustainability, or certification in particular. However, there is an upcoming trend of paying more attention to employees' wellbeing and happiness as companies start to understand that employees pay very important role as up to 90 % of the company's expenses is connected to its workforce. This trend is visible also in Prague, where some companies, for example in IT sector, invest into smart design of the office interior, quality installations, and other innovative office features. The focus on occupier's wellbeing is aligned with the certifications themselves as well as categories as Health & Wellbeing account for an important part of the certificate. However, these social aspects are not always directly linked to sustainability in the eyes of general public, whose awareness still often remain connected with the energy efficiency and decrease in the building's running costs. In conclusion, the final hypothesis was confirmed by the research.

Most important sustainability drivers and barriers

The main research question addresses the most important drivers and barriers towards sustainable office development. The literature and the subsequent empirical research showed, that these drivers and potential barriers vary for the involved actors, but are also very much linked together. The vicious circle of blame may possibly be broken by the push from the tenant side, however, in order to do so, they have to understand the benefits of occupying a sustainable building. As practice showed, easily countable benefits of low operating costs not always hold in the sustainable buildings, and the tenants would have to understand other less tangible, social aspects of sustainability, to be able to appreciate them, demand them and possibly pay more for them. The education may come from the side of government in forms of regulations or sustainable strategies, which is not the case in Prague as the municipality believes in office market solving its issues itself, from organisations as Green Building Council, which despite their efforts remain however slightly limited to actors already interested in the topic, or by developers, advisors and building owners. The last mentioned case could be visible at the very beginning of the certifications in Prague in case of the City Green Court building developed by Skanska, which was developed as the first LEED Platinum building, hoping that its uniqueness at that time would attract A-class tenants. This proved to be true and the building was fully rented out and sold even before the end of construction. Therefore in practice, the vicious circle of blame needs to be approached from all the three sides simultaneously.

The main drivers for the developers and investors lay in the financial benefits, and are in form of none or only a small increase in the design and construction costs and increase in the asset value. A thorough comparison of costs and benefits of sustainable buildings is needed in order to prove that with early involvement of sustainability in the design and capable design and construction team, the cost increase does not need to be substantial, and that it is worth spending a bit extra for purchasing a sustainable buildings while comparing it to the whole life cycle of such building. Currently, although a lot of research has been already done in quantifying the costs and benefits of sustainability, it still remains a rather confusing area as the outcomes of these researched vary and developers and investors cannot thus rely on any hard data. The lack of data and lack of awareness of all the spectrum of sustainability, were pointed out as the main barriers against the development. In the Prague context, this is also accompanied by obstacles in the legislative process, which do not only hinder sustainable development making some projects legally obsolete already in time of construction, but development in general. Lack of reliable zoning regulations, long permit procedures in case of bigger developments and unstable political situation are problems, which developers in Prague have to cope with in their practice.

In conclusion, the most important drivers and barriers are summarized in Figure 49. The drivers have been defined by the theoretical review and shaped by the empirical research, whereas the barriers relate more closely to the current situation of the Prague office market and were mostly retrieved from the empirical research. As the market situation is similar for other capitals within the Central Eastern Europe region, these main drivers and barriers may be generalized to these countries as well.
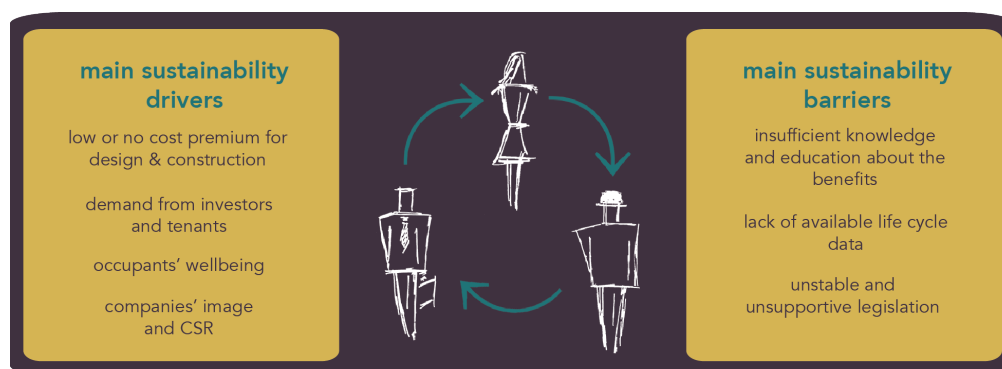
Figure 49 Most important sustainability drivers and barriers (own ill.)

Recommendations

Application in practice

This research took an integral approach, overlooking a general picture of the drivers and barriers towards sustainability in the Prague office market. It may thus function as a good starting point for actors in the field, to understand the issue of sustainability and relate it to the local context they function in, reflecting on the current market situation, market movements, and suggesting possible future pathways towards a more sustainable development. In Prague many actors in the field remain either rather sceptical towards the benefits of sustainability, or do not put much effort into understanding the issue in its complexity. As this research aimed to bring overview of different perspectives, it helps understanding the business case for sustainable offices as a whole. And understanding the state of the art is a first step in being able to improve or create something new.

Developers when aiming for an environmental certification usually limit themselves on counting the achievable credits and calculating the costs of them, they often do not really try to create truly more sustainable buildings. Often developers hold an opinion that sustainable buildings are much more expensive than common ones and in the Prague financially driven market such costs are impossible to retrieve back. However, the developers with help of consultants and assessors should try to understand the possibilities of implementing sustainability in their projects in order to gain the true added value and thus should demand sustainability from their architects and contractors. By combining strong commitment, knowledge exchange, early decision making and smart design and management, the costs for constructing such buildings do not need to be significantly higher and the buildings will subsequently bring greater value for their future owners and occupiers. A further step is paying more attention to sustainable retrofit and transformation of Prague buildings. As plots in attractive areas of Prague city centre are very scarce, retrofit and transformations seem to be the future ways to be looked into.

The investors should not only rely on the innovative and energy-efficient technologies used in their certified buildings and expect that such buildings will automatically consume less energy and water, and will need less maintenance. A great emphasis should be put on employing capable facility managers who understand the building's systems and who are able to monitor and optimize its performance, and also on building's commissioning and data gathering. Only then a reliable comparison between traditional and sustainable buildings is possible.

The occupiers need to understand the benefits of sustainable offices and the impacts these may have on the employees. In a healthy and comfortable environment the employees' wellbeing increases and so does the productivity. Moreover, if the occupiers behave according to building's design and capable facility management is put in place, savings on operating costs are possible. The advisors and real estate agents should educate tenants about such benefits of sustainable offices. If tenants understand all of these benefits, they might be eventually willing to pay premium for the sustainable aspects of buildings, making the business case stronger for developers and investors and speeding up the sustainable office development.

The Prague municipality should stabilise the current situation around the new Prague land use plan. Finishing this important document will decrease the developers' risks and thus support the development in the city. Moreover, the Prague municipality should create a sustainability agenda of the city within which further boundaries will be given to developers who wish to build in the city. The public tenders should be based more on qualitative criteria, including sustainability, not only on the lowest price, as is the practice today. This would trigger the architects and contractors to get accustomed to the issue of sustainability, and adjust their business and way of working accordingly.

Further research

As stated above, this research took a general perspective on the problem field. Subsequent research may be thus focused on the specific actors within the circle. Probably the most interesting one is the tenant, which as seen in this research is a difficult actor to clearly define. Moreover, it may focus specifically on some of the defined sustainability factors, preferably those that have been evaluated as the most important ones in the Delphi panels. For example the rent and asset value premia may be explored within the specific context of Prague using hedonic pricing study; or a thorough overview of the cost increase relating to design & construction of certified buildings in the Czech Republic may be done. These quantitative outcomes are important for showing whether the business case for sustainable buildings is indeed a solid one and the reluctance towards building sustainably is an unjustified standpoint of market actors, or whether improvements needs to be done in the process to create a sound business case.

The social aspects of sustainability in the Czech Republic or CEE region may also be researched more thoroughly. If any studies regarding sustainability are being done in this context, they mostly address energy-related, economic or environmental aspects. Looking at the social side of sustainability, the increase in wellbeing and productivity of the office occupiers would enhance the understanding of the issue as a whole.

Studies may also focus on evaluation of the certified buildings within their life cycle and search for reasons of why certified buildings, designed as energy-efficient, sometimes behave comparably to non-certified older building. This would include a study into behaviour of office occupiers and how these could be triggered to use the building as supposed to in order to achieve low energy demand.

A further research may also focus on possibilities of sustainable retrofit and sustainable transformation of office buildings in Prague. Developers usually assign more risks to retrofit and transformation than to building new, therefore the drivers for sustainable retrofit and transformation need to be clearly defined to support the business case.

Similar study may also be performed focusing on the residential sector of the built environment. As the end user is different, the results are expected to vary as well.

Lastly, research may focus on ways of addressing the issue of sustainability to general public, ways of approaching people and sending the intended message across. As markets are usually end user-driven, then if a sustainable development is the goal, the end user needs to understand the benefits of sustainable buildings to be willing to change his ways of thinking and operating.

CHAPTER 9
REFLECTION

Chapter 9: Reflection

At the end of the paper, it is important to reflect back on the research process, and a degree to which the initial aim was achieved. This final part is thus devoted to reflection on the research and on the personal process.

I greatly benefited from the research experience on both personal and professional level. During the thesis time, I not only gained a lot of new knowledge about the researched topic and about proper ways of conducting a scientific research, but I also had an opportunity to meet incredibly interesting people from the field. Throughout the research there were times, through which I moved with ease and excitement, others during which I had to fight with frustration and difficulties. All these bits and pieces left me at the end more mature, knowledgeable and humble. I began the research with high ambitions, hard statements, and a tendency to jump to quick and easy solutions. In the process, thanks to great feedback from my supervisors, colleagues and friends, with whom I discussed my on-going work, I started to follow Elon Musk's words: "I think that's the single best piece of advice: constantly think about how you could be doing things better and questioning yourself". At the end, I feel that this particular issue is the most valuable one I have gained from my thesis; an ability to think critically about information that is provided to me and constantly reflect back on my opinions and actions.

Reflection research

This research was carried out in ten months. The first five months consisted of writing a research proposal and defining a research scope. The remaining five months were devoted to the actual research. The methods chosen for approaching the research were literature study, scope interview, Delphi method and semi-structured interviews.

The literature study phase marked a rather rough start of the thesis. At the beginning of the thesis work I found it quite difficult to clearly frame the research scope, which would then easily filter relevant scientific articles for my literature review. Instead I went through great number of articles in order to search for the right path, leaving me however more overwhelmed; in other words, I was experiencing difficulties to step down from the "general notion of sustainability" on a big scale and frame my research into the scope of the built environment. Moreover, the focus of my research has shifted several times. At first, I intended to clearly separate drivers and barriers of sustainable office development, however the issue proved to be much more complex to be able to do so. The more I dived into the literature, the more interconnections I found in between various factors I have set. Next to the literature review, I have performed three scope interviews, which have not only greatly helped me to narrow down my research focus and specifically showed me possible research pathways, but were also extremely helpful in shedding some light on the Prague context.

Another difficulty appeared in P2 period when I needed to set some definitions, specifically what I mean by "sustainable office buildings", which were the focus of my research. I defined them as buildings that have achieved top levels of environmental certifications as LEED or BREEAM. This definition, although widely used in the market, was however questioned several times later on during the interviews, pointing out that energy efficiency of certified buildings is sometimes comparable with other non-certified buildings and that not always are the occupants of certified offices more satisfied. Throughout the process, I sometimes found myself confused by all these different aspects of sustainability and their interrelations and I had to re-evaluate what exactly is the issue I am researching and whether I am keeping the right direction.

The empirical research consisted of Delphi panel, in which first round was performed in person and thus allowed combination with semi-structured interviews. From the two methods used, the semi-structured

interviews seemed to be more fitting for the purpose of the explorative nature of this study and during the discussions a lot of interesting issues were brought up. The Delphi panels did not reach as high consensus as was initially hoped for, probably due to the heterogeneity of the expert panel, interrelations between the rated factors and a fact that for some respondents it might have been too difficult to grasp the whole complexity of such rather new topic. Moreover, the Delphi method requires longer-lasting involvement of the respondents as they are being asked to review their answers in several rounds. Although most of the respondents were very keen on setting up a meeting for the first round and gave a lot of interesting opinions in the interviews, unfortunately, in the second round most of the respondents did not react on the plea to adjust their answers. Also by sending reminders and appeals to react, the whole data gathering process then took much longer than expected. Typically, the process of Delphi rounds should be repeated until desired consensus is reached, however, I cannot imagine this happening as I experienced respondents' fatigue and reluctance to participate already in round two. In the process, this was quite a disappointment for me, and I would recommend other students using Delphi for their research to make sure of the lasting interest and enthusiasm of their respondents throughout the whole empirical research.

The research in general could have been done better, if 1) more respondents were involved which would increase a chance of more respondents reacting in the subsequent rounds, 2) the respondents would be more specifically defined as "members" of one of the three (developer-investor-tenant) perspectives and 3) the first round of the Delphi was analysed faster in order to follow up quicker on the meetings and thus keep up the interest of the respondents. Moreover, during the empirical research phase it became apparent that several additional sustainability factors could have been used in the research, such as demand level, unfulfilled expectations, legal boundaries, subsidies, personalities of company's management, etc. Due to continuity of the Delphi these were however impossible to implement in the research in later stages. Perhaps to avoid such situation, a few more scope interviews could have been done right after finalising the theoretical framework in order to validate the list of factors before starting the actual Delphi.

Lastly, I experienced some difficulties in drawing conclusions separately from the quantitative and qualitative part of the research. Drawing conclusions in the qualitative research in general requires some expertise in addressing concepts from the collected data; the amount of opinions and interests, which are often quite subjective, makes it hard to draw hard black and white conclusions. The final findings of the research are due to the chosen topic and not high consensus in the Delphi thus rather general and less concrete than I have hoped for at the beginning.

Reflection personal process

The first step of the thesis process is choosing a research topic. Although I was certain from the beginning that I want to focus on the soft side of sustainability, searching for the drivers behind it, I experienced a lot of difficulties with narrowing down the thesis topic and defining the final product of the thesis, as already discussed above. I spent a lot of time reading articles about the issue of sustainability in general terms, and the complexity of the issue kept me from setting up an aim reachable in a one-year-long research project. In the period between P1 and P2 my focus shifted from retrofit of existing offices to mostly newly-built certified offices. The reasoning behind this decision was a need for testing the hypothesis whether or not the retrofitted office buildings are more sustainable than the newly-built office building. This could have been a thesis topic by itself and it was not the way I wanted to go. Moreover, even though this hypothesis would have been taken as truth and used as a starting point of the research, it was very questionable whether the respondents in the Czech Republic, who later proved to be very financially driven, would be able to align with such statement.

The planning of the research was estimated at the beginning of the process and finalised in the P2 research proposal. It was however adjusted several times afterwards due to changes in the research methodology, time changes of performing the empirical research in Prague and due to other university obligations. What

proved very useful for me was setting up several layers of goals, starting from main milestones as P1 to P5, divided into separate topics which needed to be addressed before each milestone, and finally by writing down more specific to-do list per each week as I moved to next topic. However, this task-division need to be done very cautiously and must involve some buffer periods for cases, when the research does not go at planned speed, which in my experience happens most of the times.

Performing the empirical research in a different country than the current country of residence was sometimes also an obstacle. Firstly, I had only limited time when I was personally present in the Czech Republic and when the interviews could have been performed. This time did not fit several potential respondents and thus they could not actively participate in the research. Secondly, in the sampling procedure I had to rely solely on my contacts and could not use contact databases of the university. Getting the contacts thus became quite time consuming. And lastly, it was sometimes difficult to operate in two languages and effort had to be put into being precise on the correct interpretation of the interview set-up and findings. This "language-barrier" might have been also a reason for potential misunderstanding of some respondents about the meaning of a few sustainability factors.

On the other hand, I was very lucky to interview the true experts in the field of sustainability in Prague. This field still remains quite small in the Czech Republic, so it could be said that throughout the research I have met most of the people involved in the field. This was confirmed during the interview round, as at some point the respondents started recommending me to contact other respondents, with whom I have already met. These new acquaintances have already proved to be very valuable for my future career, as following up on the research, I have already started collaboration with Czech Green Building Council and entered into discussions about possible job positions. The thesis thus has marked an important milestone in both my professional as well as personal development.

REFERENCES
APPENDICES

BLOX - BREEAM OUTSTANDING

REFERENCES

List of abbreviations

BRE	Building Research Establishment
BREEAM	Building Research Establishment Assessment Method
CEE	Central Eastern Europe
CO_2	carbon dioxide
CSR	corporate social responsibility
CZGBC	Czech Green Building Council
DGNB	Deutsche Gesellschaft für Nachhaltiges Bauen
ESCo	energy service company
EU	European Union
GDP	gross domestic product
HVAC	heating, ventilation and air-conditioning
IPCC	Intergovernmental Panel on Climate Change
IPR	Institut plánování a rozvoje hl. m. Prahy
LEED	Leadership in Energy and Environmental Design
NPV	net present value
RICS	Royal Institution of Chartered Surveyors
RPI	responsible property investing
SBTool	Sustainable Buildings Tool
SEAP	sustainable energy action plan
U.S.	United States (of America)
USGBC	U. S. Green Building Council
WGBC	World Green Building Council

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APPENDICES

Appendix A: sustainability factors

developer

znalost problematiky trvale udržitelného rozvoje
knowledge of sustainability

Nedostatečná znalost problematiky trvale udržitelného rozvoje může být překážkou pro další rozvoj a implementaci šetrných budov.

zájem o trvale udržitelný rozvoj
interest in sustainability

Jelikož cílem mnoha firem je finanční profit, který nemusí být v otázce trvale udržitelných staveb zřetelný na první pohled, zájem firem o implementaci může být snížen.

cena návrhu a výstavby
design & construction costs

Pro nejvyšší stupeň certifikace LEED či BREEAM je odhad zvýšení nákladů na návrh a výstavbu v řádu několika procent.

právní záležitosti & povolení
legal obsolescence

Příliš pomalý proces získávání povolení může být bariérou pro implementaci šetrných budov, neboť v době získání povolení jsou již navržené technologie v budově částečně zastaralé.

financování projektu
financing

Je možné, že developer či investor snáze získá peníze na výstavbu či koupi šetrné budovy než budovy běžné, neboť investice do šetrné budovy je pokládána za méně riskantní.

doba prodeje
time to sell

Někteří developeři věří, že certifikovanou budovu je možné rychleji prodat; je atraktivní pro investory. Zda je toto způsobeno šetrností budovy či dalšími aspekty (jako např. lokalita, architektura), je otázkou.

obsazenost budovy
occupancy

Někteří developeři věří, že certifikovanou budovu je možné snáze pronajmout; je atraktivní pro nájemce. Zda je toto způsobeno šetrností budovy či dalšími aspekty (jako např. lokalita, architektura), je otázkou.

image & marketing
image & marketing

Certifikace kancelářských budov je v dnešní době používána developery a investory především jako součást propagace budovy mezi nájemci. Pro nájemce mít kancelář v šetrné budově může zlepšovat jeho image před potenciálními klienty a obchodními partnery.

návratnost investice
return on investment

Za předpokladu, že tržní hodnota šetrné budovy je vyšší, a že náklady na její výstavbu o mnoho nepřesáhnou náklady na výstavbu běžné budovy, návratnost investice se zvyšuje.

kvalita budovy
building's quality

U šetrné budovy je též dbáno na její lokalitu, architekturu, funkčnost či použité technologie (mj. součástí certifikací). Celková kvalita budovy tedy může být vyšší než u budovy běžné.

prodejní cena budovy
selling price

Jelikož náklady na výstavbu šetrné budovy mohou být vyšší než budovy běžné, investice je pro developera výhodná tehdy, kdy se mu náklady vrátí v podobě vyšší prodejní ceny budovy.

Figure 50 Sustainability factors from the developer´s perspective (own ill.)

investor

znalost problematiky
trvale udržitelného rozvoje
knowledge of sustainability

Nedostatečná znalost problematiky trvale udržitelného rozvoje může být překážkou pro další rozvoj a implementaci šetrných budov.

zájem o trvale udržitelný
rozvoj
interest in sustainability

Jelikož cílem mnoha firem je finanční profit, který nemusí být v otázce trvale udržitelných staveb zřetelný na první pohled, zájem firem o implementaci může být snížen.

exit yield
exit yield

Jelikož investice do šetrných budov může být investory považována za méně riskantní, konečný výnos (exit yield) aplikován k získání současné hodnoty (NPV) investice může být nižší.

provozní náklady
operating costs

Důležitým aspektem šetrných budov je jejich nižší spotřeba energie, tedy snížené provozní náklady. Paradoxem však je, že za lepší technologie, použité v budově, platí developer, zatímco výhody v podobě nižších provozních nákladů většinou využívá nájemce.

financování projektu
financing

Je možné, že developer či investor snáze získá peníze na výstavbu či koupi šetrné budovy než budovy běžné, neboť investice do šetrné budovy je pokládána za méně riskantní.

náklady na údržbu
maintenance costs

V šetrných budovách jsou převážně použity nové spolehlivější technologie, které vyžadují nižší údržbu. Náklady na údržbu se tedy snižují.

obsazenost budovy
occupancy

Někteří developeři věří, že certifikovanou budovu je možné snáze pronajmout; je atraktivní pro nájemce. Zda je toto způsobeno šetrností budovy či dalšími aspekty (jako např. lokalita, architektura), je otázkou.

image & marketing
image & marketing

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návratnost investice
return on investment

Za předpokladu, že tržní hodnota šetrné budovy je vyšší, a že náklady na její výstavbu o mnoho nepřesáhnou náklady na výstavbu běžné budovy, návratnost investice se zvyšuje.

kvalita budovy
building's quality

U šetrné budovy je též dbáno na její lokalitu, architekturu, funkčnost či použité technologie (mj. součástí certifikací). Celková kvalita budovy tedy může být vyšší než u budovy běžné.

výše nájmu
rent level

Některé výzkumy potvrdily, že výše nájmu je vyšší u šetrných kancelářských budov než u srovnatelných běžných budov. Je ovšem obtížné ve statistikách zcela izolovat pouze "šetrnost" budovy, aniž by nebyly brány v potaz ostatní aspekty (např. lokalita, architektura).

hodnota budovy
asset value

Některé výzkumy potvrdily, že tržní hodnota je vyšší u šetrných kancelářských budov než u srovnatelných běžných budov. Je ovšem obtížné ve statistikách zcela izolovat pouze "šetrnost" budovy, aniž by nebyly brány v potaz ostatní aspekty (např. lokalita, architektura).

funční zastaralost budovy
functional obsolescence

U šetrných budov je občas též dbáno na flexibilitu, dlouhou životnost a možnost využití i pro jinou funkci, než byla budova původně navržena.

Figure 51 Sustainability factors from the investor´s perspective (own ill.)

nájemník

výše nájmu
rent level

Některé výzkumy potvrdily, že výše nájmu je vyšší u šetrných kancelářských budov než u srovnatelných běžných budov. Je ovšem obtížné ve statistikách zcela izolovat pouze "šetrnost" budovy, aniž by nebyly brány v potaz ostatní aspekty (např. lokalita, architektura).

náklady na údržbu
maintenance costs

V šetrných budovách jsou převážně použity nové spolehlivější technologie, které vyžadují nižší údržbu. Náklady na údržbu se tedy snižují.

kvalita budovy
building's quality

U šetrné budovy je též dbáno na její lokalitu, architekturu, funkčnost či použité technologie (mj. součástí certifikací). Celková kvalita budovy tedy může být vyšší než u budovy běžné.

provozní náklady
operating costs

Důležitým aspektem šetrných budov je jejich nižší spotřeba energie, tedy snížené provozní náklady. Paradoxem však je, že za lepší technologie, použité v budově, platí developer, zatímco výhody v podobě nižších provozních nákladů většinou využívá nájemce.

produktivita práce
productivity

Některé výzkumy dokázaly, že v šetrných budovách díky vyšší kvalitě vnitřního prostředí je zvýšená produktivita zaměstnanců. Tento aspekt, leč velmi důležitý pro jakoukoliv firmu (náklady na personál tvoří většinou nejvyšší položku v nákladech firmy) se velmi těžce přímo dokazuje.

vnitřní komfort
comfort

Obecně se předpokládá, že vyšší kvalita vnitřního prostředí společně s promyšlenou architekturou zvyšují komfort pro nájemce v šetrné budově.

spokojenost personálu
staff happiness and satisfaction

Některé výzkumy dokázaly, že v šetrných budovách je personál spokojenější. Tento aspekt se ovšem velmi těžce přímo dokazuje, především protože je složité oddělit "šetrnost" od dalších aspektů budovy (např. architektura).

zdraví personálu
staff health

Výzkumy dokázaly, že se v šetrných budovách díky vyšší kvalitě vnitřního prostředí zlepšuje zdraví personálu. Jelikož pro většinu firem jsou náklady na zaměstnance hlavním nákladem firmy, tento aspekt je velmi důležitý.

zájem o trvale udržitelný rozvoj
interest in sustainability

Jelikož cílem mnoha firem je finanční profit, který nemusí být v otázce trvale udržitelných staveb zřetelný na první pohled, zájem firem o implementaci může být snížen.

image & marketing
image & marketing

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znalost problematiky trvale udržitelného rozvoje
knowledge of sustainability

Nedostatečná znalost problematiky trvale udržitelného rozvoje může být překážkou pro další rozvoj a implementaci šetrných budov.

Figure 52 Sustainability factors from the tenant´s perspective (own ill.)

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Appendix B: Box-plots

A box-plots or box-whisker diagrams are graphical representation of the distribution of a variable. At the centre of the plot is the median, surrounded by a box at the top and the bottom, representing the middle 50 percent of observations; the length of the box represents the interquartile range. The whiskers sticking out from the top and bottom of the box, extend to the most and least extreme scores respectively, the maximum and minimum value of the observations (Field, 2009, p. 99; Koppels et al., 2007). The circles and stars outside the box-plots represent cases, which are deemed to be outliers; in other words observations with values that deviate more than 1,5 times from the interquartile range. The small circle (o) represents "out" value, whereas the asterisk (*) stands for "far our" or extreme value (Field, 2009; Koppels et al., 2007, p. 102).
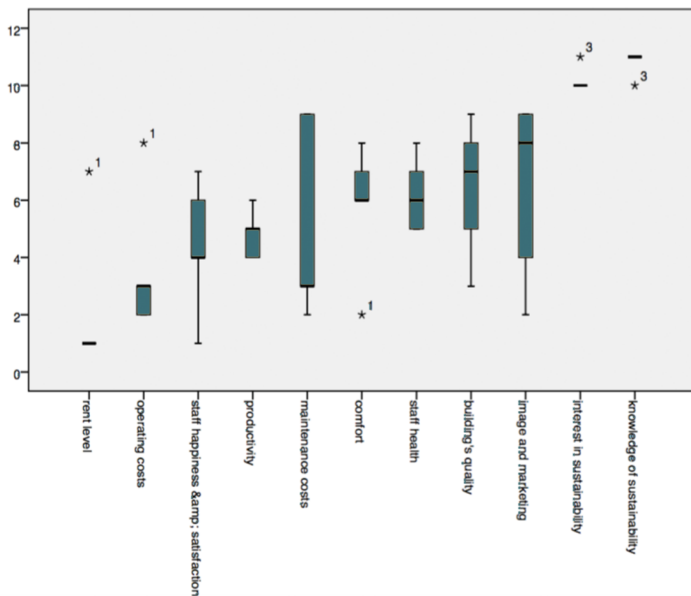
Figure 53 Cross analysis, developer´s perception of tenants (own ill.)
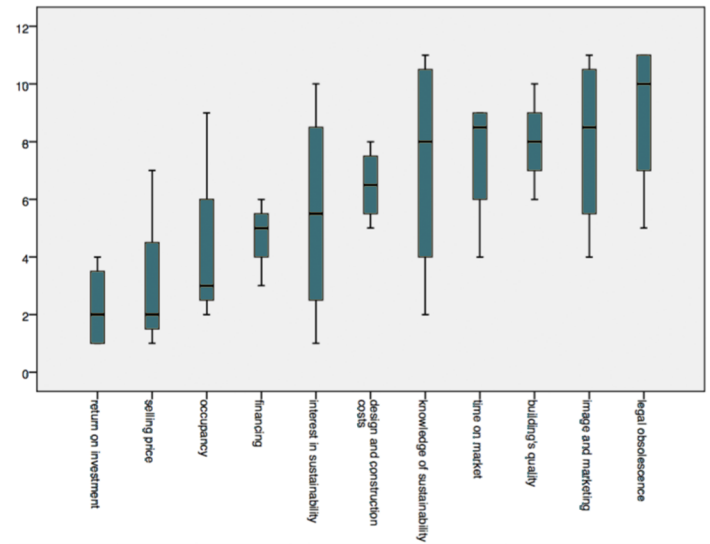
Figure 54 Cross analysis, tenant´s perception of developers (own ill.)

123
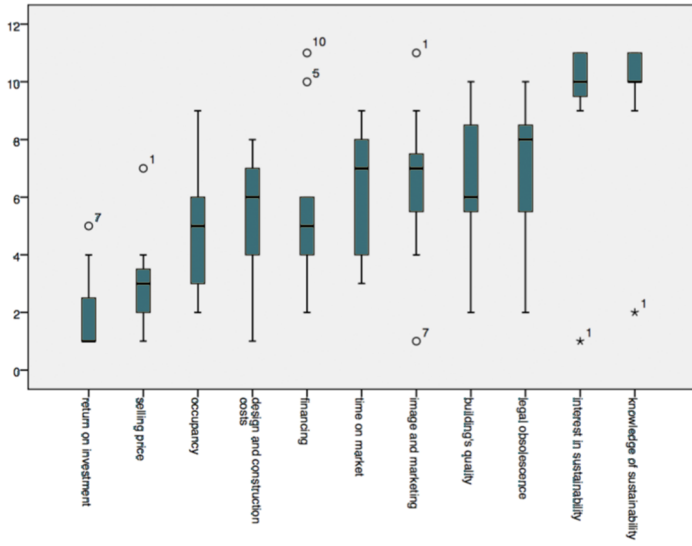
Figure 55 Developer, round 1, general profile
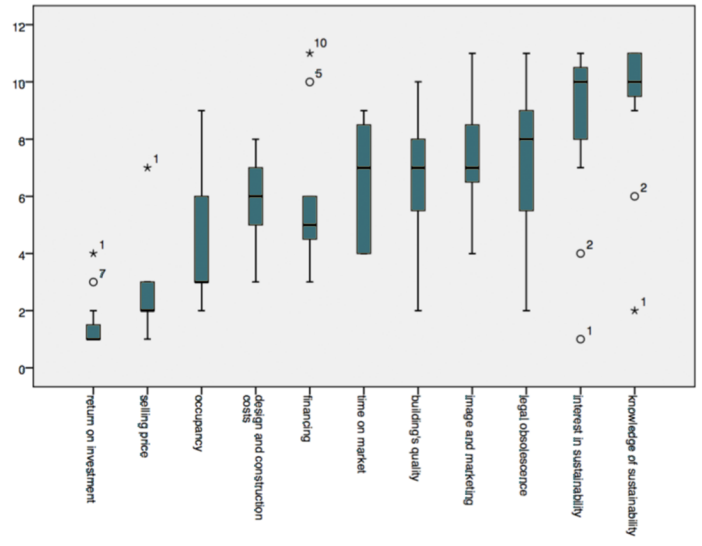
Figure 56 Developer, round 2, general profile
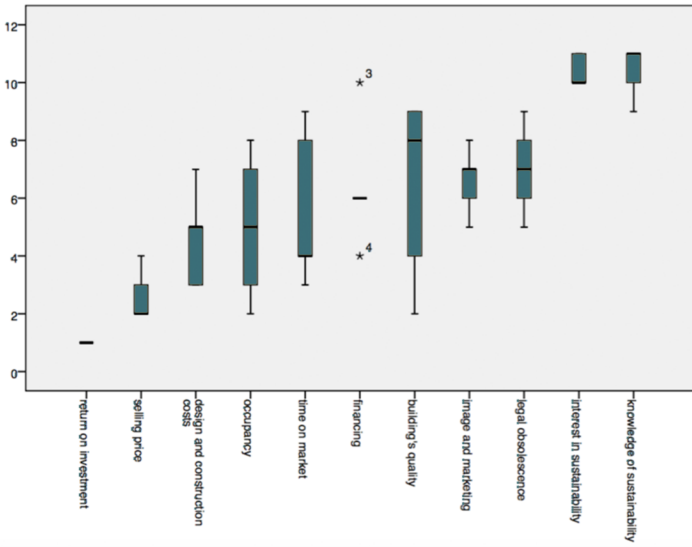
Figure 57 Developer, round 1, developer profile
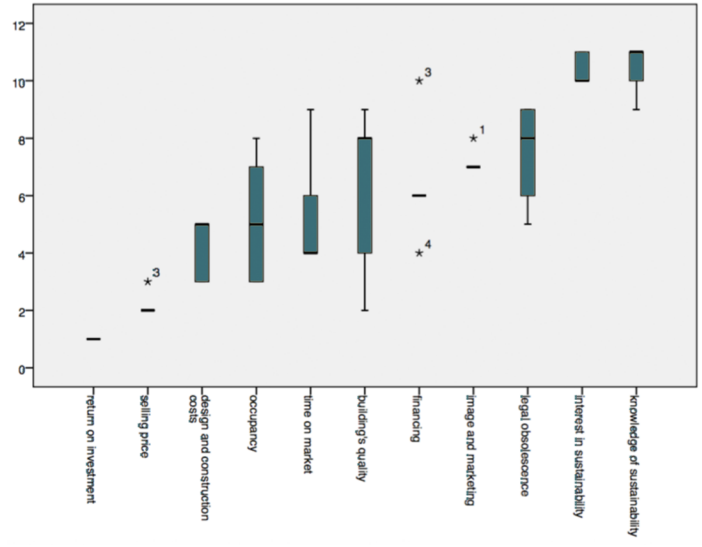
Figure 58 Developer, round 2, developer profile
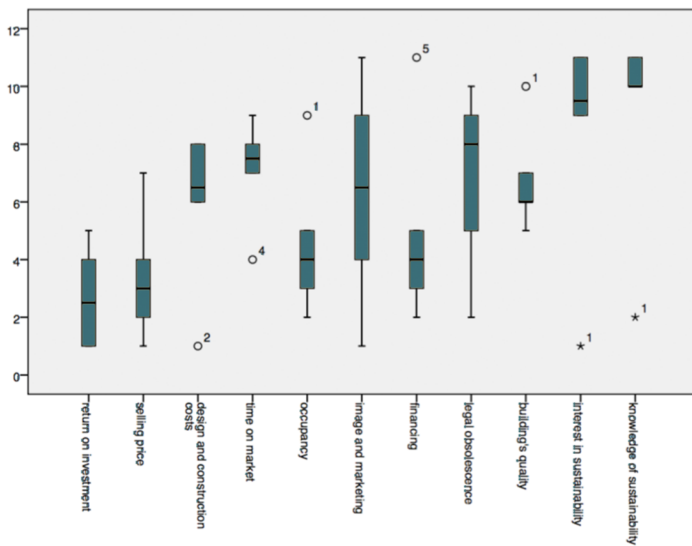
Figure 59 Developer, round 1, "others" profile
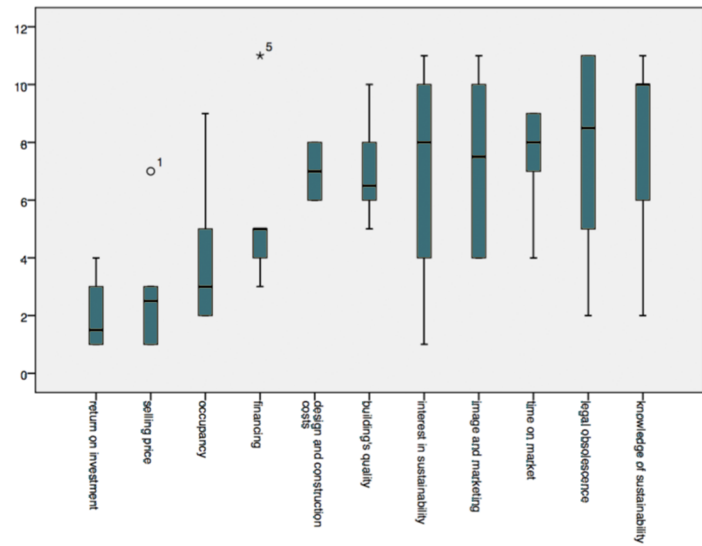
Figure 60 Developer, round 2, "others" profile
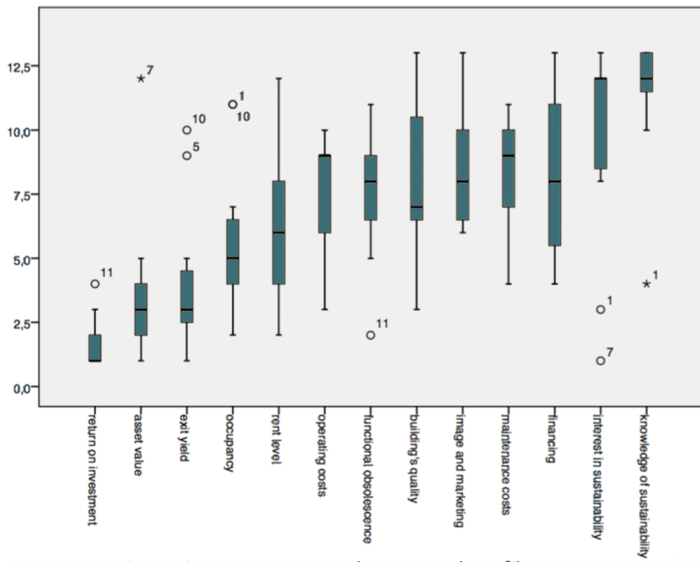
Figure 61 Investor, round 1, general profile
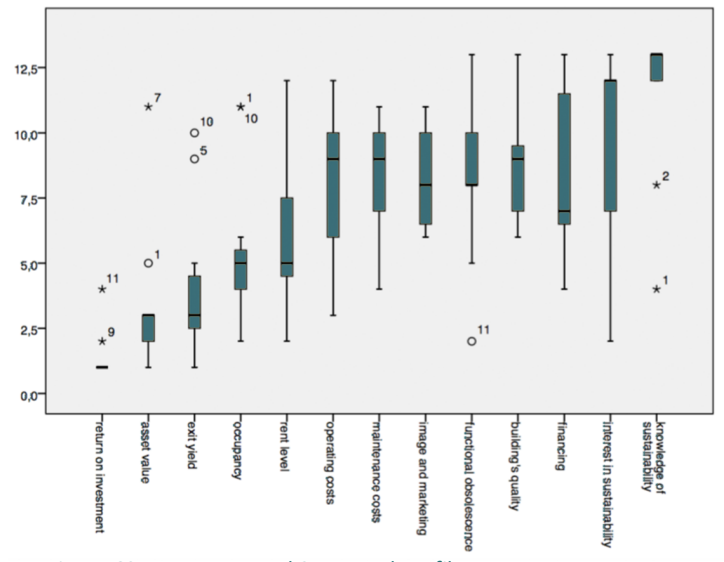
Figure 62 Investor, round 2, general profile
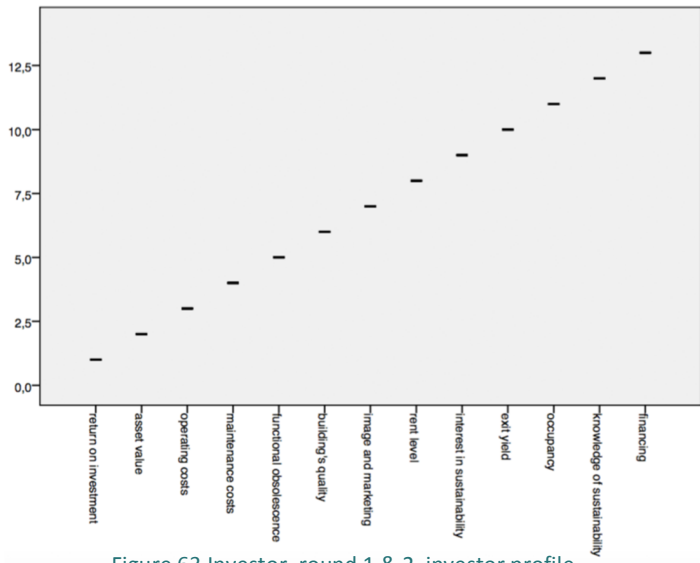
Figure 63 Investor, round 1 & 2, investor profile
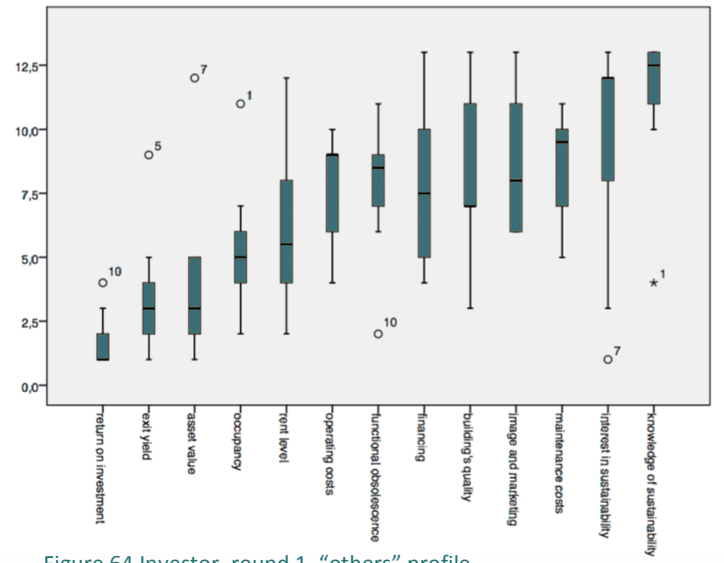
Figure 64 Investor, round 1, "others" profile
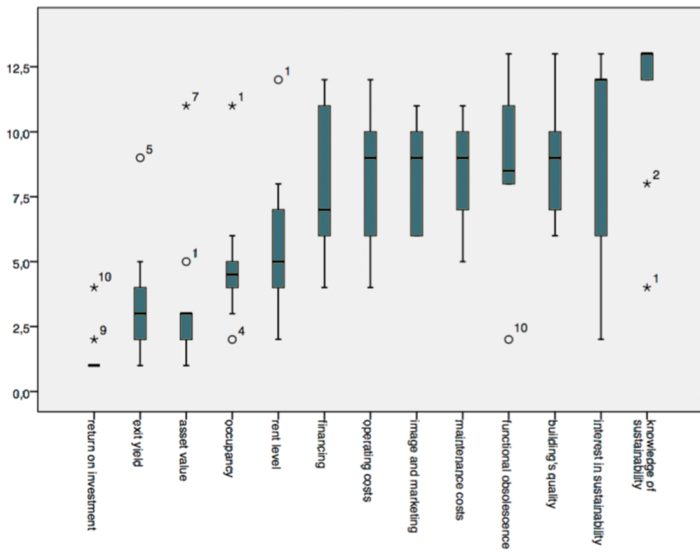
Figure 65 Investor, round 2, "others" profile
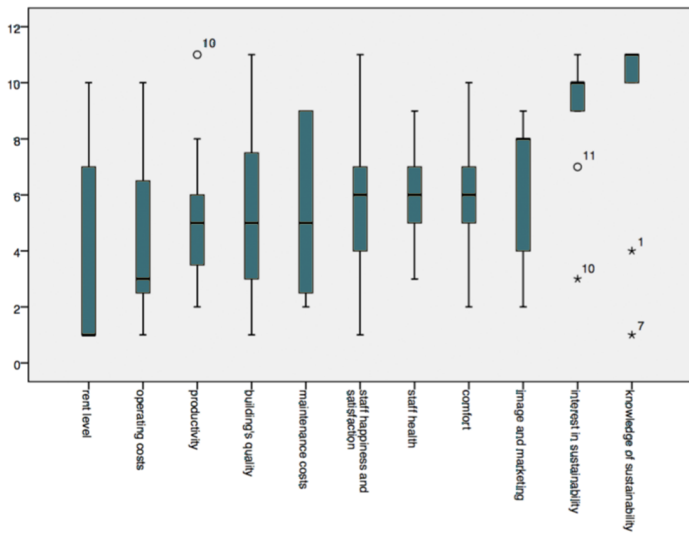
Figure 66 Tenant, round 1, general profile
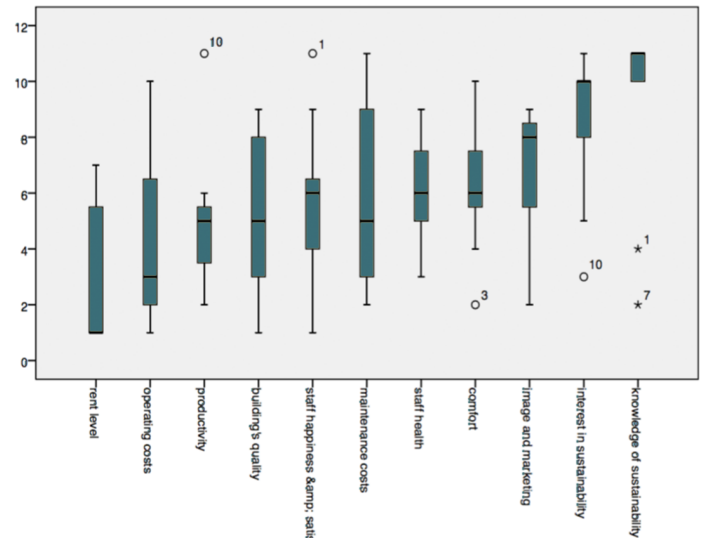
Figure 67 Tenant, round 2, general profile
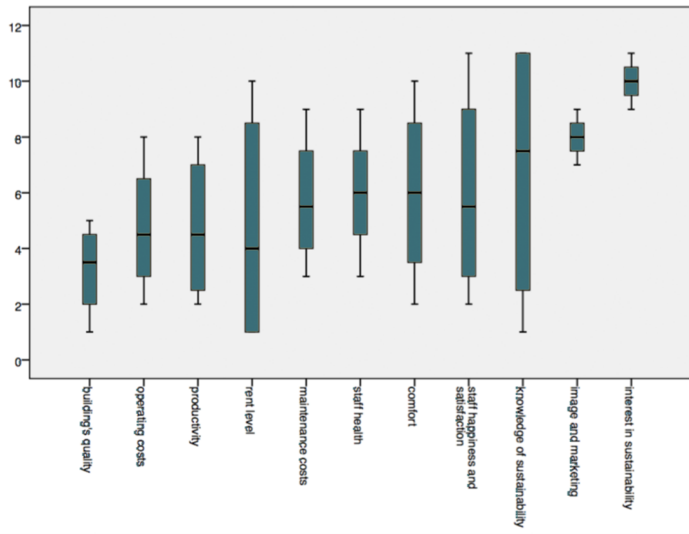
Figure 68 Tenant, round 1, tenant profile
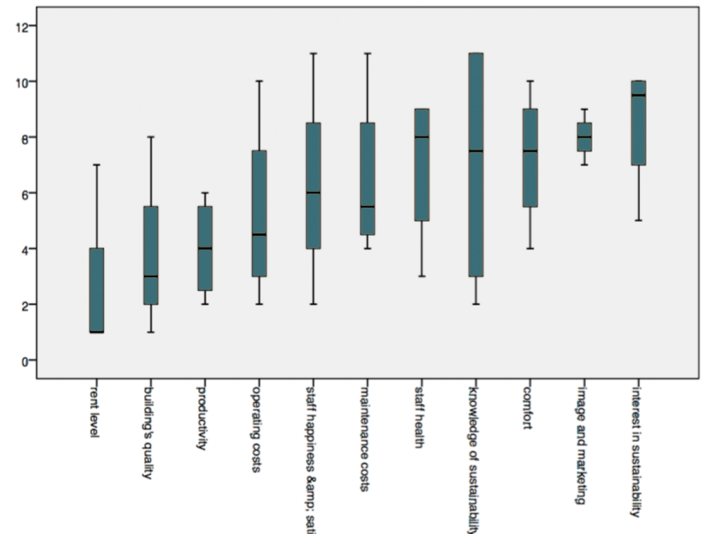
Figure 69 Tenant, round 2,   tenant profile
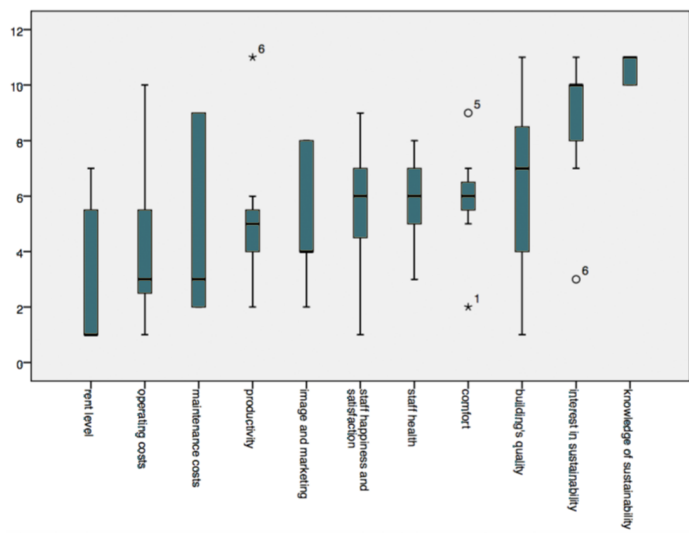
Figure 70 Tenant, round 1, "others" profile
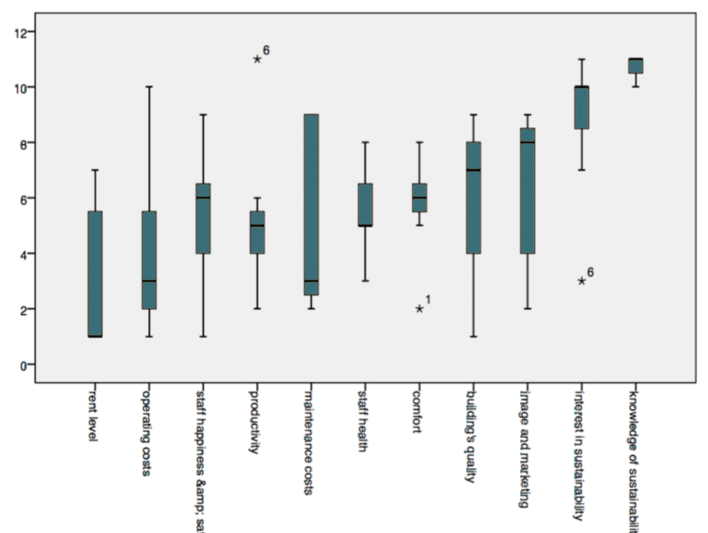
Figure 71 Tenant, round 2, "others" profile

Appendix C: Preparation sheet for the 1st round Delphi and interviews

PRAKTICKÁ ČÁST VÝZKUMU K DIPLOMOVÉ PRÁCI

Sustainability drivers and barriers: mapping the motives for sustainable office development in Prague

5. – 12. dubna 2016, Praha
Karolína Dvořáková, Management in the Built Environment, TU Delft

Úvod do diplomové práce

Diplomová práce s názvem "*Sustainability drivers and barriers: Mapping the motives for sustainable office development in Prague*" je závěrečnou prací mého magisterského studia oboru Management in the Built Environment na Fakultě architektury na Technické univerzitě v Delftu, Nizozemí.

Ve své diplomové práci se snažím definovat teoretické důvody, proč by investoři, nájemci a developeři mohli preferovat stavění zelených kanceláří a porovnávám je s momentální situací na pražském trhu. Celková doba práce na diplomové práci je rok (konkrétně září 2015 – září 2016) a skládá se z několika kroků: definování problému a oblasti zájmu, teoretický výzkum tématu v dostupné literatuře, praktický výzkum a vyvození závěrů.

Stručné definování problému řešeného v diplomové práci

Trvale udržitelný rozvoj (*sustainability*) ve stavebnictví je v rámci vyspělé části světa velmi důležitým tématem již několik let a jeho rozvoji napomáhá jak nemalé množství akademického i praktického výzkumu, tak národní i nadnárodní legislativa. V oblasti komerčního developmentu toto téma nabralo na důležitosti mj. díky **environmentálním certifikacím** jako například LEED či BREEAM, které se používají pro ohodnocení kancelářských budov z hlediska dopadu na životní prostředí. Mezi hlavní hodnocené oblasti těchto takzvaných „zelených kanceláří" patří spotřeba energie a zdrojů, lokalita stavby, kvalita stavebního procesu, materiálů a vnitřního prostředí, odpadové hospodářství a úroveň znečištění stavbou.

V **České republice** se certifikace budov aktivně používají již několik let a v dnešní době takřka každá nově postavená kancelářská budova v Praze usiluje o určitý stupeň certifikace. Obdržený certifikát je developery a investory následně užíván především jako prostředek pro **propagaci budovy** mezi nájemci. Přestože náklady na výstavbu certifikované budovy s nejvyšším ohodnocením jsou pro developera finančně náročnější, na českém (konkrétně pražském) trhu se tyto výdaje prozatím zcela nepromítají ve vyšší hodnotě budovy a to jako vyšší nájem či vyšší celková tržní hodnota (*market value*) budovy.

Hlavním **cílem této práce** je zmapování teoretických motivů a překážek developerů, investorů a nájemců pro výstavbu/investování/pronajímání šetrných kanceláří a jejich porovnání s momentální situací na pražském trhu. V České republice momentálně neexistuje velké množství akademického výzkumu na téma šetrného stavění, proto má diplomová práce je poněkud obecnějšího charakteru a snaží se zhodnotit problém z různých pohledů.

Teoretický výzkum literatury

V rámci mého teoretického výzkumu byl zpracován rozsáhlý přehled literatury, v němž jsem definovala nejdůležitější faktory (*sustainability factors*) týkající se tématu výstavby šetrných kanceláří. Výchozím bodem pro můj teoretický model byl tzv. ***vicious circle of blame*** představený v roce 2000 Davidem Cadmanem a v roce 2008 převzán společností RICS. *Vicious circle of blame* popisuje vztahy mezi jednotlivými aktéry v oblasti šetrného stavění.
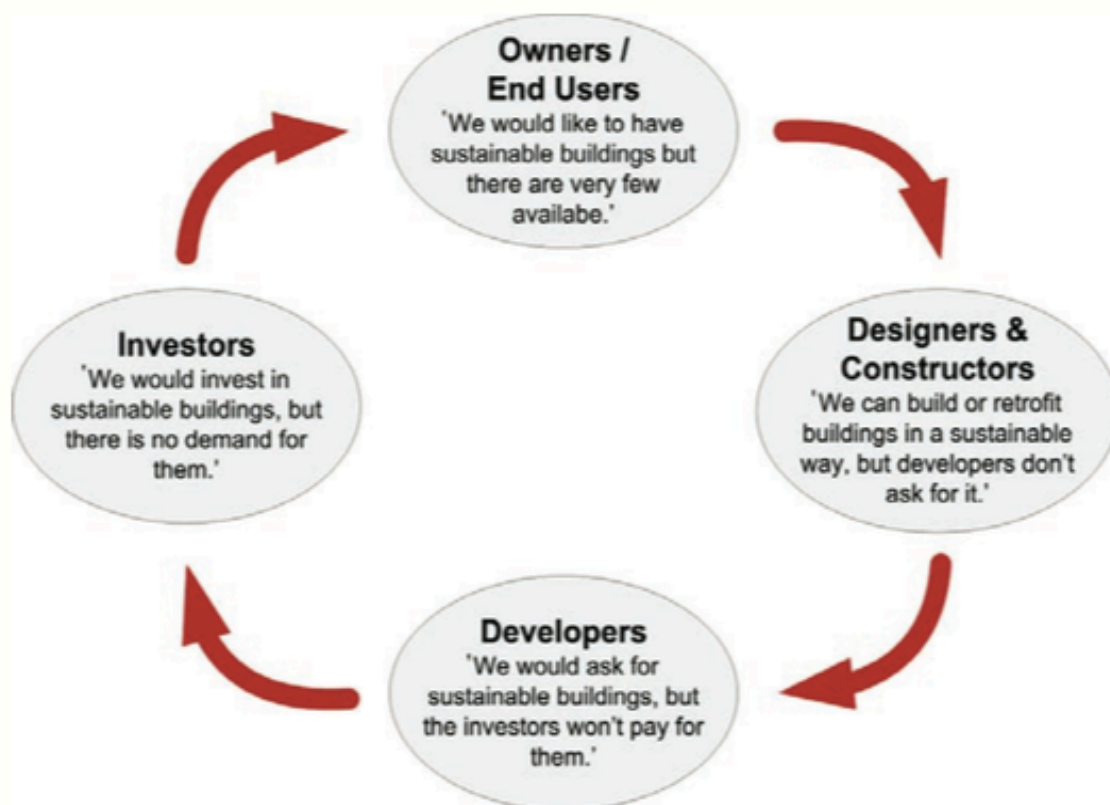
Figure 72 Vicious circle of blame (RICS, 2008)

V rámci mé diplomové práce jsem v dalším uvažování ovšem vypustila roli architektů & stavitelů (*designers & constructors*) a zaměřila se pouze na zbylé aktéry: **developery, investory a nájemce**. Ve svém teoretickém přehledu jsem definovala hlavní **faktory stavění šetrných kanceláří** a pokusila se je shromáždit do skupin podle toho, jak spolu souvisejí:

- **Corporate social responsibility**: image & marketing, zájem o trvale udržitelný rozvoj, znalost oboru trvale udržitelného rozvoje
- **Proces návrhu a výstavby**: cena návrhu a výstavby, právní záležitosti & povolení, financování projektu
- **Snižování rizik**: doba prodeje, obsazenost budovy, funkční zastaralost budovy, návratnost investice
- **Tržní hodnota budovy**: výška nájmu, hodnota budovy, prodejní cena, konečný výnos
- **Životní cyklus budovy**: náklady na údržbu, kvalita budovy, provozní náklady

- **Personál**: produktivita práce, komfort, spokojenost personálu, zdraví personálu

- **Corporate social responsibility:** *image & marketing, interest in sustainability, knowledge about sustainability*
- **Design and construction process**: *design and construction costs, legal obsolescence, financing*
- **Risk mitigation**: *time to sell, occupancy, functional obsolescence, return on investment*
- **Market value**: *rent level, asset value, selling price, exit yield*
- **Life cycle**: *maintenance costs, building's quality, operating costs*
- **Staff wellbeing**: *productivity, comfort, staff happiness and satisfaction, staff health*

Tyto faktory v sobě většinou obsahují jak potenciální pozitiva, podporující výstavbu šetrných kanceláří, tak negativa (př. obecně se tvrdí že v šetrných kancelářských budovách je lepší kvalita vnitřního prostředí, tudíž zaměstnanci firmy, jež má kanceláře v takové budově, budou zdravější, spokojenější a produktivnější= pozitivum. Toto tvrzení se ovšem velmi těžce exaktně dokazuje= negativum).

Hlavním výstupem teoretické části výzkumu je model, zobrazující hlavní faktory (*sustainability factors*) tak, jak souvisejí s jednotlivými aktéry. Tento model je podkladem pro následnou část, praktický výzkum.
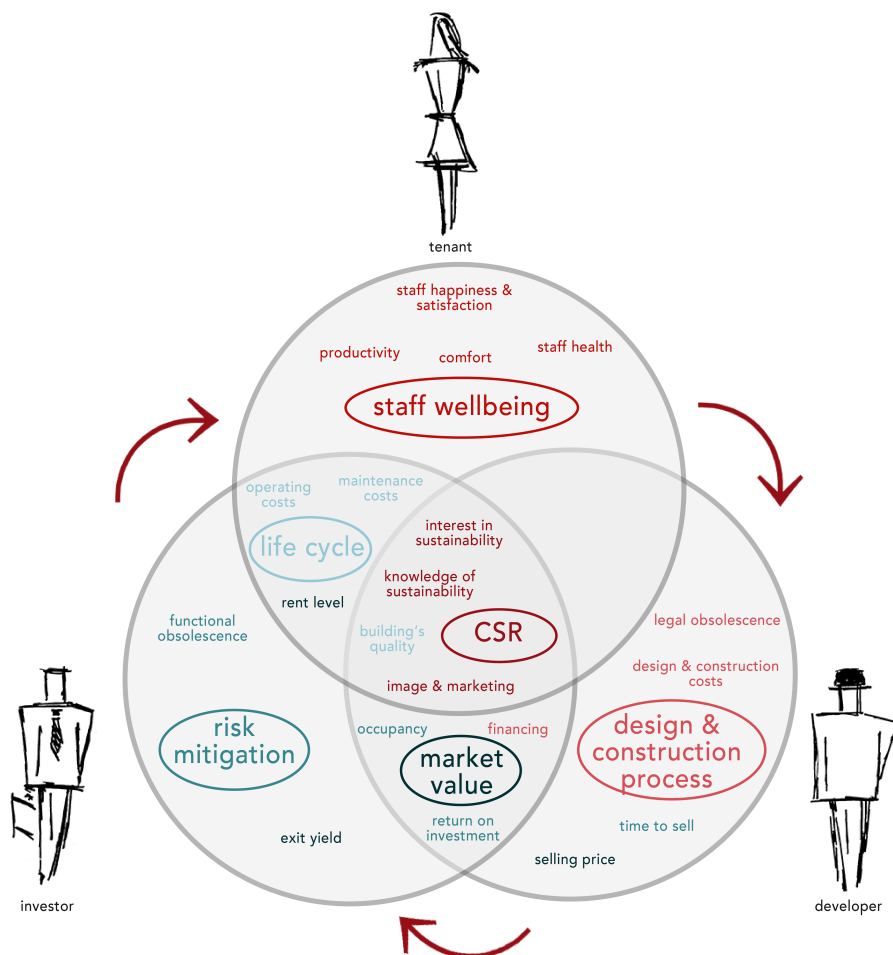
Figure 73 Model vycházející z teoretické části výzkumu (vlastní ilustrace)

Praktická část výzkumu

Popis metody Delphi a organizace rozhovoru

Má praktická část výzkumu se skládá z **řady rozhovorů s odborníky v oboru**. Snažím se oslovit různorodou škálu lidí, abych v rozhovorech získala co nejvíce různých pohledů na věc; developery, investory, agenty, členy České rady pro šetrné budovy a další.

Rozhovor se skládá se **dvou částí** a to:
- Seřazení faktorů stavění šetrných kanceláří dle jejich důležitosti ze 3 pohledů: developer, investor, nájemce (10-15 minut)
- Polo-strukturovaný rozhovor (30 minut)

Pro praktickou část výzkumu je použita **metoda Delphi**. Delphi se skládá z několika rozhovorů s heterogenní skupinou odborníků z oboru, kteří mají různé pohledy na danou problematiku. Metoda se používá pro ustanovení konsensu mezi dotázanými, a to tak, že po vyhodnocení všech rozhovorů mají respondenti možnost na základě odpovědí ostatních respondentů své odpovědi upravit. Z tohoto důvodu respondentům v příštích 2 týdnech pošlu navazující e-mail, kdy budou mít možnost právě takto upravit své prvotní odpovědi. Toto „upravení" se týká pouze první části praktického výzkumu, a to seřazení faktorů dle jejich důležitosti; ne pak polo-strukturovaného rozhovoru.

1. Faktory stavění šetrných kanceláří

V této části respondent vždy seřadí předem definované faktory šetrného stavění kanceláří podle jejich důležitosti a to ze **3 různých pohledů**. Postupně se respondent pokusí vžít do role developera, investora a nájemce a odhadne dle svého úsudku, jakou důležitost mají jednotlivé faktory pro dané aktéry. Některé faktory jsou použity více než jednou, protože se týkají více aktérů.

Respondent v každém kole obdrží **kartičky s jednotlivými faktory**, které budou obsahovat český a anglický název a krátké vysvětlení v češtině, jak dle mého teoretického výzkumu daný faktor souvisí s problematikou šetrných kanceláří. Tyto kartičky pak seřadí podle důležitosti, podle toho jak velkou roli hraje daný aspekt při rozhodování jednotlivých aktérů. Výsledné pořadí je následně zaznamenáno.

Pozice developera:
- *Image & marketing*
- *knowledge about sustainability*
- *interest in sustainability*
- *selling price*
- *time to sell*
- *design & construction costs*
- *building's quality*
- *legal & financing*
- *occupancy rates*
- *asset value*
- *return on investment*

Pozice investora:
- *image & marketing*
- *knowledge about sustainability*

- *interest in sustainability*
- *functional obsolescence*
- *exit yield*
- *building's quality*
- *occupancy rates*
- *asset value*
- *return on investment*
- *maintenance costs*
- *operating costs*
- *rent level*

Pozice nájemce:
- *image & marketing*
- *knowledge about sustainability*
- *interest in sustainability*
- *building's quality*
- *productivity*
- *comfort*
- *staff happiness and satisfaction*
- *staff health*
- *maintenance costs*
- *operating costs*
- *rent level*

2. Polo-strukturovaný rozhovor

Pomocí polo-strukturovaných rozhovorů se snažím nahlédnout na celkové povědomí pražského trhu na problematiku stavění šetrných kanceláří, jaká je momentální praxe v tomto oboru a jaké jsou vyhlídky do budoucnosti.

Otázky k rozhovoru:
Úvodní otázky pro všechny respondenty:
- Čím se Vaše firma v oboru stavebnictví zabývá a jakým způsobem je ve Vaší firmě vnímán a uplatňován trvale udržitelný rozvoj?
- K jakému z výše popsaných aktérů (developer, investor, nájemce) máte profesně nejblíže?
- Jaké je podle Vašeho názoru obecné povědomí na pražském trhu nemovitostí o trvale udržitelném rozvoji? Jak se tato situace liší od jiných zemí?
- Jaké jsou obecně hlavní překážky trvale udržitelného rozvoje ve stavebnictví v Praze? Liší se nějak kancelářský a rezidenční trh?
- Jakou roli hraje česká a pražská legislativa v oblasti šetrného stavění (brání rozvoji či podporuje rozvoj)?

Otázky podle oboru respondenta:
Developer
- Jaké jsou hlavní aspekty při rozhodování developera ohledně postavení kancelářské budovy? Jakou roli v tomto rozhodování hraje udržitelnost budovy, získání certifikátu?
- Jaký je rozdíl mezi cenou výstavby zelené budovy a běžné budovy? Odráží se tato (navýšená) cena následně i ve vyšší celkové hodnotě budovy či vyšším nájmu? Jak se tato cena liší u různých stupňů certifikace? Jakým způsobem se tato investice do výstavby developerovi vrátí?

- *Předpoklad: rekonstruování budov je šetrnější k životnímu prostředí než stavění nových budov.* Souhlasíte s tímto výrokem (proč / proč ne)? Jaký je momentální vývoj na pražském trhu ohledně rekonstrukcí budov? Jaké jsou hlavní překážky a hlavní motivy pro rekonstrukce? Jak se tento vývoj změní v budoucnu?

Investor
- Jaké jsou hlavní aspekty při rozhodování investora ohledně investování do kancelářské budovy? Jakou roli v tomto rozhodování hraje udržitelnost budovy (např. to, že budova vlastní certifikát)?
- Jak se odráží šetrnost budovy v její hodnotě (hodnota budovy, výše nájmu) v porovnání s běžnou kancelářskou budovou (za předpokladu, že ostatní aspekty jako lokalita jsou stejné)?
- Jakým způsobem investor vnímá různé stupně certifikace?

Nájemce, agent
- Jaké jsou hlavní aspekty při rozhodování nájemce ohledně nastěhování se do kancelářské budovy? Jakou roli v tomto rozhodování hraje udržitelnost budovy (např. to, že budova vlastní certifikát)?
- Jakým způsobem nájemce vnímá různé stupně certifikace?

Závěrečné navazující otázky pro všechny respondenty:
- Jak bude podle Vašeho názoru vnímán v budoucnu trvale udržitelný rozvoj ve stavebnictví na pražském trhu? Který z výše zmíněných aktérů bude hrát v tomto vývoji nejdůležitější roli a jak?

Ukončení rozhovoru

Appendix D: Example Google Form created for 2nd round Delphi

Sustainability Drivers & Barriers

Diplomová práce Sustainability Drivers & Barriers: Mapping the Motives of Sustainable Office Development in Prague, TU Delft
Karolína Dvořáková
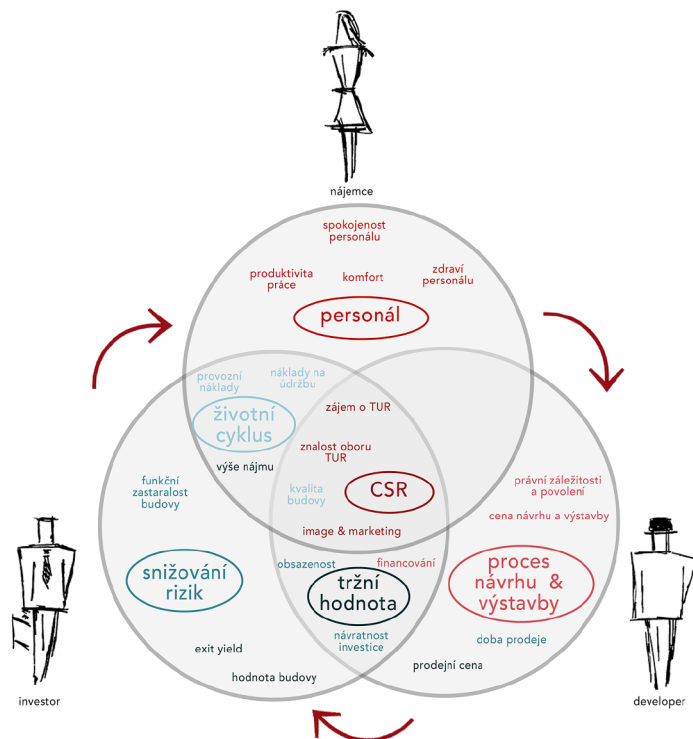
DEVELOPER

Jaké jsou nejdůležitější faktory pro developera při rozhodování, zda postavit určitou (šetrnou) kancelářskou budovu?

(Developer staví budovu za účelem brzkého prodeje investorovi.)

1. místo = nejdůležitější faktor
11. místo = nejméně důležitý faktor

výsledky 1. kola + Vaše odpovědi v 1. kole

Sustainability Drivers & Barriers

umístění	faktor trvale udržitelného rozvoje	anglický překlad	průměrné umístění	nejnižší umístění	nejvyšší umístění	Vaše umístění v 1.kole
1	návratnost investice	return on investment	1,91	1	5	1
2	prodejní cena budovy	selling price	3,00	1	7	2
3	obsazenost budovy	occupancy	4,73	2	9	3
4	cena návrhu a výstavby	design & construction costs	5,36	1	8	5
5	financování projektu	financing	5,55	2	11	6
6	doba prodeje	time to sell	6,45	3	9	4
7	image & marketing	image & marketing	6,45	1	11	7
8	kvalita budovy	building's quality	6,55	2	10	8
9	právní záležitosti a povolení	legal obsolescence	7,00	2	10	9
10	zájem o trvale udržitelný rozvoj	interest in sustainability	9,36	1	11	10
11	znalost problematiky trvale udržitelného rozvoje	knowledge of sustainability	9,64	2	11	11

2. kolo - Zde máte možnost upravit své hodnocení faktorů dle jejich důležitosti.

Pro každý faktor prosím PRÁVĚ JEDNO umístění (1.-11. místo), dva faktory nesmí být na stejném místě

1. **seřazení faktorů z pohledu developera:**
   Mark only one oval per row.

	1. místo	2. místo	3. místo	4. místo	5. místo	6. místo	7. místo	8. místo	9. místo	10. místo	11. místo
návratnost investice	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
prodejní cena budovy	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
obsazenost budovy	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
cena návrhu a výstavby	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
financování projektu	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
doba prodeje	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
image & marketing	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
kvalita budovy	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
právní záležitosti a povolení	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
zájem o trvale udržitelný rozvoj	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
znalost problematiky trvale udržitelného rozvoje	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Vysvětlení jednotlivých faktorů trvale udržitelného rozvoje (developer):

Sustainability Drivers & Barriers

developer

návratnost investice
return on investment

Za předpokladu, že tržní hodnota šetrné budovy je vyšší, a že náklady na její výstavbu o mnoho nepřesáhnou náklady na výstavbu běžné budovy, návratnost investice se zvyšuje.

prodejní cena budovy
selling price

Jelikož náklady na výstavbu šetrné budovy mohou být vyšší než budovy běžné, investice je pro developera výhodná tehdy, kdy se mu náklady vrátí v podobě vyšší prodejní ceny budovy.

obsazenost budovy
occupancy

Někteří developeři věří, že certifikovanou budovu je možné snáze pronajmout; je atraktivní pro nájemce. Zda je toto způsobeno šetrností budovy či dalšími aspekty (jako např. lokalita, architektura), je otázkou.

cena návrhu a výstavby
design & construction costs

Pro nejvyšší stupeň certifikace LEED či BREEAM je odhad zvýšení nákladů na návrh a výstavbu v řádu několika procent.

financování projektu
financing

Je možné, že developer či investor snáze získá peníze na výstavbu či koupi šetrné budovy než budovy běžné, neboť investice do šetrné budovy je pokládána za méně riskantní.

doba prodeje
time to sell

Někteří developeři věří, že certifikovanou budovu je možné rychleji prodat; je atraktivní pro investory. Zda je toto způsobeno šetrností budovy či dalšími aspekty (jako např. lokalita, architektura), je otázkou.

image & marketing
image & marketing

Certifikace kancelářských budov je v dnešní době používána developery a investory především jako součást propagace budovy mezi nájemci. Pro nájemce mít kancelář v šetrné budově může zlepšovat jeho image před potenciálními klienty a obchodními partnery.

kvalita budovy
building's quality

U šetrné budovy je též dbáno na její lokalitu, architekturu, funkčnost či použité technologie (mj. součástí certifikací). Celková kvalita budovy tedy může být vyšší než u budovy běžné.

právní záležitosti & povolení
legal obsolescence

Příliš pomalý proces získávání povolení může být bariérou pro implementaci šetrných budov, neboť v době získání povolení jsou již navržené technologie v budově částečně zastaralé.

zájem o trvale udržitelný rozvoj
interest in sustainability

Jelikož cílem mnoha firem je finanční profit, který nemusí být v otázce trvale udržitelných staveb zřetelný na první pohled, zájem firem o implementaci může být snížen.

znalost problematiky trvale udržitelného rozvoje
knowledge of sustainability

Nedostatečná znalost problematiky trvale udržitelného rozvoje může být překážkou pro další rozvoj a implementaci šetrných budov.

INVESTOR

Jaké jsou nejdůležitější faktory pro investora při rozhodování, zda investovat do určitě (šetrné) kancelářské budovy?

(Investor nakupuje od developera postavenou kancelářskou budovu, již i s případnými nájemníky.)

1. místo = nejdůležitější faktor
13. místo = nejméně důležitý faktor

výsledky 1. kola + Vaše odpovědi v 1. kole

umístění	faktor trvale udržitelného rozvoje	anglický překlad	průměrné umístění	nejnižší umístění	nejvyšší umístění	Vaše umístění v 1.kole
1	návratnost investice	return on investment	1,64	1	4	1
2	hodnota budovy	asset value	3,64	1	12	3
3	exit yield	exit yield	4,00	1	10	5
4	obsazenost budovy	occupancy	5,82	2	11	2
5	výše nájmu	rent level	6,27	2	12	4
6	provozní náklady	operating costs	7,55	3	10	9
7	funkční zastaralost budovy	functional obsolescence	7,73	2	11	11
8	kvalita budovy	building's quality	8,09	3	13	10
9	image & marketing	image & marketing	8,36	6	13	6
10	náklady na údržbu	maintenance costs	8,36	4	11	8
11	financování projektu	financing	8,45	4	13	7
12	zájem o trvale udržitelný rozvoj	interest in sustainability	9,64	1	13	12
13	znalost problematiky trvale udržitelného rozvoje	knowledge of sustainability	11,45	4	13	13

2. kolo - Zde máte možnost upravit své hodnocení faktorů dle jejich důležitosti

Pro každý faktor prosím PRÁVĚ JEDNO umístění (1.-13. místo), dva faktory nesmí být na stejném místě

2. **seřazení faktorů z pohledu investora:**
Mark only one oval per row.

	1.místo	2.místo	3.místo	4.místo	5.místo	6.místo	7.místo	8.místo	9.místo	10.místo	11.místo	12.místo	13.místo
návratnost investice	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
hodnota budovy	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
exit yield	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
obsazenost budovy	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
výše nájmu	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
provozní náklady	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
funkční zastaralost budovy	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
kvalita budovy	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
image & marketing	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
náklady na údržbu	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
financování projektu	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
zájem o trvale udržitelný rozvoj	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
znalost problematiky trvale udržitelného rozvoje	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Vysvětlení jednotlivých faktorů trvale udržitelného rozvoje (investor):

investor

návratnost investice
return on investment

Za předpokladu, že tržní hodnota šetrné budovy je vyšší, a že náklady na její výstavbu o mnoho nepřesáhnou náklady na výstavbu běžné budovy, návratnost investice se zvyšuje.

hodnota budovy
asset value

Některé výzkumy potvrdily, že tržní hodnota je vyšší u šetrných kancelářských budov než u srovnatelných běžných budov. Je ovšem obtížné ve statistikách zcela izolovat pouze "šetrnost" budovy, aniž by nebyly brány v potaz ostatní aspekty (např. lokalita, architektura).

exit yield
exit yield

Jelikož investice do šetrných budov může být investory považována za méně riskantní, konečný výnos (exit yield) aplikován k získání současné hodnoty (NPV) investice může být nižší.

obsazenost budovy
occupancy

Někteří developeři věří, že certifikovanou budovu je možné snáze pronajmout; je atraktivní pro nájemce. Zda je toto způsobeno šetrností budovy či dalšími aspekty (jako např. lokalita, architektura), je otázkou.

výše nájmu
rent level

Některé výzkumy potvrdily, že výše nájmu je vyšší u šetrných kancelářských budov než u srovnatelných běžných budov. Je ovšem obtížné ve statistikách zcela izolovat pouze "šetrnost" budovy, aniž by nebyly brány v potaz ostatní aspekty (např. lokalita, architektura).

provozní náklady
operating costs

Důležitým aspektem šetrných budov je jejich nižší spotřeba energie, tedy snížené provozní náklady. Paradoxem však je, že za lepší technologie, použité v budově, platí developer, zatímco výhody v podobě nižších provozních nákladů většinou využívá nájemce.

funční zastaralost budovy
functional obsolescence

U šetrných budov je občas též dbáno na flexibilitu, dlouhou životnost a možnost využití i pro jinou funkci, než byla budova původně navržena.

kvalita budovy
building's quality

U šetrné budovy je též dbáno na její lokalitu, architekturu, funkčnost či použité technologie (mj. součástí certifikací). Celková kvalita budovy tedy může být vyšší než u budovy běžné.

image & marketing
image & marketing

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náklady na údržbu
maintenance costs

V šetrných budovách jsou převážně použity nové spolehlivější technologie, které vyžadují nižší údržbu. Náklady na údržbu se tedy snižují.

financování projektu
financing

Je možné, že developer či investor snáze získá peníze na výstavbu či koupi šetrné budovy než budovy běžné, neboť investice do šetrné budovy je pokládána za méně riskantní.

zájem o trvale udržitelný rozvoj
interest in sustainability

Jelikož cílem mnoha firem je finanční profit, který nemusí být v otázce trvale udržitelných staveb zřetelný na první pohled, zájem firem o implementaci může být snížen.

znalost problematiky trvale udržitelného rozvoje
knowledge of sustainability

Nedostatečná znalost problematiky trvale udržitelného rozvoje může být překážkou pro další rozvoj a implementaci šetrných budov.

NÁJEMNÍK (zaměstnavatel)

Jaké jsou nejdůležitější faktory pro nájemníka při rozhodování, zda se nastěhovat do určité (šetrné) kancelářské budovy?

(Nájemník si pronajímá kancelář od developera / investora.)

1. místo = nejdůležitější faktor
11. místo = nejméně důležitý faktor

výsledky 1. kola + Vaše odpovědi v 1. kole

umístění	faktor trvale udržitelného rozvoje	anglický překlad	průměrné umístění	nejnižší umístění	nejvyšší umístění	Vaše umístění v 1.kole
1	výše nájmu	rent level	3,73	1	10	1
2	provozní náklady	operating costs	4,45	1	10	3
3	produktivita práce	productivity	5,00	2	11	5
4	kvalita budovy	building's quality	5,18	1	11	7
5	náklady na údržbu	maintenance costs	5,36	2	9	9
6	spokojenost personálu	staff happiness & satisfaction	5,64	1	11	4
7	zdraví personálu	staff health	5,82	3	9	8
8	vnitřní komfort	comfort	5,82	2	10	6
9	image & marketing	image & marketing	6,36	2	9	2
10	zájem o trvale udržitelný rozvoj	interest in sustainability	9,09	3	11	10
11	znalost problematiky trvale udržitelného rozvoje	knowledge of sustainability	9,18	1	11	11

2. kolo - Zde máte možnost upravit své hodnocení faktorů dle jejich důležitosti

Pro každý faktor prosím PRÁVĚ JEDNO umístění (1.-11. místo), dva faktory nesmí být na stejném místě

3. **seřazení faktorů z pohledu nájemníka:**
Mark only one oval per row.

	1.místo	2.místo	3.místo	4.místo	5.místo	6.místo	7.místo	8.místo	9.místo	10.místo	11.místo
výše nájmu	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
provozní náklady	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
produktivita práce	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
kvalita budovy	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
náklady na údržbu	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
spokojenost personálu	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
zdraví personálu	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
vnitřní komfort	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
image & marketing	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
zájem o trvale udržitelný rozvoj	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
znalost problematiky trvale udržitelného rozvoje	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Vysvětlení jednotlivých faktorů trvale udržitelného rozvoje (nájemník):

nájemník

výše nájmu
rent level

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produktivita práce
productivity

Některé výzkumy dokázaly, že v šetrných budovách díky vyšší kvalitě vnitřního prostředí je zvýšená produktivita zaměstnanců. Tento aspekt, leč velmi důležitý pro jakoukoliv firmu (náklady na personál tvoří většinou nejvyšší položku v nákladech firmy) se velmi těžce přímo dokazuje.

kvalita budovy
building's quality

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náklady na údržbu
maintenance costs

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spokojenost personálu
staff happiness and satisfaction

Některé výzkumy dokázaly, že v šetrných budovách je personál spokojenější. Tento aspekt se ovšem velmi těžce přímo dokazuje, především protože je složité oddělit "šetrnost" od dalších aspektů budovy (např. architektura).

zdraví personálu
staff health

Výzkumy dokázaly, že se v šetrných budovách díky vyšší kvalitě vnitřního prostředí zlepšuje zdraví personálu. Jelikož pro většinu firem jsou náklady na zaměstnance hlavním nákladem firmy, tento aspekt je velmi důležitý.

vnitřní komfort
comfort

Obecně se předpokládá, že vyšší kvalita vnitřního prostředí společně s promyšlenou architekturou zvyšují komfort pro nájemce v šetrné budově.

image & marketing
image & marketing

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knowledge of sustainability

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