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# High-rise zero emission buildings in the Netherlands

The challenges and opportunities concerning the multiple institutional logics in the construction sector

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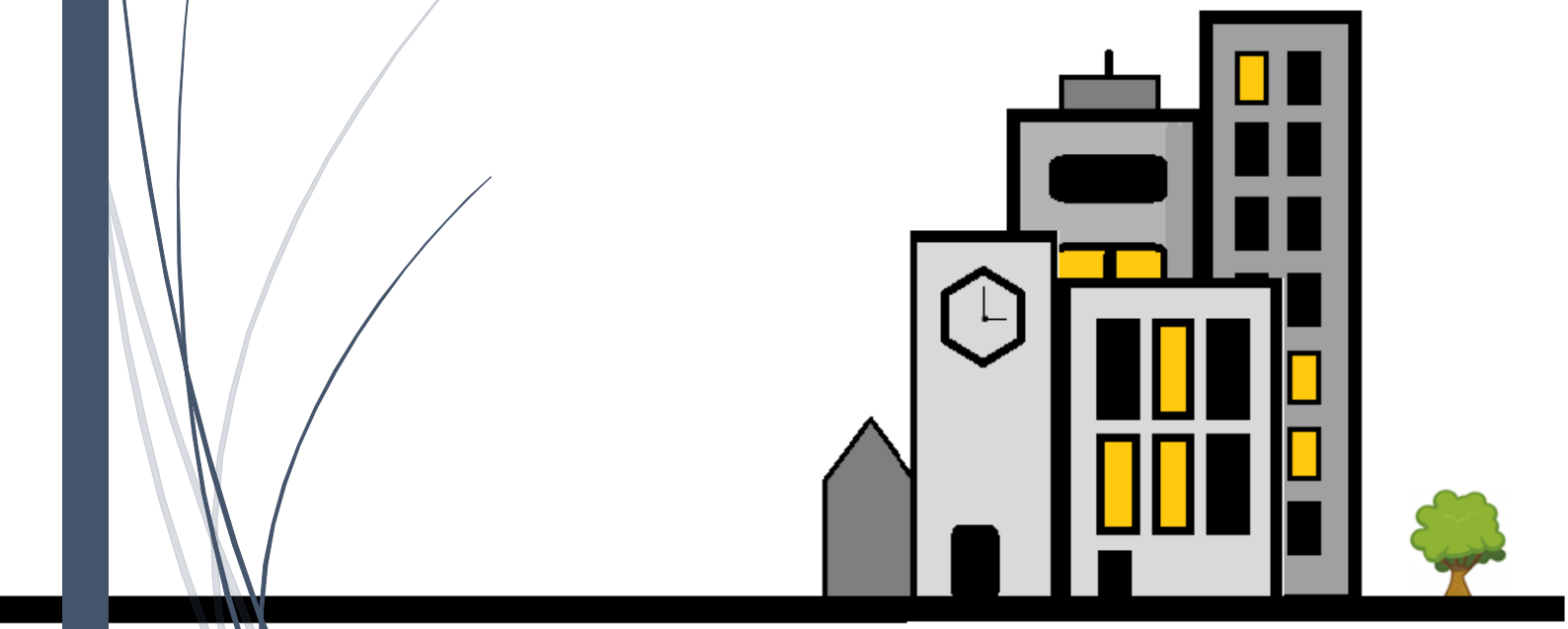

# Abstract

Since the whole world is facing climate change caused by $CO_2$ emissions there is need for sustainable development. This research focuses on the construction sector in the Netherlands since buildings are a large contributor to urban pollution. The paper specifies on high-rise ZEB development. In the long run high-rise buildings can form an opportunity to contribute to sustainable development and be a solution to the increasing housing and office building shortage. This is currently not yet implemented on large scale. The construction sector is large and complex with a lot of different actors involved for each project. It is described as a traditional and conservative sector with low R&D expenditures. This research examens if this traditional character challenges the high-rise ZEB development by looking at the multiple institutional logics approach combined with the theory of institutional entrepreneurship. The results show a sector broad institutional field of risk averse behaviour, cost control, resistance to change, dispersed actor network and traditional regulation. These institutional logics form a stable and coherent system and challenges high-rise ZEB development because it is difficult to change a dominant stable system. However, some constructive logics including collaboration and experimentation arise. These are constructive since they are conflicting with the traditional set of logics. From the results another aspect came forward which appeared to be of quite large influence on the multiple institutional logics. These are labelled as the external factors including personnel shortages and increasing energy prices. The constructive logics in combination with the external factors are destabilizing the traditional logics and thereby creating opportunity for change. The opportunities of change can be used as starting point for institutional entrepreneurship which's activities can be fulfilled by actors, actor groups or governmental organizations.




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# 1 Introduction

Since the world is facing climate change, biodiversity loss and environmental pollution, the need to reduce the CO2 emissions that enforce these problems increases (Luederitz et al, 2013). In Europe over 80 percent of the total greenhouse gas emissions are energy related, meaning that they are caused by energy production and energy use (EEA, 2013). Cities play a huge role in these energy related emissions since they contribute for 78 percent of the world's energy demand. Therefore, cities are major contributors to the above-mentioned problems such as climate change (UN, 2021). Especially, buildings have a significant share in this energy use and hence an interesting topic to focus on when examining sustainable energy strategies. Within this context there is a growing interest in zero energy buildings (ZEBs). The focus lies on lowering the energy use of the buildings and produce the energy demand with renewable energy sources (Li et al, 2013). The notion of zero refers to the fact that the energy demand is fully supplied with renewable energy which leads to an energy balance of zero (Torcellini et al, 2012).

The Netherlands is a country with a big percentage of urban area. Where the average of Europe of urban covered area is 5%, this percentage is more than doubled in the Netherlands (RTL Nieuws, 2013). This makes it an interesting country to look at the development of ZEBs to contribute to sustainable development. Furthermore, there is a dire housing shortage in the Netherlands, resulting in exploded housing prices and long waiting lists for social housing (Bossuyt, 2020). Also office buildings are scarce which is leading to companies making concessions concerned the quality or location of their office buildings (van Zwet, 2020). High-rise buildings can enable a higher housing- and office density and be part of the solution for affordable buildings on popular locations for everyone while contributing to sustainable development.

The Dutch government sees ZEBs as a very promising development and supports this development through policies. One example is the BENG-requirements, which is the Dutch abbreviation for 'Bijna Energie Neutrale Gebouwen' or translated into English 'Almost Energy Neutral Buildings'. These entail that all new constructed homes should be almost energy neutral starting in 2021 (RVO, 2021). The transition to ZEBs is already present in low-rise buildings with almost 12.000 ZEBs in 2020 (Milieu centraal, 2021). However, for high-rise buildings challenges seems to arise since there are only a few examples of specific high-rise ZEBs. Research into these challenges can provide insights in how to stimulate the development of high-rise ZEBs and contribute to a more sustainable construction sector and a higher housing- and office density.

In the case of ZEBs there is already a lot of knowledge available about technical options to implement these buildings. It is known what a high-rise ZEB should look like and which technologies are needed to build it. Research shows for example that high-rise buildings, despite the small surface potential for solar energy, can meet BENG-requirements by installing several different installations such as heat pumps and sun blinds (LenteAkkoord, 2019).



This suggests that the technical aspects of ZEBs are not the main challenge, but other aspects like change and upscaling of implementation might be more obstructive in case of the high-rise ZEB development. Furthermore, the Dutch construction sector has a history of focusing on low-rise buildings, since it is faster and cheaper to build those somewhere outside the city (Gadet, 2018). This is supported by research mentioning that specifically for the construction sector, there are indications that the aspect of change can be challenged by a specific sector culture and fast changing policy (Eib, 2017). The above-mentioned challenges in sector culture and regulative environment are challenges within the institutional environment. To examine these kinds of challenges an institutional approach can create useful insights where to focus on to support implementation of ZEBs and creating a sustainable construction sector. This concludes in the following research question:

*What are the challenges in the institutional environment of the Dutch construction sector and which institutional changes can be addressed to support the development of high-rise ZEBs?*

Since there is a very limited amount of research about high-rise buildings in the Netherlands this thesis has an explorative focus. To answer the research question the theory of institutional logics is used. This theory provides insights into norms, values, sector culture and regulative environment which are called the institutional logics. The dynamics within these logics are embedded in the theory of multiple institutional logics in terms of coherence and conflict between different institutional logics and offers information about opportunities for change. The institutional entrepreneurship approach is used as contribution for a deeper understanding what role actors can fulfil within institutional change since the multiple institutional logics approach does not cover this. Besides, where earlier research on multiple institutional logics focused on among others the digital economy and the health care sector (Tumbas et al, 2015; Vickers et al, 2017; Van den Broek et al, 2014), this research focuses on a new applied research direction by examining on the construction sector.

To investigate the institutional logics of the construction sector it is important to create a clear view of the structure of the sector to enable a delineation of the institutional field. Within this field relevant actors can be selected to gather information about the institutional logics and challenges through interviews.

This research is structured as follows. In chapter 2 the empirical background provides background information about the sector. In chapter 3 the theory of institutional logics is explained. Chapter 4 describes the methodology and how the theory is operationalized. The results are shown in chapter 5 followed by the discussion of these results in chapter 6 and a conclusion.



# 2 Empirical Background

*This research focusses on the construction sector, which is a comprehensive sector ranging from carpenters to project developers. This chapter provides insights in the structure and content of the sector to enable delineation and showing relations between different actors within the sector. Furthermore, the high-rise ZEB development is placed in a broader sustainable perspective of the sector.*

## 2.1 The sector in numbers

The construction sector provides an important contribution to the quality of life in the Netherlands. It is not only responsible for comfortable housing, but also proper commuting and common property (BouwendNederland, 2021). In 2020 the sector accounted for a 9% share of the gross domestic product and employed 326.000 people spread across 205.510 companies. The next paragraph explains on which part of the construction sector this research specifically focuses. Within this sector, it is important to recognize that construction includes new buildings as well as renovation activities. Figure 1 helps to understand how these two market segments relate to each other in terms of size. The figure shows a share of 73% new construction and only 26% renovation activities and exposes a larger share of housing compared to buildings (Eib, 2019a).

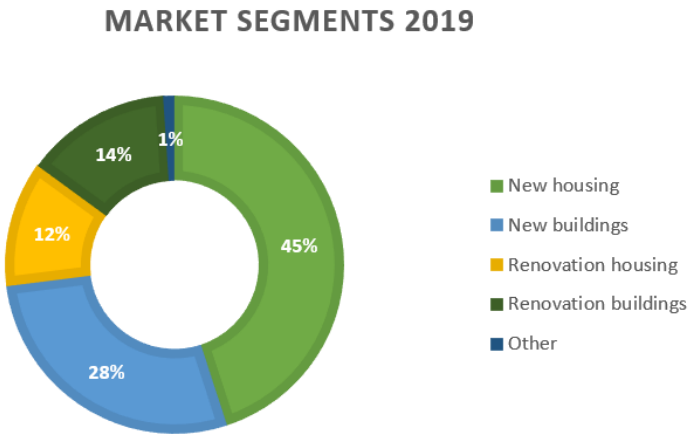


*Figure 1: Overview share market segments 2019*

## 2.2 Structure and standard business classification

This paragraph summarizes the process of constructing a new building depicted in figure 2 to show the structure of the sector and the relations among different actors. The process starts with the client who wants to start the project and is often the risk owner and future owner of the building. This can be the future user of a building or a project developer. The client is also responsible for arranging the right permits (Kennisbank, n.d.). An architect creates a design and when needed receive assistance from construction and/or installation specialists. The design is executed by a contractor who is responsible for the construction process and the finishing of the builder. The contractor has employed builders which can be for example an electrician or carpenter. In different phases of this process advisors and consultants can be involved.

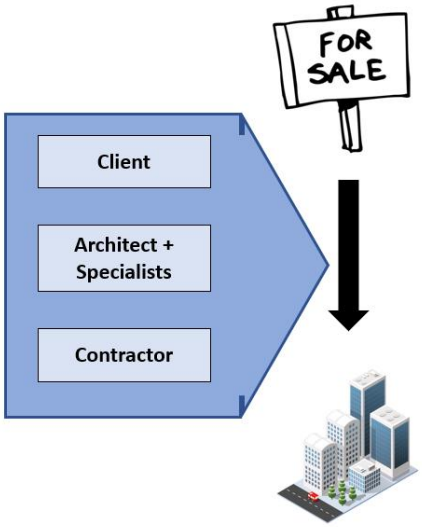


*Figure 2: Structure construction sector*

The above-mentioned figure provides a general overview of the sector. The SBI uses letters for different sectors and numbers for business subdivisions within the sector. The relevant business divisions are selected and aggregated in Table 1. The extended table can be found in appendix 9.1. The table shows how actors are distributed among the different subcategories. For example, a carpenter is placed under subcategory 43.3 finishing buildings and project developer in category 41.1.

These classifications provide delineation and insights by including the possibly actors involved with high-rise ZEB buildings and excluding other categories of the construction sector, for example road building.

| F Construction sector | |
|---|---|
| **41. General civil and utility construction and project development** | 41.1 Project development<br>41.2 General civil and utility construction |
| **43. Specialized work in construction** | 43.2 Building installations<br>43.3 Finishing buildings<br>43.9 Roofing and other specialized construction work |
| **71. Architects, engineers and technical design and consult** | 71.1 Architects, engineers and technical design and consult |

*Table 1 SBI classification construction sector (SBI, 2019)*

## 2.3 Political context of sustainability in the sector

In the introduction the importance of sustainability within the sector is mentioned in terms of global warming and other negative externalities of greenhouse gasses. Moreover, it is clear that high-rise ZEBs can contribute to a sustainable transition and therefore decrease negative externalities. In this wider context there is a political field of regulation and sustainability goals affecting the behaviour of actors in the sector because policies are an important factor influencing innovation activities and development (Blind, 2012). This paragraph provides a short overview of the agreements within the construction sector on this sustainable transition to show the setting in which actors are operating and in which context institutional challenges and change can unfold.

In the Netherlands agreements on emission decrease and other sustainable goals are established in 'Het Klimaatakkoord'. The agreements for the construction sector are assigned to the heading-built environment. The main idea is to stimulate sustainability while keeping it financially affordable for the consumer (Klimaatakkoord, 2019).



The transition plan starts with sealing of districts from the natural gas supply. This goes hand in hand with local governmental planning to make the sustainable transition district per district. The national government provides funds and appealing loans to stimulate houseowners to invest in sustainable options and guidance for building owners (schools, hospitals etc.) how to transit.

Eventually, this results in a sustainable and comfortable housing and working environment and by saving on the energy bills, the investments pay themselves back over time (Klimaatakkoord, 2019). This plan sounds promising and an analysis of this scenario and effects of these agreements are calculated by PBL showing it is executable (Plan Bureau for Living environment). However, Eib (Economic institute for building) questions if the calculations of the costs and benefits are reliable. For example, PBL relies on massive cost decrease for building and installation activities resulting in affordable prices. Furthermore, PBL adjust their numbers based on incoming annual results, though this can lead to falling behind policy (Eib, 2019b).



# 3 Theory

*As mentioned before this research has an explorative focus. To examine the institutional barriers of high-rise ZEB development the theory of institutional logics is used. This theory can provide insights in the institutional logics within the construction sector and makes it possible to explore opportunities for institutional change to support sustainable development. In this chapter this theory with the corresponding concepts is elaborated.*

## 3.1 Institutional logics and institutional change

Technical progress or technical innovation is often seen as a driver for social and economic progress. However, this technical progress is enabled or disabled by institutional conditions (Josifidis & Supic, 2021). As mentioned in the introduction, in case of high-rise ZEBs there are indications that technical progress is present but hindered by the institutional environment of the construction sector. To examine this, my thesis focuses on the institutional side of high-rise ZEB development. Institutions are defined as: '*Social structures that have attained a high degree of resilience. They are composed of cultural-cognitive, normative and regulative elements that, together with associated activities and resources, provide stability and meaning to social life'* (Scott, 2003). Institutions can vary from regulative laws and norms to induvial norms and values or common cultural beliefs (Scott, 2003). They can be seen as 'rules of the game'.

When these institutions are starting to influence the social reality of firms or individuals, they become institutional logics. This social reality consists, for example, of decision making (Thornton & Ocasio, 1999). The logics provide some guidance for institutional behaviour for industries and individuals on how to understand things and how to justify decisions (Hadida et al, 2021). The institutional logic literature describes difficulties of change because logics provide stability and influence a firm's behaviour. Since institutional logics are resilient it may occur that they steer into certain patterns of behaviour in for example decision making.

An example to show how institutional logics can be applied is that in the Netherlands we see a construction sector focused on low-rise concrete buildings in general (Gadet, 2018). In other countries such as China there are much more high-rise buildings. The theory of institutional logics can provide insights in these differences and where they come from. In this case an explanation from institutional perspective can be the dominance of land costs over technical complexity in super dense cities such as Hong Kong stimulates companies to build high-rise buildings (De Jong & Wamelink, 2008). Another example is the low innovativeness of the sector in terms of R&D expenditures compared to other sectors. Research shows that this can be caused by the market culture (De Bruijn & Maas, 2005). What this culture includes and if it is stable can be investigated with institutional logics by identifying logics and comparing institutional logics among different sectors.



Although institutional logics can reinforce a stable system it does not mean that they are static. When the value structure or content of institutional logics or a set of logics is changing there is institutional change. As described in institutional literature there are several sources for institutional change. Sources of institutional change can be new institutional logics, destabilizing existing logics and replacement of existing logics (Lyon, 2003). This institutional change can be empowered by institutional entrepreneurs. These are actors or actor groups who do not have to be entrepreneurs in a literal way but also can be companies or governments for example. Also, they do not necessarily have the intention to change logics even though they are performing activities which are divergent in the dominant institutional system (Battilana et al, 2009). They do initiate changes by supporting sources of institutional change by breaking the dominant logics and stimulating new logics or the transformation of existing logics. As described by Battilana et al (2009) there is a 'paradox of embedded agency'. This means that on one hand institutions are driving regulation and policymaking and on the other the institutions are influenced by regulation and policy making. An specific example to show this paradox in the construction sector is that the companies are influenced by regulation. Especially for high-rise buildings there is strict regulation if a building is higher than 70 metres. The other way around there are always actors lobbying for favourable policies and influencing regulation. This shows the interaction between policy making and institutions.

The theory of institutional entrepreneurship is a theory of action where the institutional entrepreneurs can change the institutions which will influence the policymaking. Specific activities institutional entrepreneurs can execute are developing a vision, mobilizing people, and motivating others to achieve and to sustain the vision. Focusing on these activities could initiate institutional change. This is relevant for suggestions how actors can deal with challenges and opportunities that are examined in this thesis. Battilana uses the term social position as one of the core categories of enabling conditions of institutional change. An actor's social position can play a role in institutional change by influencing the likelihood that an actor initiates change. For example, in the construction sector actors need financial resources to initiate change if they want to develop a prototype of their innovation. It is easier to convince others when there is proof of successful projects. In this case the financial resources play an important role to show that innovations and only an actor with these resources of with connection to those resources can initiate change.

Another core category for enabling institutional change is field-level characteristics based on the degree of institutionalization. When there is a high degree of institutionalization and the field is homogeneous it is harder to change than when there is heterogeneity in the field. Meaning that a lower degree of institutionalization enables opportunities for change and institutional entrepreneurship. There is also a variety of institutional logics in between the high and low degree of institutionalization, for example a dominant set of logics with inconsistencies. This degree of institutionalization can be used for interpretation of the results of this thesis research by explaining how stable or unstable the institutional field of the construction sector is.



## 3.2 Multiple institutional logics

The multiple institutional logics approach expands on tensions between different institutional logics which can cause internal coherence or conflict. For this reason, it can be used to add a deeper understanding into the dynamics between the different institutional logics and how it can be a source of institutional change. Besharov and Smith (2014) recognizes that there are different types of multiple institutional logics causing different intensity of conflict. This depends firstly if there is one logic at the core or multiple core logics. Secondly, it depends if they are compatible or not. In this way, compatible multiple logics with one core logic results in a stable dominant system which is hard to change. On the opposite, multiple not compatible core logics causing extensive conflict creating space for change (Besharov & Smith, 2014). In this way, multiple logics can either be a constraint for change or a source of change and providing opportunities for institutional entrepreneurship.

The construction sector is a broad comprehensive sector with different subdivisions as described in the empirical background chapter, which is expected to result in a complex set of multiple institutional logics. Therefore, the construction sector is an interesting sector to look at from an institutional logics view. By approaching this case with multiple institutional logics there is attempted to reveal insights about this institutional complexity to make it able to understand how institutional change can appear.

## 3.3 Theoretical framework

Figure 3 provides a schematic overview, summarizes the theoretical framework which can used to identify challenges and eventually opportunities for change within high-rise ZEB development. The picture shows a guidance of how to attain an overview of the current state of the multiple logics within a system.

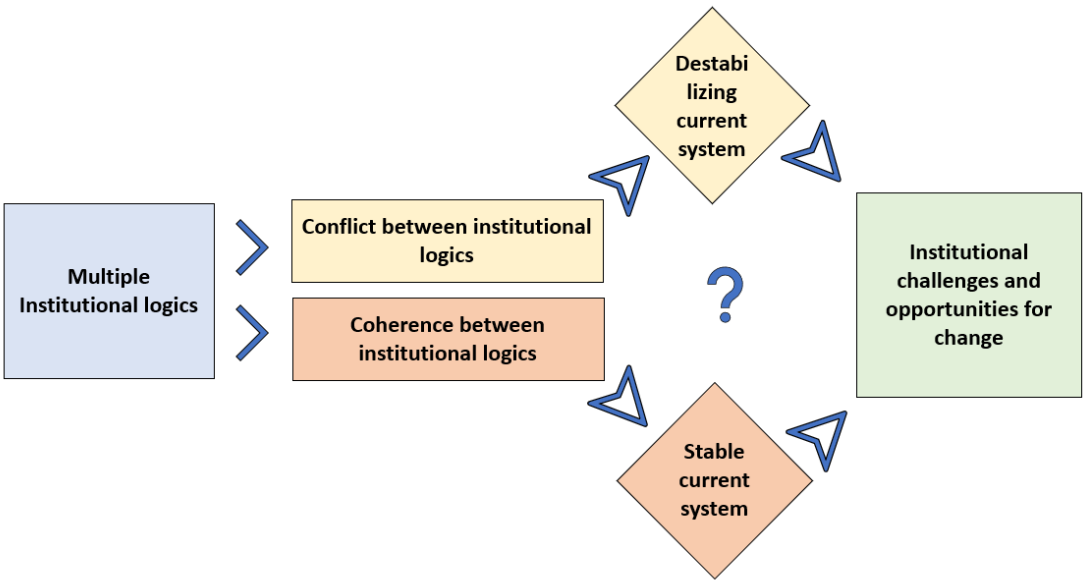


*Figure 3: Theoretical framework*

The starting point is the multiple institutional logics approach. This block consists of logics that are present in the construction sector and as shown in the figure it can lead into two ways. Firstly, conflict between logics. As described by the theory of Besharov and Smith (2014) this can be caused by the presence of a variety of logics which are incoherent. A variety of logics and conflict makes it easier to change since conflict is destabilizing the dominant system. Destabilization provides opportunities for change and institutional entrepreneurship. The second direction describes coherence within the system. This can be caused by a core logic or coherent multiple logics. This influences the degree of institutionalization of the institutional field. Furthermore, it can cause path dependency strengthening the stability of the system. This results in challenges for changing the system. The picture might suggest that these two ways are separate from each other, but in reality is assumable that there are ways in between where there are conflicting as well as coherent logics within a certain institutional system at the same time which is shown by the question mark. The figure shows schematically how institutional logics work in different pathways in general. This thesis examines how this framework functionates in the specific case of the construction sector. This provides insights in what way or intermediate way is applicable to the institutional field of the construction sector and the corresponding challenges and opportunities. To retain the explorative focus the framework is iterative. Meaning that the theoretical framework is built as guidance, but thorough research there is room for additions and improvements.



# 4 Method

*This chapter explains how the theoretical framework of multiple institutional logics is applied on the case of high-rise ZEBs in the Netherlands. A schematic overview of the methodology is depicted in figure 4. The different blocks are explained in this chapter, including description of data collection and how the data is analysed.*

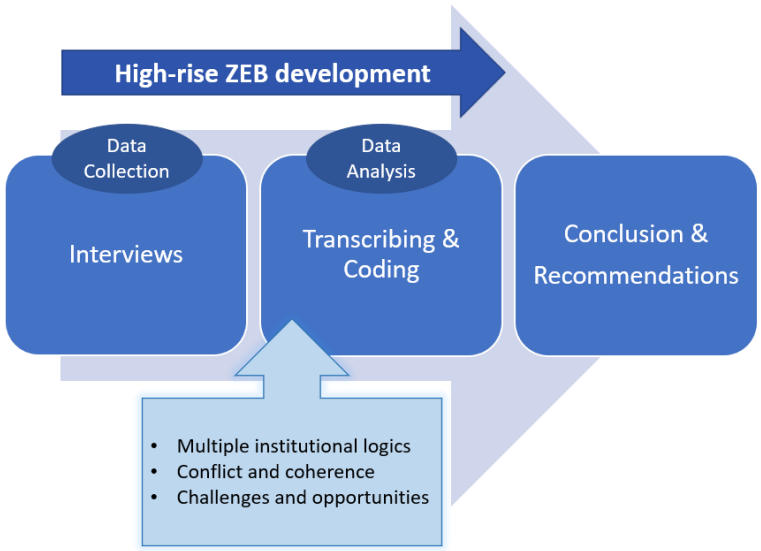


*Figure 4: Schematic overview methodology*

## 4.1 Data collection

As mentioned before there is not much research available about barriers in high-rise ZEB development. This makes a qualitative approach the most suitable for this specific case to support the explorative and theory generative nature of this research. The inductive character of qualitative research leaves room for exploration and interpretation to find new insights which are not yet covered in existing literature.

To gather information, I conducted semi-structured interviews (Bryman, 2012). This means that there is an interview guide including questions directing towards institutional logics, however there is also room for new insights. The semi-open structure supports and enables grasping of thoughts and answers from the interviewees that are unexpected and therefore might not come up with a fully structured interview. The structure of the interview guide is a starting point, but in some interviews the conversation diverged from the order of the interview guide and some questions were already answered when answering other questions. The into English translated interview guide can be found in appendix 9.2 and is prepared according to the following structure. I started with a short introduction of myself and what the research is about. I did mention the definition of institutions to indicate that it includes more than only regulation since this appeared to be bit confusing in some cases for the participants. This was followed by general introduction questions about the role of the interviewee, working experience, and what kind of projects they are involved in. Then there were questions focussing institutional logics.

The first question concerning logics was asked form a broad perspective to prevent steering the interviewee in a certain answer direction. Since institutional logics and institutions can be interpreted in different ways, follow up questions about experiences, norms and values etc. are used when the interviewee needs some more direction. Furthermore, questions about conflict and coherence of the mentioned logics were asked and if some are more present or relevant than others. In addition, questions are asked about challenges for ZEB implementation and what kind of change is needed to enable high-rise ZEB development. The questions are meant to create insight in challenges within the existing logics and required logics for high-rise ZEB development. Furthermore, there are questions based on insights form previous interviews. When someone mentions for example the importance of financial feasibility and this is not mentioned by someone else there is asked for their opinion on that topic. To close the interview there are questions concerning the interviewee's future perspective on the construction sector. This open structure creates not only room for answers about required logics, but also for spontaneous answers which can be relevant for the case. Lastly, I asked if they know contact persons for following interviews. The questions are focused on ZEB development but also answers about sustainable development and innovation in general are helpful to create insights into the institutional logics in the sector, so this is also included into the interview conversations. From the first interviews it appeared that even though institutions and institutional logics can be widely interpreted the questions did function appropriately to collect information.

## 4.2 Sampling strategy

The multiple logics approach as described in the theory chapter is a general approach. In this research it is specified on the construction sector. For the purpose of this research, the Standard Business Classification (SBI) is used as preliminary step providing a clear and detailed delineation. These boundaries delineate which actor groups to focus on to ensure a complete and sector broad information gathering, also to examine if there are general conflicting or coherent logics between or within actor groups. The SBI classification scheme includes all types of construction work. This research only focuses on the SBI business categories within the construction sector regarding the construction of housing and buildings. This means that for example road construction and plumbing are excluded. As mentioned in chapter 2, the main groups where the research focus on can be found in appendix 9.1. The included categories are 'general civil and utility construction and project development', 'specialized work in construction' and 'architects, engineers and technical design and consult'. This covers the actors involved in the process of constructing a building for start till the end. From the different category actors were invited and while searching for potential participants search terms as sustainability, energy neutrality and high-rise buildings were included. Large companies such as DuraVermeer and BAM were contacted but also smaller actors were invited to participate. This was used as starting point to contact people, leading into snowball-sampling to reach more interesting and relevant actors. There is asked for the opinion of interviewees who they would recommend interviewing and if available contact information. Some actors did not fit in the SBI scheme but are included when they are seen as relevant by other interviewees and researcher.



For example, housing cooperatives were mentioned several times as relevant by interviewees so different potential actors were contacted after a few interviews. For each SBI category at least three interviewees participated ranging from large construction and installation companies to relatively small actors. A list of interviewees is presented with interview number, description and SBI classification in appendix 9.3. It is important to mention that some actors do have working experience in other classification categories or perform activities outside their classification category. Therefore, this should be seen as tool to reach a sector broad perspective and not a way of putting the interview respondents in certain boxes.

To reach participants I did send mails with a short description of the research and the question if they were interested to participate. If they were interested an extended description of the research and an attached informed consent form was sent. This includes information about the recording and transcription of the interview and that it is the possible to stop the interview at any time. Furthermore, the interviews are anonymized in the research to prevent leaking of personal information of participants. This is done by not mentioning individual names or company names and delete specific personal information that could reveal a certain participant. The transcripts are stored on a USB and the recording is destroyed after transcribing. Only quotes and citations of the transcripts are used in the report with an anonymized reference using interview number and description e.g. interview 1, consultant.

The differences in institutional logics among different subdivisions in the construction sector is only an example how the characteristics of the sector can impact the dynamics of the institutional logics. This explorative research may either confirm or create insights like these. Besides differences between SBI subdivisions, it is important to recognize it is assumable that there are some differences between the institutional logics of renovation buildings and new construction buildings. For example, the regulation field differs. However, since it is likely there is also a lot of overlap this research will focus on both categories. For example, the importance of cost-control and economic benefits is likely to overlap.

## 4.3 Data analysis

To identify challenges in high-rise ZEB development and draw up some advice how opportunities can be used, the following steps are pursued. Firstly, the multiple institutional logics are identified. Secondly, there will be looked at the tension or coherence between institutional logics. The dynamics of these tension or coherences can be elaborated by the theory of Besharov and Smith (2014) by looking at core logics and compatibility. The core logics can be described by interviewees as most important or seems most influential. This leads into insights where opportunities and challenges arise. And can contribute to find out whether there is need for institutional change and if there is need for new institutional logics or replacing institutional logics for example. Finally, based on the previous mentioned insights some suggestions are proposed where opportunities for institutional entrepreneurship arise.



To enable a proper data analysis the interviews is transcribed and coded. The NVivo software is used to support this coding process and enabling to execute the coding in a structured and clear way. The coding process starts with open coding, by breaking interview lines down in small components and describing them with some words. Similar words and word groups can be grouped together in nodes (Bryman, 2012). These nodes are attributed to the different aspects of the data analysis: multiple institutional logics, tension or coherence and challenges. The data analysis is done in between interviews to ensure the interview guide is correctly structured. This includes that the information is coded right after the first interview to see whether information about institutional logics comes up. This helps to expand the interview guide with questions about findings in previous interviews and identifying patterns of institutional logics.



# 5 Results

*In this section the findings and insights from the interviews are discussed and placed in the theoretical framework. As discussed in the theory section the multiple institutional logic approach provides insights in the different institutional logics within a system and coherence and conflict between those logics affecting the stability of the system. In this chapter, I share my results from the interviews and explain them by use of the multiple institutional logic approach. By applying this approach on the construction sector challenges and opportunities for the implementation of high-rise ZEBs can be identified.*

I will start with an overview of the findings to show the multiple institutional field of the construction sector. The individual logics and external factors are elaborated in the next sections. Figure 5 provides an overview of the multiple institutional logics and the interactions between multiple institutional logics. The multiple institutional logics are represented hexagons. It appears that there is dominant set of logics strengthening a conservative and traditional way of doing things. These traditional set of logics are surrounded by a dotted line. However, the picture shows a variety of logics including logics outside the dotted line. These logics are mentioned by respondents, but do not strengthen the traditional set of logics. This is shown by the red lines representing the conflicting interactions between them and the traditional logics. The arrows represent external factors and which logics they influence. Overall, the logics concerning the traditional construction sector form a stable coherent system of stimulating to keep things how they are and do business as usual. When conducting the interviews, I came across some factors which neither belong to the multiple institutional logics nor can be neglected. These external factors are shown in the figure in blue and green arrows.

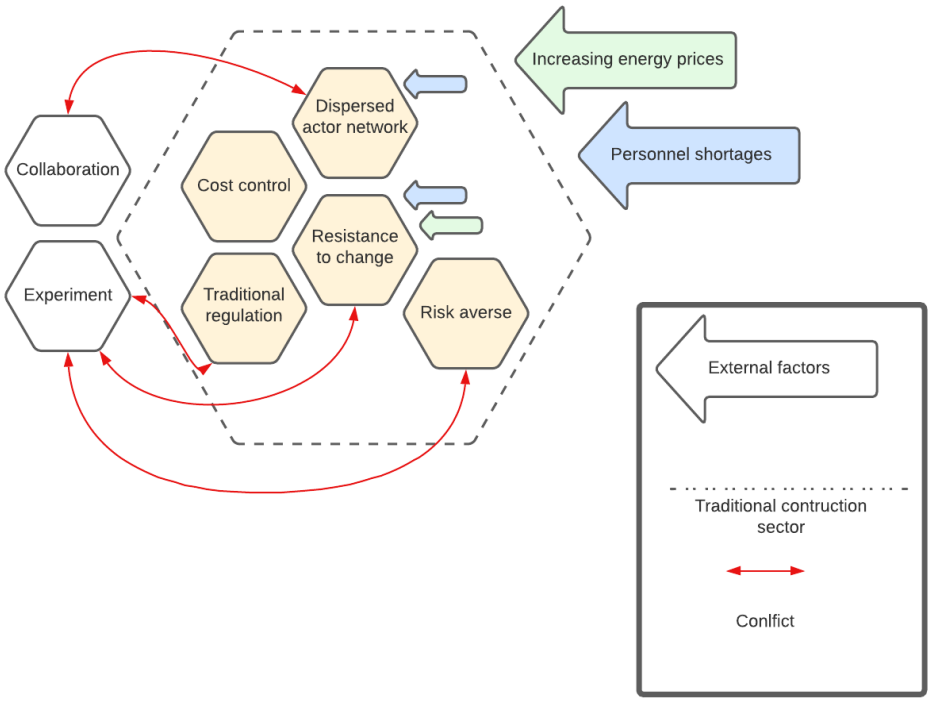


*Figure 5 The multiple institutional logics od the construction sector*

## 5.1 The traditional and conservative construction sector

In many interviews the construction sector is described as a conservative and traditional sector. This includes traditional regulation, a dispersed actor network, and cost control reinforcing risk averse behaviour and resistance to change.

Firstly, the part of the multiple institutional logics which are present in regulation. The regulation can be either stimulating or restricting and thereby influencing actors' behaviour and decision making. The regulation for high-rise buildings in the Netherlands is characterized by a drastically increasing number of regulation when a building passes the height of 70 metres. The conservative attitude as described above is reflected in the regulation. As mentioned by an interviewee:

> *'It is sometimes said that the construction sector is quite traditional. On behalf of regulations that's for sure. It is really focused on what we know and also directing in the known way. I notice that we have to collaborate with institutes and we get answers as: The computer says no. They have heat calculation programmes, but not appropriate for wood buildings'.(Construction company, Interview 13).*

This example shows that innovative or unusual designs are limited by regulation since the regulation cannot be applied suitably on these designs. This is also confirmed with another example about a heat pump with part vertically in the surface. One of the Interviewees talks about complex municipal applications which makes it easier to just apply a standard air heat pump or CV (Installer, Interviewee 15). This traditional regulation also results in illogical regulations from a sustainable perspective. For example, placing an unsustainable building and leave it there for 100 years is fine, but sustainably refurbishing parts and move it, so to speak 50 metres, comes with lots of regulation (Construction company, Interview 14). All these examples show that regulation is pushing the sector in certain directions. The BENG regulation in this case is meant to stimulate almost energy neutral buildings which is in itself a sustainable direction. However, it steers the familiar way of constructing and hinders other ways, for example wooden construction which does not fit in the calculation models and thereby scores low on BENG requirements (Technical consultant, Interview 12). This is strengthened by missing expertise within municipalities. As one of the interviewees said:

> *'There can be done more complex calculations to proof the BENG (almost energy neutrality) but in another way. However, there is not always expertise within a municipality. Of course, they do not believe consultants on their blue eyes. But till a certain level there is need for expertise on the judging side' (Technical consultant, Interviewee 12).*

The regulation in general is influenced by large conservative actors in the construction sector which cause an interrelation between the traditionality of the regulation and the sector itself. One of the interviewees provides an example what happens in the political environment after a fire in a high-rise building in London:



*'When there is need for additional regulation you see propositions coming from every corner. Then you think come one, firstly it leads to false security. And secondly, it excludes consciously competitors from the market'. (Regulation expert, Interview 8).* This is quite a sensitive topic in a sector where safety is hugely important.

Secondly, the conservative and traditional character of the sector is strengthened by the dispersed structure of the sector. When making a building a lot of parties are involved in different phases of the process from designing till the delivery of a building. This is mentioned by the interviewees as dispersed and this structure has its influence on innovation and strengthening risk averse behaviour, because actors do not want to take responsibility for others. As stated by interviewee 12: *'When the chain is more complicated people are more protecting of themselves. I believe in my part but the others. Then I do something I have done before since that went well'.* Interviewee 14 confirms this by saying: *'If you talk about high-rise a lot of streams flow together: architect, constructor, builder, installation technique etc. Then you all should have the same ambition to become energy neutral.* This can cause friction when the architect has a certain design, but there is need for a lot of installation technique.

Different interviewees mention the need for change in the dispersed actor network structure. The challenge arises that the current traditional structure of the sector leaves small room for innovation and costs immediately increase when taking some risks. How this dispersed network works becomes clear by the following example:

> *'What we learnt over the past years which is very important is that we became very dependent of installers. We need the installer on 2/3 areas, one of the is putting installations into modules in our factory. We are going to change that and do it ourselves.' (Engineer, Interviewee 6).*

Next to installers, also architects can cause challenges:

> *'I think collaboration is difficult due to the current revenue models. For example, I think architects have a large influence when they differ from standards. We want to work towards standards to be able to fulfil the production demand from the government. For all the buildings that needs to be produced in a short time span different companies should make production facilities. But if architects keep reinventing the wheel and changing things, we can never produce the demand amounts. (Engineer, Interviewee 6).*

That structure change is needed to enable large production is also confirmed by another interviewee who suggest shortening the value chain of the construction process. This includes more standard buildings for housing which can be produced mainly in factories, resulting in replacing the work of installers and architects. It should be mentioned special building such as theatres are exceptions in this case. By starting mass production, the cost price decreases which enables lower risks due to production certainty, revenue certainty and might provide more financial space to invest in innovation (Construction company, Interview 11).



The dispersed actor network correlates with all different revenue models of the different actors. Interviewees mentioned for example that the municipality also wants the full price for their plots and making money out of it, and the project developer wants its revenue efficiency (Construction company, Interview 2, 11). It appears that cost control is extremely important in the traditional character of the sector. This is a combination of financial feasibility, business cases and supply and demand. Interviewee 2 mentions that most people think it is quite easy to have a good business case in the building sector. However, the feasibility of building in relation to the market prices are quite critical. For the sustainable technological option, it is not always possible to round a business case. Also, interviewee 1 confirmed that it is all about reaching a feasible market price. This combines with the supply and demand. As stated by interviewee 13:

> *'That makes you do not put money aside for innovation. There is no demand from clients and when there is no demand you are not going to make it. So, it is demand and supply' (Construction company, Interviewee 13).*

It comes down to the fact that although in general large amount of money are going around in the sector, there is relatively small room for extra expenditures. This results again in even higher risk surcharges when implementing any form of innovation. These risk surcharges are already present for regular buildings since construction is mostly executed on site which involves risks as delivery delays, bad weather conditions etc. This results in enormous risk surcharges when implementing something new and causing risk averse behaviour:

> '*We are used to cover everything with enormous guarantees. For innovation it is impossible to proof it already works for 20 years, since it is not used for 20 years yet.' (Technical consultant, Interview 12).*

These risk surcharges affect the financial business case for high-rise ZEBs. Different interviewees mention the financial feasibility of high-rise ZEBs. The importance of cost control is hard to change since the whole world economy is focused on currency and revenue and there is no monetary value attached to sustainable development. The challenge arises how to make high-rise ZEBs economically attractive or at least feasible. However, the cost structure of the sector can change to strengthen the business case of sustainable buildings. I am going to illustrate this by an example. Instead of demanding the cheapest building and focusing on the financial perspective the focus on sustainability can be expanded. As mentioned by one interviewee:

> *'You see for example development budgets. When a developer applies for a plot the municipality can require high standards. When they say they want certain minimal sustainability calculation. Then the market will become very creative to find the right solution.' (Construction company, Interviewee 2).*



And as mentioned by another interviewee there should not only be looked at the development costs of a building, but also on a longer time span. He mentioned the example of a building only 1,5 percent more expensive than others. How does that relate to paying less on energy bills for years (Technical consultant, Interviewee 5).

The above-mentioned logics reinforce a culture of risk averse behaviour and resistance to change. When suggesting doing something different there is a tendency to a wait and see attitude. Many actors have preferences to do what they have done before. As one interviewee mentioned: '*Many parties are searching for proven technologies and something they do more often. … There is often referred to this is how we always do it so let's do it that way.'(Technical consultant, Interviewee 12).* Another interviewee adds that this is caused by the low number of academics in the sector:

> '*When you do not have the knowledge you are not allowed to join the conversation. That is not a bad perspective, however it results in basing their knowledge heavily on practice-based cognition, since there is a relatively low share of academics in the construction sector.' (Installer, Interviewee 17).*

This correlates with risk averse behaviour. Or as said by interviewee 7: '*Often the choice is made to do the things you know you can do. Then you know you have no uncertainties'. (Technical consultant, Interviewee 7).*

### 5.2 Constructive logics and external influences

Not all mentioned logics cohere with the traditional and conservative set of logics. Different actors mention the logics of experimentation and collaboration which conflict with the dispersed actor network, risk averse behaviour, traditional regulation, and resistance to change. These constructive logics appear to belong to a more innovative part of the sector and are mentioned as required to enable innovation. In this institutional environment there is willingness to change which makes it constructive in opposite to the change averse traditional logics.

In this constructive institutional field collaboration takes place in different forms. Where one talks about building teams, someone else talks about co-makers. In the end they contribute to the same goal by enabling trust relationships and shared responsibility and thereby spreading the risk of innovation. As one interviewee mentioned:

> *'Actors become attuned to each other when you work in changing coalitions and more often is fixed teams… If you are talking about innovation power in the sector. You should be able to see that value with each other and not only staying on your own island'(Technical consultant, Interviewee 10).*

And as another interviewee mentioned about co-makers: *'It works faster and more pleasant and you know for long-term what you are going to do' (Construction company, Interviewee 13)*. This indicates that collaboration reduces some risks.



Besides collaboration also experimentation was mentioned by interviewees. One of the interviewees mentioned that the Dutch construction sector is focussed on low-rise buildings, compared to other countries such as Hong Kong where the high-rise density is much higher in cities. Therefore, to know if people's behaviour changes you need to experiment with other kind of cities. For example, when travel distances are they might travel by the bike more often or walk the distance(Architect, Interview 16). Another interviewee mentioned that there is missing room for experimentation within regulation (Technical consultant, Interviewee 10). Of course, it should be safe, but it did take a long time before it was allowed to put solar panels on a roof nearby even though it only has sustainable advantage and no risk at all.

Besides the multiple logics some external factors arise from the interviews which do have a major impact on the logics of the sector. The do conflict with the traditional logics but cohere with the constructive logics. The constructive logics combined with external factors indicate opportunities for change, since they are conflicting with almost all traditional logics. This change can be beneficial for wide implementation of high-rise ZEB development.

Currently there is an enormous increase in the prices of gas and electricity. As stated by one of the interviewees: *'Change can start in several ways. You can be motivated to do something different, but you can also say there is need for a game changer. The mark-ups do help to do it in another way" (Construction company, Interviewee 14).* The mark-up prices influence the demand for energy neutral buildings to lower fixed charges for residents. Besides several interviewees are mentioned the challenge of personnel shortages. The average age of construction workers is increasing and there is a low interest for the profession. This pressures the traditional way of personnel intensive construction work on site. As mentioned by one interviewee this pushes the sector to work efficient with the workers that are left and resulting in the development of modular construction (Installer, Interview 15). And mentioned by someone else:

> *'Innovation costs a lot of money. We are not only pursuing it from financial or sustainability perspective but also with eye on the labour market. From your age group wants to work in the construction or installation sector? That are relatively few people while everybody wants a house. You can see that due to scarcity the sector needs to change ' (Construction company, Interviewee 14).*

Another opportunity for changing the system arise from the personnel shortages, which cause a barrier for traditional construction. The large housing demands are pushing the sector into standardisation and fabrication which in turn can create space for institutional change. The increased energy prices can steer this change in favour of a sustainable development such as high-rise ZEBs. As addition to this opportunity for institutional change mentioned by one interviewee:



*'High-rise buildings and wooden constructions are not really institutionalised in the Netherlands. People fall back on institutionalised parts such as terraces houses and brickwork etc. That is not beneficial for sustainable high-rise buildings, but the advantage is that there are no reliant ideas specifically for high-rise buildings.'(Architect, Interview 16).*

This indicates that there is an opportunity to change the multiple institutional logics in the construction more focused more on sustainability, high-rise buildings, and mass production. Figure 6 shows an opportunity for changed institutional logics, where the traditional construction is still present, but the dominant logics exist of collaboration, cost control, mass production, experiment and regulation conform the institutional change. There will be still conflicting logics, however the external factors are pressuring the non-dominant logic.

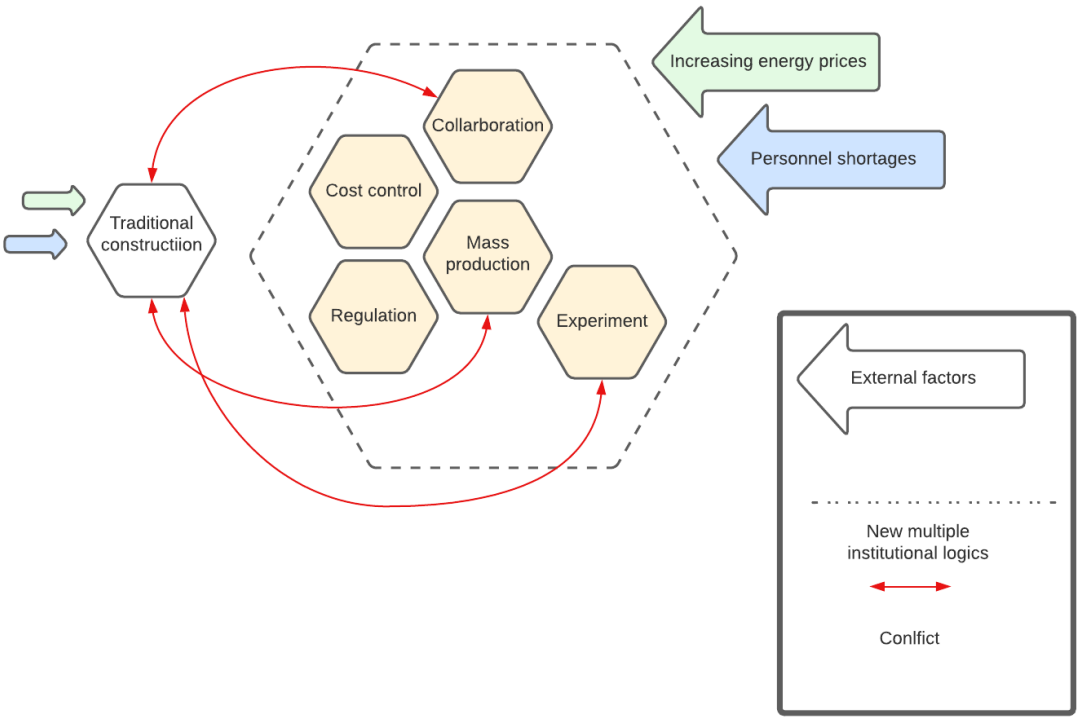


*Figure 6 Opportunities for institutional change*

The external factors already indicate a more integral perspective than only multiple institutional logics. During the interviews there was asked what interviewees thought would be the future perspective on high-rise ZEBs and sustainable high-rise buildings in general. And it appeared that many interviewees agreed on focusing broader than individual buildings. One example is the implementation of smart grids. The parking lots of high-rise building could be a perfect battery with a lot of cars that can load and unload, so it can be used for peak shaving (Architect, Interview 3). Someone else mentioned the necessity of smart monitoring of the energy use of a building and its users to use the energy as efficient as possible to enable energy neutrality in buildings (Technical consultant, Interview 10).

Added to this, an interviewee mentioned that especially due to the mass character of high-rise buildings it can be interesting for reusing energy streams and combining functions. For example, placing a datacentre and using the heat and combining shops and housings in a building (Construction company, Interview 14). There are also options for sharing devices and reusing water and waste streams which becomes a more attractive option compared to low-rise building due to the large scale of high-rise buildings (Architect, Interview 16).

These examples show that high-rise buildings do have characteristics that can be beneficial for sustainable development which contrasts with the traditional view that it is difficult to become energy neutral due to the small roof surface and large number of users in the case of housing.



# 6 Discussion

*In this section the findings are analysed and explained based on the multiple institutional theoretical framework. Starting with a reflection on the multiple institutional logics of the construction sector, followed by opportunities for institutional entrepreneurship.*

As described by Besharov and Smith (2014) coherence and conflict can lead to a certain stability of the system. The construction sector is dominated by conservative and traditional institutional logics resulting in a strong embedded agency. The traditional institutional logics: risk averse behaviour, cost control, resistance to change, traditional regulation and dispersed actor network constitute a stable institutional field. This stability causes a system where actors tend to do to the same as they did before, which shows the institutional path dependency and a lock-in in the current system. The current traditional construction includes a focus on low-rise buildings because it is easier, cheaper and less complex to build new low-rise buildings on an empty plot in contrast to building high-rise buildings in general. Furthermore, due to different actors and their revenue models the percentage of revenue left for R&D expenditures is quite low compared to other sectors. It does not mean that the construction sector is not innovative at all, but it limits the financial space for taking risks and sustainable development. This means that from the theoretical perspective of Battilana et al (2009) and Besharov and Smith (2014) it can be concluded that the system is to a large extent stable, homogeneous, and coherent.

However, besides the dominant traditional logics there are popping up constructive logics: experimentation and collaboration. These logics are constructive since they do enable taking risks for innovation and sustainable development in opposite to the traditional logics and indicate a way of doing things different from how it used to be. These constructive logics are supported by another condition influencing and destabilizing the institutional field which are the external factors: increasing energy prices and personnel shortages. It appears that these factors have an influence on the multiple institutional logics to some extent that cannot be neglected for the analysis of this research. Where Besharov and Smith (2014) describe conflicting logics as source of destabilization these external factors are also a source of destabilization. In case of the construction sector these external factors are destabilizing the traditional multiple logics and are in coherence with the constructive logics. Figure 7 shows how these external factors can be added to the earlier proposed theoretical framework. Since the specific results of this research only reveal them as influence on destabilizing influence on the current system, they are not connected with the stable system block.

To summarize, by applying the theoretical framework on the construction sector the results show an intermediate way between stability and instability. The traditional logics follow the path of coherence towards a stable system. The constructive logics follow the way of destabilizing the system strengthened by the external factors. This results in challenges as well as opportunities for changing the dominant traditional logics.



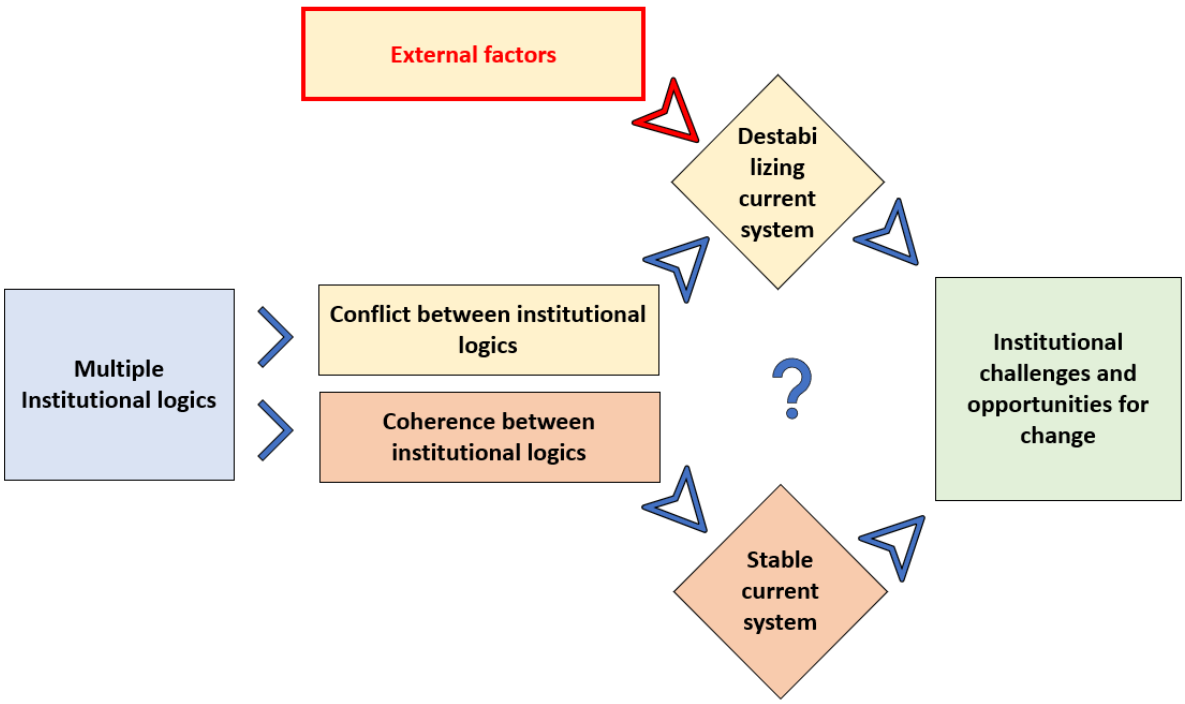


*Figure 7: External factors added to the theoretical framework*

The challenge is to destabilize or replace existing dominant institutional logics since they are conflicting with the constructive logics. This can be pursued by changing vision. For example, including environmental costs within the cost effectiveness besides building costs. This vision should than be spread among actors widely to enable institutional change. This can be reinforced by policymakers in term of energy taxes for buildings to give sustainability a monetary value. However, it should be noted that sustainability has wide implementations in the construction sector where the focus of this thesis energy neutrality is only one aspect besides other aspects such as sustainable material use. Therefore, it might be interesting to look at a total $CO_2$ footprint of a building for example.

The opportunities for change can be a chance for institutional entrepreneurship and a starting point new institutional logics. From the results it becomes clear that there are actors pursuing change in the system, by taking collective responsibility for projects or shortening the value chain by installing their products themselves. They might not consciously try to change the system, but these actions do cohere with the constructive institutional logics. Other actors do not necessarily initiate change but are forced to change their way of doing thing by personnel shortages for example. The opportunities for change can be used as a starting point for policymakers or institutional entrepreneurs to initiate institutional change. Policy makers could focus on fitting the regulation more to the constructive perspective instead of the traditional construction sector. Institutional entrepreneurs can initiate collaboration and stabilize the constructive logics. Since the Netherlands has a low-rise culture at the moment which is copied to high-rise buildings, and it can be argued that expertise for high-rise buildings is missing. However, it does provide space for a new institutional field focusing on sustainable high-rise buildings.



An integral implementation of sustainable technologies including smart grids, smart monitoring and using the mass character of high-rise buildings can be the centre of a new set of high-rise institutional logics. This is purely suggestive, but it shows that there are opportunities for change and how the constructive logics experimentation and collaboration can support high-rise ZEB development and be part of a new institutional field.



# 7 Conclusion

The aim of this paper is to elaborate on the multiple institutional logics approach by researching a complex sector facing social and environmental challenges in terms of climate change and large housing and office building deficits. This is covered by the following research question:

*What are the challenges in the institutional environment of the Dutch construction sector and which institutional changes can be addressed to support the development of high-rise ZEBs?*

The challenge is the traditional and conservative character of the coherent dominant set of logics of the construction sector shaping a stable system and disabling change. The traditional logics include risk averse behaviour, resistance to change, traditional regulation, cost control and a dispersed actor network. These logics reinforcing each other creating a system where the bar for taking innovative actions is quite high which is not favourable for the implementation of high-rise ZEBs. Battilana et al (2009) describe the degree of institutionalization in their paper. In this case there is a quite homogeneous field of traditional logics The degree of institutionalization indicates how difficult it is to change the institutional field. The largely homogeneous field of the construction sector makes it difficult to change the logics. However, there is a little bit of a heterogeneous character caused by these constructive logics. Also, external factors did appear and are added to the theory of multiple institutional logics. The constructive logics collaboration and experimentation in combination with the external factors increasing energy prices and personnel shortages are destabilizing the current system and enable opportunities for change. These opportunities for change can be a chance for institutional entrepreneurship and can be fulfilled by policy makers or actors from inside or outside the sector.

The qualitative and explorative focus of this research provided room for additional insights coming forward in terms of the influence of external factors. To investigate if these external factors are a meaningful contribution to the multiple logic approach future research into this direction is necessary. Future research could be focused on other sectors and provide insights if there are more examples where external factors can cause destabilization within a, in the first instance, stable current system. Besides it would be interesting to focus on the construction sector on a longer timespan to analyse how institutional change develops over time. This could elaborate on a more quantitative side of the topic by for example measuring the number of companies sticking to the traditional logics and to the constructive logics to see if there is a shift taking place. Another addition could be to focus more on the institutional entrepreneurship in the sector and analyse which activities are fulfilled by certain actors to change the system.

With this thesis a small glimpse of the complex culture of the Dutch construction sector is given. Change is always a difficult process, but when there are enough people willing to change there is an opportunity for a sustainable future.



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# 9 Appendix

## 9.1 Appendix 1 SBI classification scheme construction sector

| F Construction sector | |
|---|---|
| **41. General civil and utility construction and project development** | **41.1 Project development**<br>41.10 Project development<br>**41.2 General civil and utility construction**<br>41.20 General civil and utility construction |
| **43. Specialized work in construction** | **43.2 Building installations**<br>43.21 Electrotechnical installations<br>43.22 Plumbing and fitting work; installation of plumbing, heating and air-conditioning equipment<br>*43.22.1 Plumbing and fitting work; installation of plumbing,*<br>*43.22.2 Installation of heating and air-conditioning equipment*<br>43.29 Other building installation<br>**43.3 Finishing buildings**<br>43.31 Plastering<br>43.32 Building Carpentry<br>43.33 Finishing floors and walls<br>43.34 Painting and glazing<br>43.39 Other finishing buildings<br>**43.9 Roofing and other specialized construction work**<br>43.91 Roofing and building of roof structures<br>43.99 Other specialized construction work<br>43.99.1 Piling and other foundation work<br>43.99.2 Braiding of rebar<br>43.99.3 Bricklaying and pointing<br>43.99.9 Other specialized construction work (other) |
| **M Consultancy, research and other specialised business services** | |
| **71. Architects, engineers and technical design and consult** | **71.1 Architects, engineers and technical design and consult**<br>71.11 Architects<br>71.12 Engineers and technical design and consult |

*Table 2: Extended SBI classification construction sector (SBI, 2019)*



## 9.2 Appendix 2 Interview guide

*Short introduction about myself and the research. Including a short definition what institutions mean and asking if it is allowed to record the conversation.*

**General questions**

1. Can you introduce yourself?
   - Including work and experience
2 Are you or your company involved in ongoing projects concerned high-rise ZEBs or sustainable projects in general?

**Questions concerned institutional logics:**

1. What kind of institutional environment do you experience in the construction sector?
   - Regulation
   - Norms
   - Values
   - Sector culture
   - How are decisions made
   - What is influencing choices?
2. Are the institutional elements from question 1 of the same weight or are some more important than others?
3. Is the institutional environment a coherent system or is there tension/conflict?

**Questions about high-rise energy buildings and sustainability in general**

1. What are barriers and challenges within the development of high-rise ZEBs?
2. Are there elements in the current institutional environment hindering the development of ZEBs (or sustainable development in general)?
3. What changes are needed to support ZEB development and are there specific actions that can be addressed to support ZEB development?

**Questions based on insights from previous interviews**

Dependent on interview answers from previous interviews

**Closing questions:**

1. What do you think the future looks like for the construction sector?
2. Do you want to mention anything which is not discussed yet?
3. Do you have contacts who can provide information about this topic or who do you think should be interviewed concerned this research?

*Thank the interviewee and asks if he or she is interested in receiving the final report.*



## 9.3 Appendix 3 Interview respondents

| Interview Number | Description | SBI classification |
|---|---|---|
| **1** | Installer | 43.21 |
| **2** | Construction company | 41.1/41.2 |
| **3** | Architect | 71.11 |
| **4** | Technical consultant | 71.12 |
| **5** | Technical consultant | 71.12 |
| **6** | Construction company | 41.1/41.2 |
| **7** | Engineer | 71.12 |
| **8** | Regulation expert | Snowball sampling |
| **9** | Property advisor | Snowball sampling |
| **10** | Technical consultant | 71.12 |
| **11** | Construction company | 41.1/41.2 |
| **12** | Technical consultant | 71.12 |
| **13** | Construction company | 41.1/41.2 |
| **14** | Construction company | 41.1/41.2 |
| **15** | Installer | 43.21 |
| **16** | Architect | 71.11 |
| **17** | Installer | 43.21 |
| **18** | Housing cooperative | Snowball sampling |