Sustainable Real Estate Development Canvas

An approach for aligning the strategic and project level to achieve sustainable development concepts

Masters Thesis

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TU Delft

Preface

I am pleased to present my Master's thesis "Sustainable Real Estate Development Canvas – An approach for aligning the strategic and project level to achieve sustainable development concepts", which I conducted as part of the Master's programme in Construction Management and Engineering at Delft University of Technology. I carried out this research from September 2022 to June 2023.

At the beginning of this research was the intrinsic motivation to change something in the construction and real estate industry, to simplify processes and create something completely new. Without setting any limits for myself and following my own intuition by thinking outside the box, I fulfilled my expectations and created the Sustainable Real Estate Development Canvas (SREDC). Without giving everything away, I would like to say that this work is meant for all practitioners and hard-working people who want to simplify their processes. It is meant for all academics who think outside the box and are not afraid of new challenges. Above all, it is meant for people like me who are looking for undiscovered possibilities and unlimited options, and who meet challenges through creative and perhaps unconventional approaches.

I would like to take this opportunity to thank my entire thesis committee individually. Professor Dr. Hans Wamelink for the support I have received for my research project since the first meeting. A big thank you to Dr. Erwin Heurkens for the push where I needed it, the intensive feedback on intermediate results, and also for the freedom to go my own way. A thank you to Dr. Johan Ninan for critical contributions whenever they were needed.

I would also like to thank Michael Schmidt for his contributions to my work and his full support regarding the research direction.

Last but not least, I would like to thank Dr. Christian Kron, who not only supervised me during my Bachelor's thesis, but also always supported me in my creativity and from whom I learned much more than I could reproduce here.

Enough said – enjoy your reading!

Elena Müller
Delft, June 2023

Abstract

Real estate development faces many challenges due to the dynamic market, socio-economic developments, but also deeply rooted mentalities and practices in the sector. According to current literature, developers need to innovate at both strategic and business levels to overcome these challenges and remain marketable in the long term. As one level contributes to the other, both need to be aligned to achieve sustainable real estate development. However, there is currently no approach that guides developers in aligning the two levels. This research explores this gap and offers a solution by answering the research question, “How can the strategic and project levels of a developer be aligned to achieve a sustainable real estate development concept?”. To answer this question, the research method of Design Science Research Methodology (DSRM) is applied, which aims to develop a solution in the form of a tool, method, or procedure for a specific problem. The research is divided into two parts, one to provide the scientific basis for developing a framework, and the other to test the tool in a practical setting from which lessons can be learned. The research provided the Sustainable Business Model Canvas (SREDC), which helps to align the strategic view of the developer and the interests of the different stakeholders at the project level to achieve a new and sustainable development concept. The practical testing of the SREDC in an in-depth case study showed that it is possible to develop sustainable concepts with this approach. The practical implementation included individual interviews at strategic and project level, which led to a high information flow, especially at the project level due to the multi-stakeholder perspective. Within the context of a workshop with all stakeholders involved, a jointly agreed development concept was achieved through the alignment of interests. Although the study is subject to certain limitations due to the single case study, it was able to provide an approach for aligning strategic and project levels in order to achieve sustainable developments.

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Introduction

Real estate developers operate in a high-risk market, and although the climate for development has been very good in recent years, developers face a number of challenges. On the one hand, outdated and conservative mindsets lead to a lack of innovation and little flexibility and adaptability. On the other hand, certain industry characteristics make it difficult to adapt to certain circumstances; for example, compared to other products, construction projects usually have a very long lead time during which requirements or needs can change again. In addition, there are a number of dynamic developments that have an impact on a construction project. Socio-economic developments such as urbanism, digitalisation, or the differences between the individual generations play a major role in the dynamic development of the market. Added to this, is the increasing importance of the topic of sustainability in relation to the environment, but also in relation to social aspects. Society as well as national and international authorities are driving the transition to sustainability. Real estate developers, but also many other market participants or industries, are thus faced with major challenges to which they must respond. This requires action at the strategic level, at the business model level and at the project or product level. As far as the first point is concerned, researchers have been dealing with the question of how it is possible to change business models sustainably for some time. Various tools have been developed and tested for this purpose. As for innovation and adaptation at the project level, market participants try to find their own solutions and ways. Strategy and project are often considered separately, however, one often conditions the other. According to Heurkens, it is necessary for a developer to coordinate the two levels in order to remain marketable in the long term. However, a clear approach for this coordination has not yet been defined. This study therefore addresses this gap. The **problem definition** of this study is as follows:

While it has been observed that the strategic (business) level and the project level need to be aligned in order to develop sustainable real estate and perform well as a developer on the market, there is no approach that guides real estate developers through the alignment of both levels.

The aim of this research is therefore to develop a framework to help real estate developers align the strategic and project levels to develop sustainable real estate. Based on this, the following **research objectives** have been defined:

- Identification of scientific and practical implications for sustainable real estate development, both at strategic and project level.
- Develop a theoretical framework for real estate development based on the findings of the scientific and documentary review that take both levels into account.
- Practical conceptualisation of the theoretical framework.
- Testing the applicability on a real life setting (case study approach).
- Assessment of the applicability and usability of the framework.
- Defining of starting points for the generalisation of the framework for real estate development.

- Outline the recommendations and limitations of this research for future real estate development.

To guide the research and set a framework for the investigation, the following research questions and sub-questions were developed:

How can the strategic and project levels of a developer be aligned to achieve a sustainable real estate development concept?

- What research findings / streams play a contributing role in the development of the theoretical framework for real estate development?
- How can the theoretical framework be conceptualised in practice to achieve sustainable real estate development concepts?
- Is the framework helpful and usable for future real estate developments?

To answer the research question, a research design was developed that follows the design science research methodology, further explained in Chapter 2. Then, the scientific basis is laid through an intensive literature study in the fields of real estate development and sustainable business model innovation. Based on the scientific findings, a theoretical framework was developed and conceptualised for practical implementation (Chapter 3). Afterwards, an intensive testing phase of the SREDC was initiated, in which the tool was tested on a single case study. Subsequently, the results as well as the approach were evaluated by experts (Chapter 4). Finally, the results are discussed (Chapter 5) and concluded (Chapter 6).

2

Methodology

This chapter deals with the methodology used, which serves as the basis for the research work. First, the different research dimensions that are necessary to derive the research design are explained. In a second step, the defined research design, here Design Science Research Methodology, is introduced.

2.1. Research Dimensions

Before developing a sound research design that will help answer the research questions, the various methodological dimensions need to be clarified and justified. This is done following the research onion (Figure 2.1). For each dimension, an objective and a guiding question were defined based on the overall approach chosen. Subsequently, each dimension is briefly explained. However, more detailed information, especially on the strategies and techniques, is given in the section “Research design”.

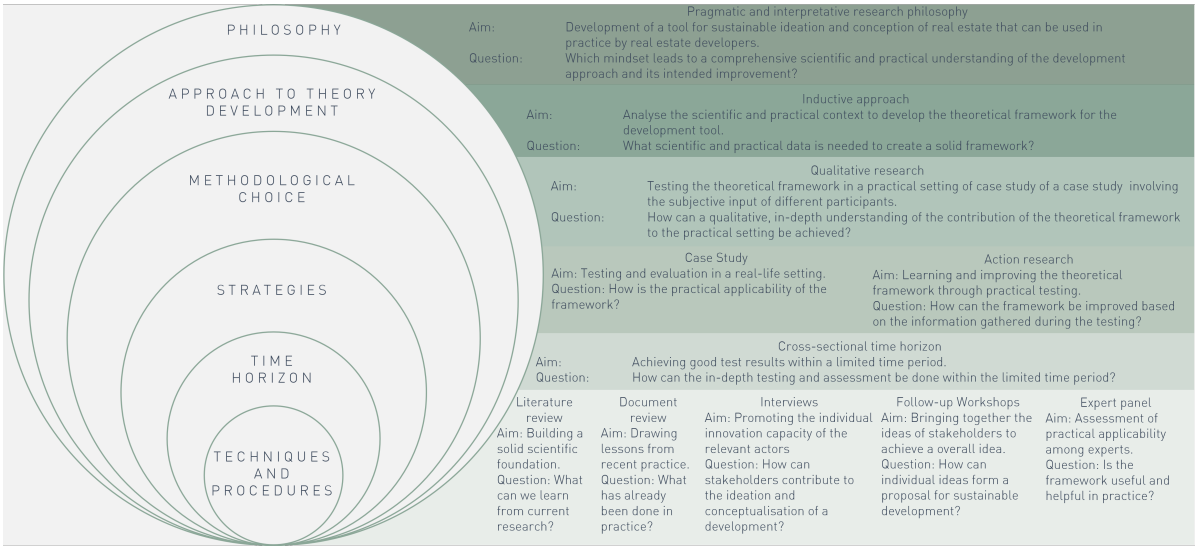

Figure 2.1: Methodology Dimensions based on the research onion (Saunders et al., 2019)

Philosophy

The outer layer of the research onion comprises the research philosophy, which encompasses the researcher's values, beliefs, and assumptions about how knowledge is created (Saunders et al., 2019). The guiding question that led to the resulting two main philosophies was defined as follows:

Which mindset leads to a comprehensive scientific and practical understanding of real estate development and its intended improvement?

The first underlying philosophy is **pragmatism**. This research is about making a difference on real estate development, not only at the basic project level, as mentioned in the problem statement, but also at the really strategic / business level of a developer or project initiator. The link between both levels for sustainable real estate has already been recognised in academia. But how to make this connection between these two levels, especially in terms of real estate development, is still quite unknown. Therefore, the researcher's intention is to come up with a useful solution that can contribute to a more efficient practical environment. Moreover, it is of great importance to test the theoretical solution in a real environment where all the effects of the idea become directly evident. This pragmatic approach is therefore also reflected in the research problem and the research questions. However, as a pragmatist, one is also aware that there are many ways to address the identified problem and that this research is only one possible interpretation of a solution.

The second philosophy is **interpretism**. Real estate development projects are usually projects that involve and affect numerous stakeholders. With the introduction of the sustainability factor, the circle of stakeholders becomes even larger. Therefore, it is important for this research to recognise that each stakeholder experiences the project differently. Consequently, individual perspectives need to be identified and understood. In this way, a highly subjective factors is introduced into the research. However, as each development project creates a unique situation with different stakeholders, a certain degree of subjectivity must be accepted.

Approach to theory development

An inductive approach was chosen for this research project. This is due to the research aim set, which concerns the creation of a theoretical framework for real estate development. However, before developing the framework, scientific and practical data needs to be collected. Based on the findings, the theory can then be developed. The guiding question is therefore defined as follows:

What scientific and practical data is needed to create a solid framework?

Methodological choice

This research project has a qualitative character, which is due to the research methods chosen. The involvement of different participants in the real life testing leads to the use of various research methods, which all aim at individual input from the participants. The outcomes are therefore of an interpretive nature. It is therefore crucial to collect enough data through the interviews, the workshop and expert panel and to interpret them carefully in order to draw conclusions for the theoretical framework. This was also highlighted in the guiding question for this dimension.

How can a qualitative, in-depth understanding of the contribution of the theoretical framework to the practical setting be achieved?

Strategies

The strategy layer elaborates on the steps required to conduct this project. The research strategy sets out the overarching plan of action to help answer the research questions (Saunders et al., 2019). Two approaches were adopted for this research.

How is the practical applicability of the framework?

Guided by the research question above, a **case study approach** was chosen as the first strategy. Through a case study, a deeper understanding of the usability of the framework is achieved, and its functionality is tested in a real project context. The case concerns a property with redevelopment potential. Further details on the specific case are described in Chapter 4 of this report.

However, due to the limited time frame, only one case study can be conducted, which makes it difficult to generalise the research outcome. To counteract this last point in some extent, the second strategy chosen is **action research**, which is guided by the following question:

How can the framework be improved on the information gathered during the testing?

Action research aims to find practical solutions through an iterative process. Usually, the process involves several steps in which knowledge is tested, evaluated, and improved. This strategy is the optimal way to test the framework in a practical setting (case study) and then improve it based on the evaluation data collected. Although only one iterative step is carried out in this study, further steps can be taken in the same manner in future research. Also, through the evaluation of the first cycle, a first attempt is made to generalise the framework.

Time horizon

This research is part of a graduation project, therefore the time horizon is limited to a certain period of time. This time limitation is reflected both in the implementation of the project and the final results. The guiding question is therefore as follows:

How can the in-depth testing and assessment be done within the limited time period?

Techniques and procedures

A total of five techniques were selected to support the aforementioned strategies. The first two techniques play a crucial role in the theory development of this inductive research. The **literature review** aims to provide a scientific basis for the theoretical framework. Here, relevant research streams contributing to the theory development were examined and conclusions were drawn. Derived from this objective, the following question was defined:

What can we learn from current research?

Complementary to the literature review, a **document review** is conducted to understand what has already been done in the market and what lessons can be learned for practice. This input helps to improve the theoretical framework with practical contributions before testing. This technique is guided by the following question:

What has already been done in practice?

Both the interviews and the follow-up workshop are intended for direct testing of the framework. With the **interviews**, the individual innovation capacity of the participants is stimulated. Therefore, through the interviews, data is collected to populate the strategic and project levels of the framework. The overarching question would be the following:

How can stakeholders contribute to the ideation and conceptualisation of a development?

After the interviews are completed, **follow-up workshops** are conducted with the same participants of the interviews. The aim of this second step is to bring together the individual ideas and achieve an overall consensus for the development concept. This technique is guided by the following question:

How can stakeholders jointly develop a concept for sustainable development?

Finally, after the testing is completed and the evaluation of the framework begins, an expert panel is conducted. The purpose of this process is to evaluate the practical applicability among experts: Based on the testing outcomes, the usability for further use in the real estate industry is assessed. Therefore, this final step is guided by the following question:

Is the framework useful and helpful in practice?

2.2. Design Science Research Methodology

Based on the methodological dimensions, the following research design (see Figure 2.2) was established. Guiding for the research design is the Design Science Research Methodology (DSRM) by Peffers et al., 2007. The decisive factor for this choice was that DSRM specifically aims to create a new reality for a specific problem, i.e. the end result should be a solution in the form of a process, a product, a tool, a technology, etc. for a specific problem. This approach fits perfectly with the overall inductive research approach and the set aim, which as mentioned is to develop a framework that helps to align the strategic level and the project level of real estate development.

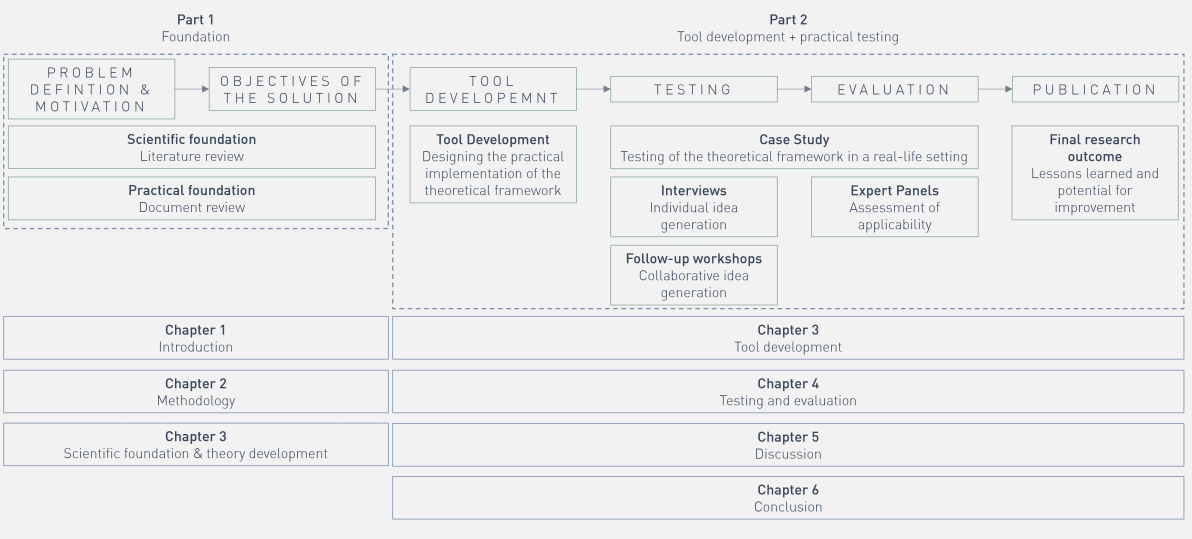

Figure 2.2: Research Design – Design Science Research Methodology

Figure 2.2 illustrates the six steps of the DSRM process. Each step is further detailed with specific actions. Overall, the research design is divided into two parts, representing the scientific part of the research and the practical part. Both are explained in more detail in the next sections.

2.2.1. Part 1: Foundation

Part 1, referred to as the “foundation”, comprises the first two DSRM steps. In general, this part has two overarching goals. Firstly, to gain a clear understanding of the problem and secondly, to establish a solid scientific and practical basis for a possible solution. To achieve these goals, a literature review and document review were conducted. Part 1 is covered by the first three chapters.

Problem definition

The first step was to identify a research problem. For this purpose, an intensive literature review was conducted, focusing on real estate development (see Chapter 3). In this process, it was necessary to capture the different sides of real estate development, which are presented in the different sections:

- Real estate development as a process
- Different types of developers
- Theoretical model of real estate development

Then, based on these three fundamental concepts, the challenges faced by real estate development in the current market context were identified. The challenges were accompanied by necessary measures to future-proof real estate development. This intensive research led to the identification and definition of the problem, defined as follows:

While it has been observed that the strategic (business) level and the project level need to be aligned in order to develop sustainable real estate and perform well as a developer on the market, there is no clear approach that guides real estate developers through the alignment of both levels.

Objectives of the solution

The findings from the literature review that helped to identify the problem also provided the objective of the solution sought, namely **the development of a framework for sustainable real estate development that takes into account both the strategic and project levels.** The theoretical framework was built on inputs from the literature on real estate development and research on sustainable business model innovation. However, in order to further advance the framework prior to testing, a document review was conducted to provide insights into current practices and possible improvements to the framework.

2.2.2. Part 2: Tool development and testing

Part 2 deals with the practical testing of the theoretical framework developed. This part covers 4 steps of the DSRM process and is explained in chapters 4 to 6.

Tool development

The third step "tool development" deals with the conceptualisation of the framework. Up to this point, only the theoretical intentions behind the framework have been explained. However, for actual application in a practical setting, a clear description of how to use it needs to be provided. Therefore, this step deals with the necessary actions to be taken by practitioners in order to fill out the framework and potentially achieve a sustainable development concept.

Testing

"Testing" is the most extensive step of the second part, as it involves the implementation of the tool in a practical environment. For this purpose, a case study was conducted, supported by interviews and a follow-up workshop. In the following sections, the setting of the interviews and the workshops are explained in more detail, and finally it is clearly argued which participants were involved.

Interviews

The first part of the test includes semi-structured (individual) interviews with several actors. The aim was to capture individual interests in relation to the case in order to fill in the strategy and project level of the SREDC. Which actors were included is explained in more detail in chapter 4. The semi-structure was chosen because participants were expected to provide unbiased input on the four themes of the SREDC, namely desirability, sustainability, feasibility, and practicability. Therefore, the interviews were only guided by the researcher, but not directly forced in any particular direction. Questions were changed or added depending on how the interview progressed.

The interviews were conducted face-to-face and one-to-one, as in the first phase of the testing the influence of other participants is to be avoided. Due to the individual circumstances, the interviews were conducted both online and in person. Each participant received an individual invitation, which already contained important information about the specific case and the framework to be examined. It was necessary for the participants to be able to prepare in advance to avoid too much steering by the researcher. The duration of each interview should be about 60 minutes, but not more than 90 minutes. Within this time frame, the following points are included:

- Beginning: introduction to the research and the case, including a reminder of the importance of individual participation. Additionally, information about the interview process.
- 4 rounds of questions and discussion: Question and ideas session to discuss each theme. A brief summary is drawn after each topic.
- Conclusion: After all topics have been discussed, all contributions are briefly reviewed and participants' agreement with the statements is given.

After all interviews were conducted, the input was prepared for further use in the follow-up workshops.

Follow-up workshops

Following the interviews, a workshop was held with the same actors from the interviews. This step in the testing process aims to bring together the individual ideas of the actors and unite them in an overall concept for real development. At the end, each participant has to agree on defined goals for each theme and understand the compromises made together. The workshop was led by the researcher as facilitator, therefore there is no direct involvement of the researcher in the development of the individual themes.

The workshop was held in person and in a project room. The overall course of the workshop is structures as follows:

- Beginning: welcoming the participants and brief introduction to the aim of the workshop.
- Presentation of the interview results: Before the alignment phase begins, the results of the interviews and thus the strategic and project level are presented to the group. The intention behind this step is to make the participants aware of all stakeholder interests.
- Workshop: Similar to the interviews, each theme is discussed individually with all participants in an interactive setting. After each theme, a summary of the agreements was prepared.
- Conclusion: After all themes were discussed, all inputs were summarised by the researcher and agreement was given by the participants.

Through the input of all participants, the main pillars of the development concept were defined. After the workshop, the concept is thus elaborated and can be used to start the implementation process.

Participants

During the literature review it became clear that sustainable development involves a multi-stakeholder perspective, therefore it is also the aim of this research to involve a wider range of stakeholders in the testing of the framework. To determine the right set of stakeholders, the agency-based model of real estate development presented in capter 3 is used as a guide. The model (Fig. 2.3) illustrates different roles with their specific market affiliation in the context of real estate development (Adams and Tiesdell, 2012). Each actor takes on one or more roles within the development process, e.g. in this case, the developer is also the landowner. For this study, it is important to carefully include actors with relevant roles in the development process, as the outcome of the concept depends on the mix of roles involved. This is also shown in the figure, as all roles and related markets have an influence on the development interest in the centre (Adams and Tiesdell, 2012).

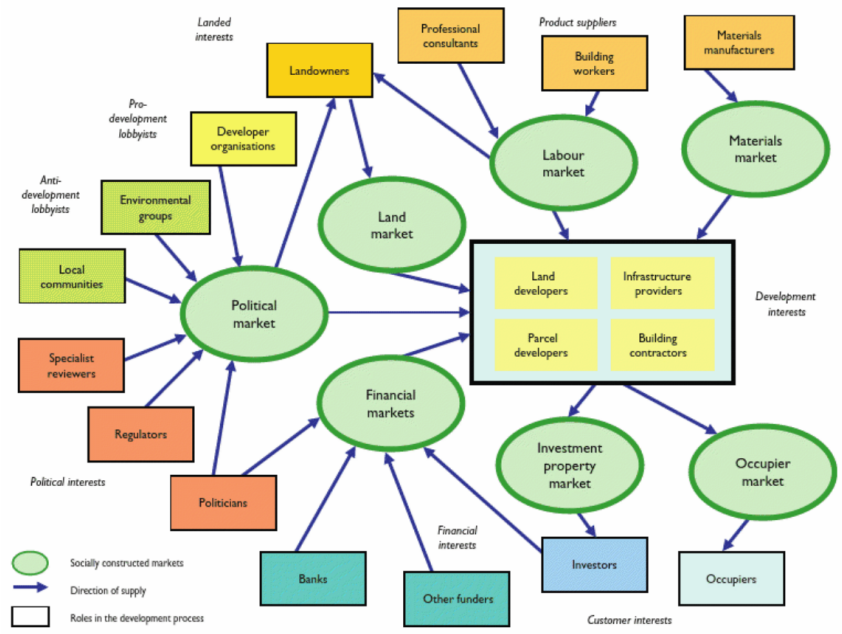

Figure 2.3: Agency-based model of real estate development by Adams and Tiesdell, 2012

Evaluation

The evaluation step describes the phase after testing the SREDC in the case study. The results were then assessed by a panel of experts, which is described in the next section.

Expert panels

The workshop marks the end of the test phase of the framework. In a final step, the extent to which the approach is useful in practice was evaluated with experts. For this purpose, four executives of the developer were involved as experts. The final result and the procedure were presented to them first. Afterwards, the experts were asked to describe from their point of view to what extent the framework is useful for practice and where they still have concerns or suggestions for improvement.

Publication

Finally, the research is completed, and the results are published. At this stage, lessons were learned, potential for further research and limitations are identified.

3

Theory

Chapter 3 deals with the different scientific research areas that have an influence on the research work. Initially, the field of real estate development is explained in detail and the current challenges are highlighted. Among other aspects, it is stated that innovation must take place both at the business model level and at the project level in order for developments to meet the challenges. In this context, the research area sustainable business model innovation is also examined in more detail. Finally, the SREDC, which was developed on the basis of the theory, is presented and conceptualised.

3.1. Real Estate Development

This section distinguishes between the different levels of real estate development and the current challenges for real estate developers and the corresponding measures.

Real estate development as a process

At the simplest level, real estate development can be understood as the process or action of development, i.e. the steps taken to (re)develop a property. This process can be divided into different phases, as shown in Figure 3.1. Usually it includes the project ideation, project design (concept and approval), project management (design and construction) and project promotion (sale). Sometimes developers even extend their involvement to the operational phase of the building. However, whether the developer is committed to the development project in the short-term or the long-term depends on its business models, which is discussed in more detail later.

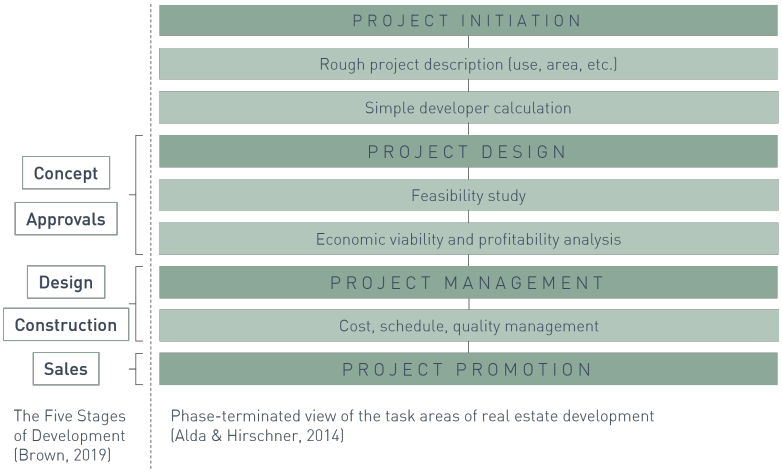

Figure 3.1: Real Estate Development Process

From a developer's perspective, this process of "real estate development" is similar to the process of "product development" as it involves the production of a specific building or infrastructure (Brown, 2018; Squires et al., 2017). These "products" require individual business cases / plans that are developed during the course of the different phases of the process. The business plans are usually the basis for further processing and detailing in the project management phase. Therefore, the final plan must include decisions on economic aspects as well as schedule, quality, and technical aspects. In addition, a market analysis and macroeconomic assumption must be considered (Ciaramella and Dall'Orso, 2021). All these aspects play an important role in minimizing the risk of the development.

A construction or real estate project seems to be a riskier venture compared to a "normal" manufactured product, as it is often a one-time project, i.e. each development is unique, so the developer produces a new product with each project. Therefore, each project must be the right combination of price, products, location, and schedule. In addition, the high risk is also due to the fact that construction projects are quite expensive and developers usually use their own venture capital and investment from investors to realise the project. To cope with the high risks, developers tend to take a conservative view of the projects and continue to apply established and commonly used practices (Brown, 2018). In addition, by preparing multiple scenarios in the business plan, uncertainty, and variability are taken into account in the early stages.

Ciaramella and Dall'Orso, 2021 has identified the following guiding principles in real estate development that promote the development process, as previously described: Firstly, developers operate predominantly on a level playing field, i.e. they generally use their own internal experience and knowledge. Solutions only go as far ad their own level of knowledge, i.e. their own experience and know-how, sets the limits for the degree of optimisation. Furthermore, when external consultants are added to the team, a top-down approach is often preferred, with the internal project team ahead of the external consultants. Secondly, the main focus of the business plan is on the building itself, i.e. great efforts are made to maximise the use of planning law and improve the overall quality. Thirdly, the economic assumptions of the business plan are usually based on available or historic date and are often supported by market analysis. Sometimes validation is done by comparison with other (completed) projects.

In summary, real estate development as a process consists of established process steps and principles that are widely applied. However, the scope of the process and decision-making about the project varies depending on the type of developer behind the development. The following section therefore presents four types of developers.

Different types of private sector development actors

As already mentioned, there is not only one type of developer. They can be distinguished according to their involvement in the project, i.e. short-term from idea to completion of long-term if the operational phase is also part of the developer's remit. Furthermore, they differ in the type of development strategy, they either have an integrated strategy with smaller projects and limited risk profile or an integral strategy with substantial scale projects and risk profile. Based on these aspects, Heurkens, 2018 has defined four types of private-led development (Figure 3.2), which are further described in the following.

In the upper left corner is the conventional developer-led development with a short-term commitment to the project and an integral development strategy. Players whose main business is real estate development fall under this category. They usually buy land, (re)develop it and deliver it to a client. The actors aim to exit the project with a reasonable profit after completion. These types of developers are also known as trader-developers (Heurkens, 2018).In the upper right corner is the investor-led development, which commits to the project for the long term and also takes an integral approach. The players in this category also have their main business in the real estate market. The main difference with the conventional trader-developer is that the investors such as institutional investors, banks, or even development investors keep the property in their portfolio after completion and thus receive a cash flow over the operating phase. Investors can either buy properties from developers or become development investors themselves. In this case, they are actively involved in the development phase (Heurkens, 2018). Moving to the lower part of the figure, there are two non-real estate participants. The area on the left includes private parties such as property owners who intend to (re)develop their own land, entrepreneurs who seek opportunities for (re)development, and citizens who intend to improve their immediate surroundings.

The involvement of this group is usually short-term, and the projects are of a smaller scale (Heurkens, 2018). At the bottom left is corporate-led development, which includes companies whose expertise is not in the real estate sector. However, they are long-term oriented and aim to optimise their real estate assets, especially in the operational phase (Heurkens, 2018).

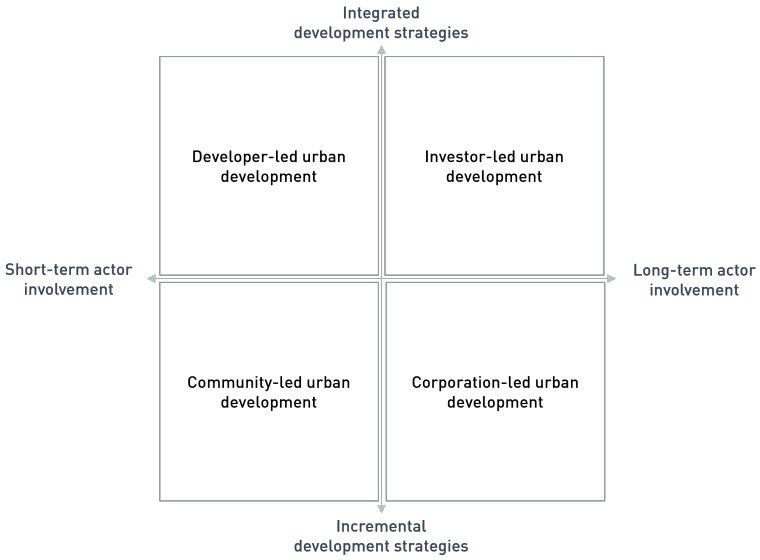

Figure 3.2: Typology of private sector-led urban development by Heurkens, 2018

Sustainability is an increasing challenge for all four types of developers, but those with a long-term commitment in particular seem to be more able to meet this challenge, as ownership and involvement in the operational phase lead to a higher commitment to investing in sustainable solutions. It therefore seems that parties in the right-wing categories are more inclined to take a leading role in the future (Heurkens, 2018). Nevertheless, there are certain scenarios for each player that could secure them a role in the future market.

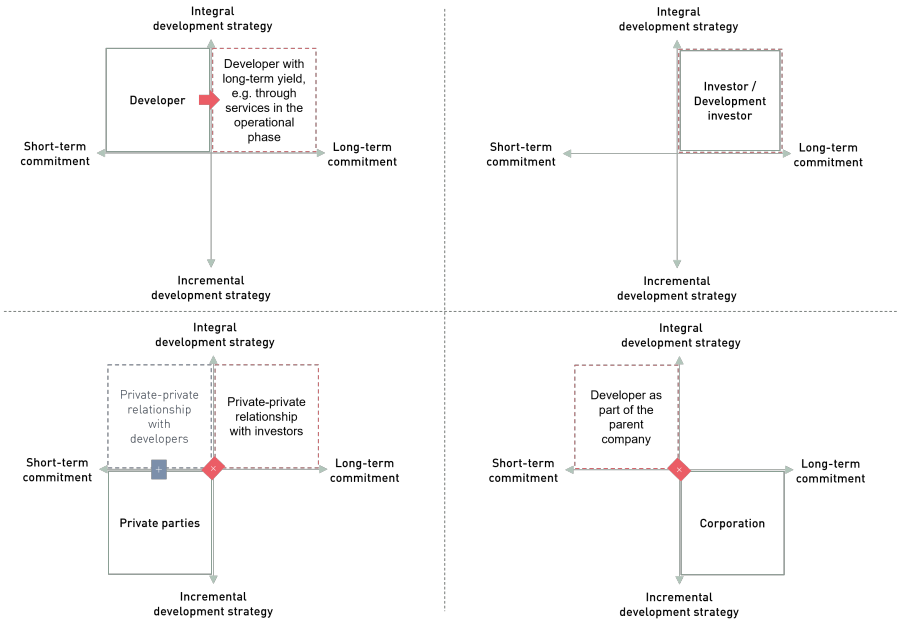

Figure 3.3: Scenarios for private-sector actors to meet the growing need for sustainability

Figure 3.3 illustrates different scenarios for each party that could enable them to be prepared for the future and the growing need for sustainability. For conventional trader developers, one possible solution would be to extend their scope of activities to the operational phase, for example by offering customers certain services such as maintenance or other innovative services. Developers would then have a greater incentive to adopt sustainable practices, as they would be involved for the long term, and thus earn long-term returns. However, trader developers are not known for taking such innovative, pioneering steps; they usually follow the innovators rather than being pioneers themselves. Such a change is thus possible, but rather unlikely, especially since investors or development investors already cover this area and take a leading role there. However, only a few of these players are currently active in the market. For private actors, a possible step for the future could be the use of private-private partnerships. Here, private players have two options, either to work with developers or with investors. Both options require close cooperation between the parties and, of course, a long-term focus with operational implications. Finally, for corporations whose core business is not real estate (such as mineral oil companies like Shell, BP or large companies in the automotive industry like Mercedes-Benz and many others from other sectors), it could be a great opportunity to expand their activities to real estate development in addition to their main business. To access the development know-how, they could either build it up themselves or partner with a conventional developer and integrate it into the parent company. In this way, the companies would have direct access to the development know-how. In addition, the developers would have more incentives to focus on sustainability, as the corporations are long-term oriented (Squires et al., 2017).

All in all, it can be said that a long-term orientation is becoming increasingly important in order to meet the sustainability targets demanded by the market. Investors and companies are already in a privileged position, private entrepreneurs, have the opportunity to cooperate with established players, only the conventional players need to find a way to move towards a sustainable business model that allows them to differentiate themselves from the development investors. One possibility here would be to cooperate with companies or private actors.

Theoretical model of real estate development

Neither real estate development as a process not the different types of developers can capture the complexity of real estate development in a hole. Over the years, many theoretical models of real estate development have been introduced to explain it. They all take a different angle on real estate development. According to Squires and Heurkens, 2015. the four most important models are the following:

- The equilibrium model assumes that real estate development is determined by the demand on the market for new real estate and thus by the given supply caused by this demand. However, this simplified view may work in a market with stable conditions and standard products; for current conditions, this market view may be too simplified (Squires and Heurkens, 2015).
- The institutional model represents real estate development in its institutional structures, which can be the “environment”, the “market” and the “organisations”. These institutions are the force that that arranges relationships and the main driver for dynamics. The real estate market can be divided into three hierarchical institutions that influence each other. First, the political, social, economic and legal institutions that organise society through certain rules, norms, and values. Second, the real estate market as an institution that functions as a network of rules, conventions, and relationships in the specific field of real estate. Third, the real estate organisations themselves, which shape the market through their actions and interactions (Squires and Heurkens, 2015).
- The agency-based model looks at the various actors who have different interests within a real estate development process. Therefore, this model reflects the social and behavioural component of the development process. Each actor takes a different role in the development process, and thus successful development depends on proper coordination between these roles. This requires an adequate basis of trust between the actors (Squires and Heurkens, 2015).

- The event-based model maps real estate development in its individual events and processes. The model makes it possible to link institutional purposes to the actual real estate development process. Through this, certain complexities and dynamic factors are included in the model (Squires and Heurkens, 2015).

All models deal with a different focus. Basically, it can be assumed that reality is a combination of all models. Squires and Heurkens, 2015 summarised the results of the individual models in one framework (Figure 3.4). Nevertheless, the researchers placed a strong emphasis on the different institutions. The conceptual model was developed to compare real estate development between different international approaches. However, the model illustrates very well the complexity and the numerous influencing factors within real estate development. For example, the process and developer types described in the first two sections are only a small part of the overall construct of real estate development. Therefore, it is necessary to keep all levels of the framework in mind when dealing with real estate development.

Figure 3.4: Conceptual model for comparative real estate development by Squires and Heurkens, 2015

Challenges for real estate development

Real estate development as a process or the various development strategies worked for many years. However, market conditions and consumer demands have changed, and assumptions and approaches that used to work are now outdated. Before describing the challenges in more detail, it is necessary to make a brief digression about the market and its change over time, as well as its impact on the real estate development sector.

Since the 1990s, markets have evolved from a predictable state where industries were known and defined, and therefore demand, supply and competition, to an unknown and unpredictable market. This is due to the fact that industries are rapidly changing, with more start-ups or small incumbents entering the market with disruptive, revolutionary, innovative ideas and technologies, which in turn compete with established players. This trend is forcing all players to adapt and strive for more flexible operating methods, which directly impacts the real estate that companies operate or use. Under predictable market conditions, real estate used to be designed and planned according to companies' established strategies and business models, and these conditions made it easy for real estate developers to meet the demands of developments. Today, under unpredictable circumstances with constantly changing market conditions, especially changing and adapting business models, real estate must be planned to adapt to these changes, i.e. it must be able to adapt to current and future business models (Ciaramella and Dall'Orso, 2021). Figure 3.5 of Ciaramella and Dall'Orso, 2021 illustrates this trend and shows that the buildings constructed specifically for the companies' business models and strategies are neither sufficient nor sustainable.This need for adaptable and flexible real estate requires a revision of conventional approaches and principles, which is covered in a later section of this chapter.

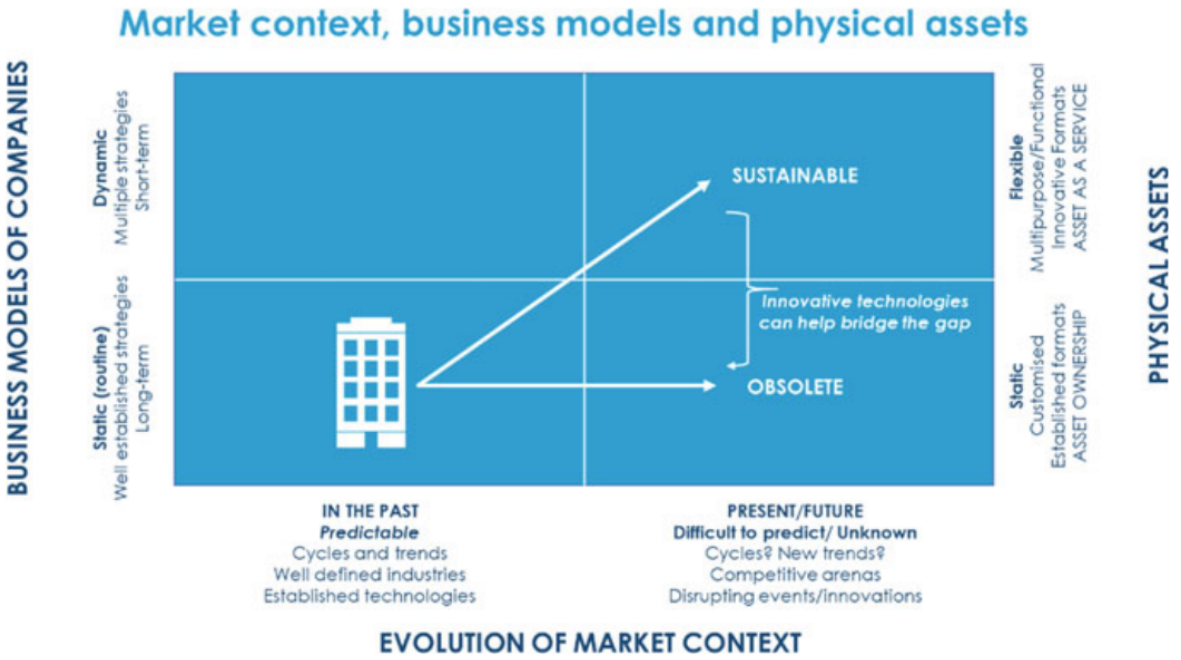

Figure 3.5: Market context, business models and physical assets by Ciaramella and Dall'Orso, 2021

These complex market conditions lead to the following two patterns of behaviour, especially by trader developers. First, because developers are no longer able to rely on past experience and predict market cycles based on general knowledge, they tend to pursue a particular "defence strategy" that minimizes market risk and the risk of volatility and macroeconomic variables on their side. To achieve this, developers aim to sell or pre-lease a large share of the building before development begins. In addition, developers aim for an early exit, i.e. once the building is built and marketed, they want to hand it over to an investor. This situation leads to the second pattern, where investors are no longer willing to invest in this type of project. The developer's exits in the short term is especially critical for building that do not meet the criteria of sustainability, quality, or adaptability. The lack of these aspects, combined with the difficult market, increases the uncertainties regrading the future demand for a property and therefore pose a high risk for the investors or even lenders (Ciaramella and Dall'Orso, 2021).

In addition to changing market demands, eight other critical aspects of the conventional real estate development that reduce the value of future developments have been identified by Ciaramella and Dall'Orso, 2021 and are discussed in the following paragraphs.

1. Lack of innovation: As already mentioned, the real estate sector tends to be conservative and sticks to what is known. Innovation therefore takes place rather slowly. According to Brown, 2018 innovation in the real estate sector can be categorized as sustainable innovation with an evolutionary focus, i.e. innovation is an improvement of existing strategies rather than completely new approaches. It is not common for developers to take bold and ambitious steps. which is also due to the high (mainly monetary) risk associated with developing a building. Therefore, breakthrough innovations are not usually to be expected in the real estate sector.

2. Low productivity and low efficiency: The development process still lacks standardisation, resulting in poor performance compared to other manufacturing products.

3. Formats and Contents "crisis": Similar to the first aspect, the tendency to stick to what is known leads to the recurring use of familiar approaches, concepts, and formats. Consequently, the demand for traditional buildings is satisfied by traditional developments. However, opening up to new possibilities and satisfying new demands through innovative developments are neglected in this way of thinking.

4. Little flexibility and ability to evolve: Changing market conditions, as described above, requires flexible and adaptable real estate. However, current developments rarely meet these conditions.

5. Old and obsolete existing stock: For many years, buildings were developed according to the traditional approach, so that communities and cities are full of such buildings. However, the floor plans and intended use of these buildings no longer meet today's requirements.

6. Unsubstantial involvement of society: Although real estate developments are recognised as a multi-stakeholder project, the relevant stakeholders outside the internal project team are usually rarely involved in the whole process.

7. Long time-to market: The time between the project idea and project completion can span several years. Within this time frame, the expectations, and needs of stakeholders and users may change.

8. Difficult to make reliable forecasts for supply and demand: Under the market conditions described, it is difficult for the developer to make reliable economic forecasts and must therefore rely on historic data or experience.

So far, the inadequacy of the real estate development process in the current market environment has been pointed out. Therefore, developers need to rethink their business model and the way they develop real estate. This need is further reinforced by external influences such as socio-demographic and ecological challenges. To start with the socio-demographic side: Urbanisation plays an important role in shaping cities in the future. In recent decades, the number of people living in cities has increased, and with it the number of megacities. As a result, housing quality, good mobility and service infrastructure play an important role in the attractiveness of a city. In order to remain competitive as a city and attract talent that will promote and strengthen local industry, the full range of available real estate and infrastructure is an important selling point. In addition to urbanisation, another factor influencing the design of the built environment is the characteristics and associated demands of different generations. The generations that have grown up with the benefits of digitisation and globalisation have high demands for a mobility and technology infrastructure that allows them to move, communicate and interact freely. A final point that also leads to the ecological challenges is the growing awareness within society for ecological sustainability. Thus, not only the demand of companies has changed over the years, but also the demand of end users. Aspects such as well-being and environmentally sound construction and operation have become equally important aspects alongside the financial aspects (Ciaramella and Dall'Orso, 2021).

Environmental sustainability is not only a challenge demanded by society, but also directly mandated by national and international authorities. Therefore, companies in all sectors are challenged to change their business practices in a more sustainable way. Global warming, loss of biodiversity, increasing pollution of air, water and soil, and depletion of the Earth's resources are just some of the impacts the planet faces as part of the environmental crisis. Although these problems have been known for decades, it was only in 2015 that the global community, in the form of the United Nations (UN), agreed to address them collectively – the result was the Paris Agreement, which set the overall goal of "limit global warming to well below 2, preferably 1.5 degrees Celsius compared to pre-industrial levels by the end of this century" ("The Paris Agreement | UNFCCC", n.d.).To achieve this ambitious goal, initiatives are needed from all governments. However, COP26 (conference on climate change) in Glasgow 2021 showed that current environmental initiatives by the UN have stalled rather than making any long-term difference ("Despite Glasgow Climate Pact 2030 climate target updates have stalled", n.d.).Likewise, the COP27 in 2022 did not produce expected results that could keep the 1.5 degree target open ("Massive gas expansion risks overtaking positive climate policies", n.d.). In addition to the Paris Agreement, the European Union has adopted its own treaty in 2020 the European Green Deal. It sets a target of reducing net greenhouse gas emissions by at least 55 percent by 2030. To achieve this, measures have been set in the areas of climate, energy, transport, and taxation ("A European Green Deal | European Commission", n.d.). Both the Paris Agreement and the Green Deal pose challenges not only for public actors but also for the private sector. The built environment in particular is one of the main contributors to many environmental problems. It is therefore a key sector for the fulfilment of the Paris Agreement and the European Green Deal ("2021 Global Status Report for Buildings and Construction | Globalabc", n.d.).

In recent years, one measure that has established itself on the market to gather information on the sustainability performance of companies or projects is the so-called E(nvironment) S(ocial) and G(overnance) ratings. Investors in particular include these ratings in their decision-making. The real estate sector is no exception, which is why developers have to implement certain ESG criteria in their developments in order to find investors. In other words, the ESG ratings required by investors indirectly force developers to adopt a more sustainable approach to development. By using ESG, the previously described "defence strategy" no longer works, as investors thus try to avert the risks that developers shift to the investors' side. However, ESG still seems to be a vague topic in the built environment. First, there is a lack of proper conceptualisation, i.e. there are no uniform processes, procedures, or standards (Dumrose et al., 2022; Kempeneer et al., 2021). Second, there is a tendency in the market to focus mainly on the environment aspect, as this is the easiest to measure and quantify. For the other two aspects, especially the social aspect, there is a lot of confusion among market participants on how to define and especially measure social criteria (Kempeneer et al., 2021; Robinson and McIntosh, 2022).

As part of the European Green Deal, the European Union (EU) has set itself the goal of developing taxonomy rules to steer investments towards sustainable solutions or projects. It is therefore primarily a policy aimed at the financial sector. However, with the taxonomy, the EU also wants to create a common understanding of the topic of sustainability. To this end, various aspects of sustainability are addressed and criteria are defined. This specific component of the taxonomy could help to eliminate ambiguities in ESG ratings, as both environmental and social aspects are addressed (Dumrose et al., 2022). So far, the EU has published six environmental targets, namely

1. Mitigation of climate change
2. Adaption to climate change
3. Sustainable management and protection of water and marine resources
4. Transition to a circular economy
5. Pollution prevention and control
6. Protection and restoration of biodiversity and ecosystems

Criteria have already been set and published for the first two objectives. Member states and industry are therefore already obliged to follow the first two objectives and their criteria (*Taxonomy: Final report of the Technical Expert Group on Sustainable Finance*, 2020). By the end of 2022, the EU wanted to publish the criteria for the other targets, but this seems to be a work in progress. Each target is described in detail by defined criteria. However, the criteria are not the same for all sectors, but are detailed for each relevant sector that makes a serious contribution to the environmental crisis. This includes the construction industry. Therefore, the six environmental criteria are elaborated in more detail by the European Union, but as mentioned above, only the first two targets have been elaborated and published so far. To briefly explain how the taxonomy is constructed and how it is to be used, a brief insight is given in the Figure 3.6. Market actors are assumed to make a significant contribution to one of the six objectives, with none of the other five objectives being compromised in any way. In addition, minimum guarantees of good governance and respect for human rights must be met.

Substantial contribution	Do no significant harm	Minimum safeguards
Make a substantive contribution of the one of six environmental objectives: • Climate change mitigation • Climate change adaption • Sustainable management and protection of water and marine resources • Transition to circular economy • Pollution prevention and control • Protection and restoration of biodiversity and ecosystems	Additionally, the other five environmental objectives should not be significantly harmed	Minimum safeguards should be respected (e.g., OECD Guidelines on Multinational Enterprises and the UN Guiding Principles on Business and Human Rights)

Figure 3.6: EU-Taxonomy—Performance thresholds

This section has highlighted that the real estate sector faces several pitfalls and challenges, some of which are related to its own development approach, but also due to the large influence of external factors. Figure 3.7 provides an overview of the main obstacles. Based, on this overview, it is clear that solutions are needed. Therefore, the following section sets out the main requirements for developers to address these circumstances.

Figure 3.7: Overview-Challenges

Requirements for future-oriented real estate development

The previous section presented various challenges that real estate developers are currently facing. This ultimately leads to the question: How can real estate developers deal with these challenges? A holistic answer has not yet been provided by academic, but principles and guiding aspects have been identified that are relevant for real estate developers and should be adopted.

To meet the challenges of a changing market environment and an increasing awareness of sustainability in terms of environmental, social and economic sustainability, real estate developers need to rethink their practices from the basic project level to the overarching strategic corporate level. Sustainable project goals can only be achieved if they are in line with the company's strategic sustainability goals. Therefore, all aspects described below need to be considered in both areas.

Based on the previous literature review, three main factors for future-proof real estate were identified. First, the need for more flexibility and adaptability. The current market requires developers to move away from strategic and forward-looking approaches. Relying solely on forecasts and market cycles is no longer sufficient as development approach. Current changes in the market, as well as changing user requirements and national and international regulations, require flexibility and adaptability in development projects and from developers. These capabilities allow real estate to be developed to meet not only current demand but also future demand, e.g. flexible construction would allow for the conversion of office space into residential or other needed space. Second, even though developers claim to take a collaborative approach, collaboration is required on a larger scale. This means that stakeholders need to be actively involved from ideation to completion and operation of a project, especially at the beginning when the idea is born. By stakeholders, it is not just the project team, external consultants and the client that are meant, but a wider network of stakeholders who have an interest in the project. A sustainable real estate development can only be achieved if all interests are taken into account and appropriate compromises are found. In other words: Only through comprehensive stakeholder involvement can sustainable needs be identified and implemented in the development. Third, developers are required to be innovative. In particular, the need for more sustainability requires more innovative solutions throughout the life cycle. On the one hand, this offered many opportunities to discover new

market segments, but on the other hand, it forces developers to step out of their comfort zone. Innovation ranges from the technological and technical level, i.e. material selections, smart building solutions, etc., to the process level, i.e. improved construction methods, operational plans, green leases, etc.. However, innovation is not only about changing and improving current products and services, but it is additionally, perhaps even more important, to foster innovation through a supportive organisational model. As innovative steps in the real estate industry can be quite risky, it is recommended to use prototypes that can be tested and improved before the final execution of the project Ciaramella and Dall'Orso, 2021. Consequently, innovation is two-sided, on the one hand product and service innovation, on the other hand business model innovation. For developers, this means that not only the project level, i.e. the conventional approach, has to be changed, but also the developer's business model, which harmonises with the new approach and thus even supports it.

Heurkens, 2020 has identified similar aspects that need to be covered by real estate developers in order to function well in today's market. Figure 3.8 shows Heurkens' theoretical approach, which defines different area of real estate development along two criteria. On the vertical axis, a distinction is made between the strategic level of real estate development, a long-term time horizon, and a project-related level, a short-term time horizon. This distinction is similar to the one already mentioned, i.e. there is a project level and a corporate level for each real estate development. On the horizontal axis is the type of steering within the real estate development. There are soft steering factors or hard steering factors. The axis divides the figure into four areas, each of which is important for sustainable real estate development. Beginning with the strategic part in the upper part of the figure, the entrepreneurial area is located on the left side by soft steering. Entrepreneurship coincides with the identified need for developers to be innovative. An entrepreneurial mindset can open up new opportunities and thus market potential. On the left-hand side, the hard steering factor is the area of investment. This area encompasses the need for long-term investments, i.e. a real estate project offers multiple opportunities for value creation and capture throughout its life cycle. From an economic point of view, these value creation opportunities need to be exploited, even if this means a long-term commitment. The lower part of the figure shows the project-based level. Here, on the left-hand side, the ability to collaborated is shown as soft steering. This is about engaging stakeholders, creating reliable networks and coalitions and discovering different forms of partnerships, for example with public partners. By working together in the right way, the full potential of property development can be realised. On the right-hand side, hard steering is the ability to produce a sustainable development concept that is built on clear economic, environmental, social and qualitative objectives and is feasible to implement.

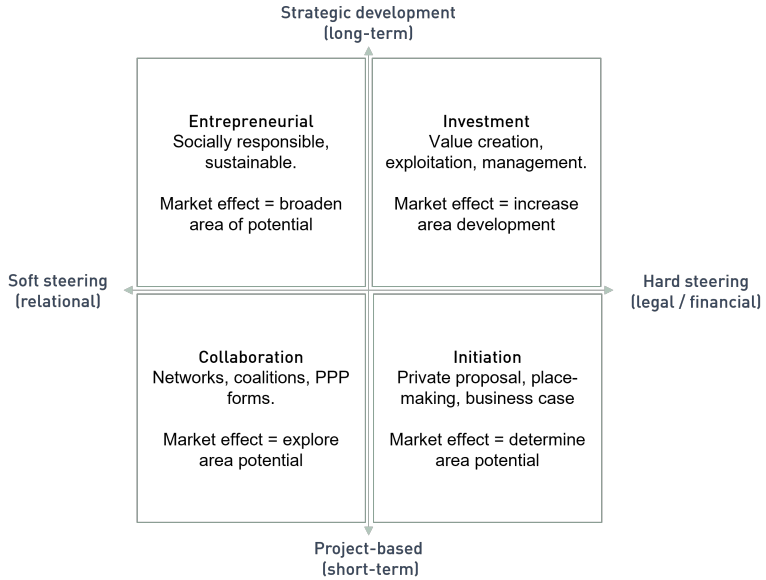

Figure 3.8: Multi-steering role in real estate development by Squires et al., 2017

In summary, it becomes clear that real estate developers need to change their approach at the project level as well as the business management level to address the current challenges. One possible approach to find a solution for real estate development on both levels could be the research area of sustainable business model innovation (SBMI), which is discussed in the next section.

3.2. Sustainable Business Model Innovation

The sustainable transformation of business models, including the associated products and services, is a topic that has attracted increasing interest in academia in recent years. An entire research field, namely "Sustainable Business Model Innovation" (SBMI), is dedicated to this topic. It has evolved from the more general field of "Business Models" (BM) and "Business Model Innovation" (BMI). As sustainability requirements have become more important in recent years, the research focus shifted from BMI to SBMI. One possible reason for this shift could be the opportunity to gain a competitive advantage. Many companies have realised that sustainability is associated with opportunities to open up new market segments. Thus, SBMI is a possible way to gain a competitive advantage over other market players (N. M. Bocken and Geradts, 2020; He and Ortiz, 2021; Inigo et al., 2017). To achieve a sustainable business model, many academics dedicated their research to defining tools, methods, or framework to help companies transform their business models.

SBMI instruments can be broadly divided into two categories. First, structured frameworks with the specific aim of SBMI. Into this category fall the Business Model Canvas (BMC) (Osterwalder et al., 2010), the Triple Layered Business Model Canvas (TLBMC) (Joyce and Paquin, 2016; López-Nicolás et al., 2021), an improved version of the BMC along the three dimensions of sustainability (economic, environmental, social), the Ecology of Business Models Experimentation map (EBME map) (N. Bocken et al., 2019), the Backcasting and Eco-design for the Circular Economy (BECE) (Heyes et al., 2018), the sustainability-oriented innovation tool (SOSI Tool) (Calabrese et al., 2018), the Circular Business Model framework (CBMF) (Lauten-Weiss and Ramesohl, 2021), and the SBMI Pilot Canvas (Baldassarre et al., 2020). Second, practices, or activities used for SBMI. This category includes research that uses design thinking for SBMI (Geissdoerfer et al., 2016; He and Ortiz, 2021), value mapping and the concept of value uncaptured (N. Bocken et al., 2015; Stubbs, 2019; Yang, Evans, et al., 2017; Yang et al., 2014), the House of Quality approach (Burhan et al., 2021), and simply developed activities and principles such as the W-questions ("OM Forum—Business Model Innovation for Sustainability", n.d.), paradoxical thinking (van Bommel, 2018), boundary alignment (Velter et al., 2020), and specific management practices (Short et al., 2014). Each of the practices in category two can easily be used in combination with the frameworks in category one, as they are mainly specific activities or way of thinking / acting.

One thing all these instruments have in common is that almost none of them cover all phases of the innovation process. To structure the process, there are four phases before SBMI is achieved (Minatogawa et al., 2022):

1. Opportunities and Risks – Initial phase in which rough opportunities and risks are worked out.
2. Sensing—Identification of opportunities and definition of value proposition. At this point, the idea is created.
3. Seizing – Detailed design to implement the idea. Working out how to capture the value.
4. Transforming: Implementation of the design; value creation.

In general, the tools are very useful in the first three phases, but they lack transformation capability, i.e. adaptation in practice. The step from ideation and conception to implementation in practice is a major problem that has also been recognised in academia and is referred to as the "design-implementation gap" (Baldassarre et al., 2020; Minatogawa et al., 2022). Reasons for these phenomena are, on the one hand, that many tools such as the TLBMC have only been developed for analysis purposes instead of really bringing about change. It is therefore a matter of raising awareness of the current business model and initiating the review process (Joyce and Paquin, 2016). On the other hand, SBMI is an extremely difficult undertaking (López-Nicolás et al., 2021), this is due to several factors. First, the whole SBMI process is guided by uncertainty of the outcome, as it is difficult to assess in advance how sustainable the new business model is (Evans et al., 2017; Minatogawa et al., 2022).

This goes hand in hand with the difficulty of understanding the impact of the new business model (Evans et al., 2017). Second, as SBMI involves a multi-stakeholder perspective, it seems to be very difficult to create a shared value for all stakeholders and furthermore to share it in a practical setting (N. Bocken et al., 2019; Yang, Vladimirova, and Evans, 2017). This is also because cross-cutting value creation requires engaging and interacting with the stakeholders throughout the process, which is a real challenge (Velter et al., 2020). All these barriers lead to SBMIs not taking the final step to implementation. However, for the sustainable business models that do make it to implementation, it was found that many of them fail in the market, although the main reasons have not yet been explored (Geissdoerfer et al., 2016).

Another aspect that plays an important role in creating SBMI is the need for dynamic capabilities at the organisational level. These are deep-rooted capabilities of an organisation that enable operational practices (Minatogawa et al., 2022). Therefore, strong dynamic capabilities support an efficient business model on the one hand, and lead to a sustainable advantage on the other hand, as organisations' dynamic capabilities are usually unique and difficult to replicate (Teece, 2007, 2018). However, while the area of dynamic capabilities for BMI has been extensively researched, there is a lack of research on dynamic capabilities for SBMI (Minatogawa et al., 2022). Research in this area is now increasing as scholars agree that the ability to innovate and develop sustainable business models requires specific dynamic capabilities (N. M. Bocken and Geradts, 2020; Evans et al., 2017; Inigo et al., 2017).

Despite the fact that there are still many obstacles to the successful design and implementation of SBMI. Science has also identified specific points that could help overcome these obstacles. These can be grouped into 4 action points:

1. Proactive stakeholder engagement: In many SBMI papers, a multi-stakeholder perspective is seen as an indispensable component of sustainable change (N. Bocken et al., 2015; López-Nicolás et al., 2021; Mendoza et al., 2019). Consequently, overcoming obstacles requires cooperation with a larger number of stakeholders and active participation in the SBMI process. However, so far, it is precisely this stakeholder engagement that has been identified as a major challenge for companies (Velter et al., 2020), which is why more research is needed on stakeholder engagement in the SBMI process.
2. Sustainable value creation: Moving from a traditional business model to a sustainable business model requires the creation of sustainable value (López-Nicolás et al., 2021). This includes considerations of value creation across internal business operations, the life cycle of product and service activities and the stakeholders involved. Only through a holistic understanding of value in all these areas can sustainability be achieved (N. Bocken et al., 2015; Yang, Vladimirova, and Evans, 2017).
3. Dynamic capabilities for SBMI: As described in the previous section, dynamic capabilities are an important aspect of achieving SBMI (Minatogawa et al., 2022). This includes embedding operational units, as innovation can be driven by all members of an organisation (Ciaramella and Dall'Orso, 2021; López-Nicolás et al., 2021).
4. Prototyping: Building a (cheap) prototype is recommended by researcher to assess the impact and sustainable value of the sustainable business model (Baldassarre et al., 2020). It also provides clarity on the results and clearly indicates the limitations (N. Bocken et al., 2019).
5. Macroeconomic support: Achieving widespread adoption of SBMI in the industry requires action outside the operational framework of organisations, i.e. governments / policymakers must increasingly support SBMI through the implementation of specific regulations (Heyes et al., 2018; Mendoza et al., 2019). This may only be achieved through a certain amount of lobbying, but not directly implemented by the companies.

In the following paragraph, the focus is put on the first point, namely the importance of stakeholder engagement, as this is a topic that almost every researcher identifies as particularly relevant. This is because by adopting sustainability, the circle of stakeholders expands (He and Ortiz, 2021). Therefore, it seems obvious that a multi-stakeholder perspective is needed on the way to a sustainable business model (Baldassarre et al., 2020; N. Bocken et al., 2019; Velter et al., 2020). Furthermore, a sustainable business model aims to create sustainable value for all stakeholders, including the environment and society (N. Bocken et al., 2019; N. Bocken et al., 2015; Inigo et al., 2017).

To achieve this, extensive cooperation and systematic coordination of stakeholders and their interests is required (Evans et al., 2017; Geissdoerfer et al., 2016; van Bommel, 2018).

Category 1 – SBM Pilot Canvas

Of the tools identified, only three from the first category were developed with the intention of covering all four phases, from opportunities to transformation. These tools are the EBME map, the SOSI tool and the SBM pilot canvas. Of these, only the SBM Pilot Canvas will be part of further research. This is due to the following reasons. First, the SBM Pilot Canvas was developed specifically for practitioners and therefore has a clear structure and is understandable for practitioners. Secondly, the aim of the Canvas was to overcome the design-implementation gap through experimentation and strategic design (=prototyping), as this is a relevant aspect for real estate, the tool is best suited for further research. The EBME map as described by N. Bocken et al., 2019 is extremely difficult to implement in practice and therefore less suitable for this research. The SOSI tool was developed specifically for service-oriented companies (service as a product), which makes it also less relevant.

SBM Pilot Canvas by Baldassarre et al., 2020 is a prototype-driven tool for creating small scale pilots. As mentioned earlier, the tool aims to bridge the design-implementation gap. This is done with the help of small-scale pilot projects that allow to check the desirability, sustainability, technical feasibility, and financial viability in advance. In this way, all aspects can be considered and bottleneck filtered out before large-scale implementation takes place. The SBM Pilot Canvas supports practitioners and helps to move beyond the ideation phase. The final tool, developed in three iterative cycles, is shown in Figure 3.9. The three iterative steps included testing in practice. Therefore, (Baldassarre et al., 2020) tested the canvas in three settings. First, in a test run at the university with students. Then with start-ups, all at a very early stage, and finally with a consulting firm and a multinational corporation. Before using the tool, a 30-minute introductory presentation was given, followed by workshops with the aim of developing a sustainable business model with the help of the Canvas. After each session, an evaluation was conducted with the participants to improve the canvas. The tool consists of five building blocks, each covering one of the aspects of desirability, feasibility, viability and sustainability, and is based on the main elements of the Business Model Canvas by Osterwalder et al., 2010. Table 3.1 describes each block and its association with the different aspects.

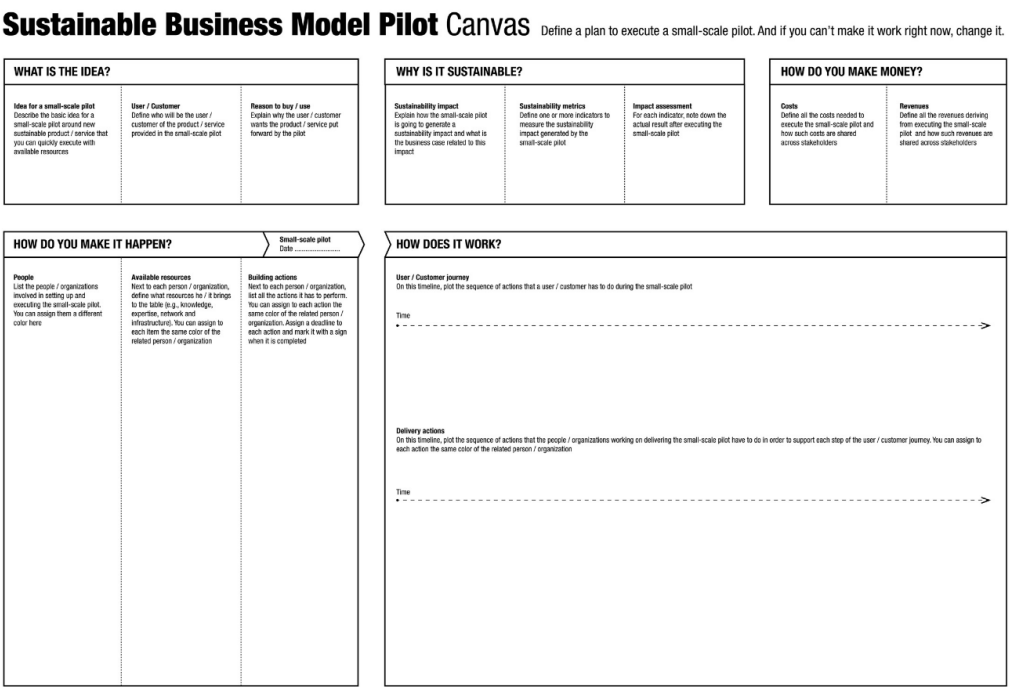

Figure 3.9: SBM Pilot Canvas by Baldassarre et al., 2020

Category 2 – Practices and methods
For further research, none of the practices will be combined with the SBM pilot canvas. This is due to the following reasons: Some practices seem to have a good starting point but are not advanced enough to be used in this research; these include paradoxical thinking or boundary work. Other activities seem simply too complex to include, e.g. the House of Quality. Finally, the main intentions of tools such as value mapping or design thinking are already part of the SBM Pilot Canvas.

Table 3.1: Overview building blocks SBM Pilot Canvas by Baldassarre et al., 2020

Building blocks SBM Pilot Canvas		
Building block	BMC component	Desirability, Feasibility, Viability, Sustainability
What is the idea? • Description of the main idea for a small-scale pilot • Definition and description of the user / customer of the product /service provided by the pilot • Explanation of why the user / customer wants the product / service provided by the pilot	Sustainable Value Proposition	DESIRABILITY
Why is it sustainable? • Explanation of the sustainability impact generated by the pilot and the related business case • Definition of indicators to measure the sustainability impact generated by the pilot • Assessment of the actual results for each indicator after executing the pilot	Sustainability Impact	SUSTAINABILITY
How do you make money? • Definition of the costs needed to execute the pilot and how such costs are shared across stakeholders • Definition of the revenues deriving from executing the pilot and how such costs are shared across stakeholders	Sustainable Value Capture	VIABILITY
How do you make it happen? • List of all people/organizations involved in setting up and executing the pilot • List of resources that each person / organisation brings to the table to set up the pilot • List of all actions that each person / organisation performs to set up the pilot	Sustainable Value Creation	FEASIBILITY
How does it work? • Sequence of actions that a user / customer has to do during the pilot • Sequence of actions that the people / organizations working on delivering the pilot have to do in order to support each step of the user / customer journey	Sustainable Value Delivery	FEASIBILITY

3.3. Theory development: real estate development and SBMI

The following section brings together the theory of real estate development and the insights of sustainable business model innovation, especially from the SBM Pilot Canvas. The aim is to create a theoretical framework for real estate development that helps reconfigure the strategic level (business model) and the project level of real estate developers.

Heurkens, 2020 theory on the multi-steering role of developers is used as the basis for real estate development. This is for the reason that the importance of strategic level is presented together with the project level. The influence of both levels on the overall sustainability of the development project has become clear in the literature review. In addition, the concept points to the need for soft governance factors, such as cooperation between a larger number of stakeholders and entrepreneurial attitude on the part of the developer to encourage new ideas. Both aspects have been identified by several scholars as necessary for a sustainability transition in real estate development. In addition to the soft steering factors, hard steering factors are also considered, which essentially reflect the economically driven part of real estate development that should not be neglected when addressing the issue of sustainability. This concepts by Heurkens, 2020 can be combined with the SBM Pilot Canvas to create a framework that supports both the strategic level and the project-level of real estate development. The SBM Pilot Canvas is well suited for real estate development as it uses prototyping to facilitate the validation of important aspects of early real estate development such as desirability, sustainability, feasibility, and viability.

The theoretical framework developed, based on Heurkens' concept and the SBM Pilot Canvas, is illustrated in Figure 3.10. The framework is divided into three areas: The red area shows the strategic perspective, i.e. the corporate level of the developer, investor, or initiator of the development; the green area represents the project-level perspective, which refers to a multi-stakeholder perspective. It is perhaps important to note that the developer is also part of this level, so he is represented on both sides as he has both strategic and project interests; the blue area is the alignment area where strategic aspects and project aspects are aligned.

The three areas as well as the order of the different aspects correspond to the axis of Heurkens' concept. From left to right, the framework goes from soft factors to hard factors. On the left side, the framework starts with the elaboration of the desirability. For strategic level, this means the definition of the strategic vision and mission, the explanation of the corporate goals and a description of the value proposition. All information is related only to the corporate level. At project level, the stakeholders must state their interests in the development as well as their wishes and ideas for the property. In addition, value propositions must be defined for all stakeholders in relation to the property development. After elaboration on both levels, the information can be aligned and the idea for real estate development can be developed. Next to desirability come sustainability. This aspect involves the definition of corporate sustainability goals on and the definition of sustainability goals in relation to the project by the different stakeholders. It is important to identify which social and environmental aspects should be met from the perspectives of different stakeholders. Afterwards, the two levels can be aligned and the sustainability of the real estate development can be elaborated. In the transition from the soft to the hard steering side, the first aspect to be worked out is feasibility. This means the entire realisation and use of the development project based on the previously defined ideas and sustainability goals. This aspect includes a review of the management style at the strategic level and the consideration of how to contribute to the overall value creation. At the project level, it is necessary to identify individual opportunities that contribute to the value creation process. Feasibility is followed by the financial viability of the project, which involves defining the investment strategy at the corporate level and determining the remuneration at the project level. However, not every stakeholder is rewarded with monetary rewards, for some it is only the added value that makes the project viable, these intangible benefits also need to be identified. Both levels together lead to the profitability of real estate development.

All in all, this framework involves the strategic level and the project level in real estate development. Theoretically, this is supposed to lead to higher sustainability. However, to confirm this claim, the theoretical framework needs to be tested, which is done in the second part of this research.

Figure 3.10: Theoretical framework for real estate development

3.4. Tool development

The theoretical framework for aligning the strategy and project levels of real estate development was presented in the previous section. So far, however, only the theoretical intentions behind the framework have been explained. Therefore, for a better applicability of the framework in practice, a conceptualisation is needed in a next step. This includes a clear description of the individual steps that need to be taken to fill this framework and achieve a sustainable real estate development concept.

The framework is intended for the very first phase of a development project – the initiation. In this phase, the developer has a plot of land, but not yet a clear idea or vision for its future development. The tool is intended to be used precisely in this phase. By integrating the issues of desirability, sustainability, feasibility and viability, the tool addresses essential aspects of a product at an early stage. In doing so, the questions of the desired outcome/end product, the targeted sustainability requirements, the implementation of the product and the targeted costs, profits and added values are equally elaborated and answered. The practical implementation of the tool is planned in three steps, preceded by a preparatory phase.

As mentioned above, a preparatory phase is required before starting with the three steps of the tool. This is because the tool requires a multi-stakeholder perspective at the project level. Therefore, before starting, a stakeholder analysis needs to be conducted to identify the key stakeholders that need to be integrated into the project level of the tool. In order to define the right group of stakeholders, the developer needs to analyse the whole life cycle and identify at an early stage relevant stakeholders from each life cycle phase that are relevant to the development. This means, for example, that the developer must make early decisions about the integration of planners and execution companies. In addition, stakeholders can also be integrated who are not normally involved in the development process, such as citizens or certain organisations, or who only join the project once it is already completed, such as an investor. It has to be weighed up individually which stakeholders are relevant and which are not; too large a circle of stakeholders is unlikely to produce results, as is too small a circle.

After all stakeholders have been identified, the practical implementation of the tool can start with the first step – the elaboration of the strategic level (red area). In this step, the developer or initiator of the development explains his strategic orientation along the four themes of the tool. This level is elaborated individually by the developer without the input of other stakeholders. The aim is to identify or even define the strategic position of the developer, i.e. the strategic vision / value proposition of the company (desirability), the sustainability goals of the company (sustainability), the management style or relationship to value creation by the developer (feasibility) and the long-term investment strategy (viability). All this still without any reference to the individual project. The developer's position on each topic is recorded in the red section of the tool. Two intentions are pursued with the elaboration and tracking of the strategic position: First, the developer's actions can be measured against these goals. Secondly, the strategic level must be reflected in the alignment level in order to achieve a successful project from the developer's point of view.

Following the strategic level, the second step can be initiated – the elaboration of the project level (green area). This area includes the project-specific elaboration through a multi-stakeholder perspective. Each aspect is elaborated individually by each identified stakeholder, without the influence of other stakeholders. The aim is to identify the stakeholders' interests in each aspect, i.e. individual desires/ideas for the property/individual value proposition (desirability), sustainability requirements for the development (sustainability), individual contribution to value creation (feasibility) and individual monetary and non-monetary added value (viability). The input of the individual stakeholders is recorded in the green area of the tool. Capturing the individual objectives leads to a high level of information at an early stage, which is usually not the case in development projects.

The third and final step is the elaboration of the alignment level (blue area). As the name suggests, this level focuses on bringing together the strategic and project levels into one development concept. To do this, the individual interests must be brought together. While the previous two steps were worked out by each stakeholder individually, this level is worked out together in an alignment workshop. It is therefore necessary that all stakeholders participate. The aim is for all participants to agree on a common direction for each aspect, i.e. defining a project idea / shared value (desirability), agreeing on the requirements for the sustainability of the project (sustainability), defining how the project should be

realised / action points (feasibility), and identifying costs, revenues as well as added value (viability). During the workshop, participants need to discuss all inputs from the strategy and project level to arrive at a commonly agreed approach. In this process, compromises have to be made, but ideally new ideas or solutions are also discovered. At the end of the workshop, all participants should have agreed on the aspects worked out, which then forms the basis for the project concept.

4

Testing and evaluation

This chapter begins the second part of the defined DSRM. First, the SREDC is tested within the framework of an in-depth case study. Afterwards, the results as well as the entire procedure are evaluated by an expert panel. Overall, this chapter marks the transition from theory to practice within the research design.

4.1. Testing

The testing phase represents the practical level of this research. While the SREDC was defined in the previous step based on various theoretical contributions, this phase aims to implement the approach in a practical setting and test its applicability. Thus, in this phase, the theoretical assumptions are tested. This section of the report is structured as follows: First, the German real estate development market and its approach to sustainability challenges are explained as the context for the case explained subsequently. Secondly, the underlying case for the SREDC test is explained. Then, the procedure for implementing the SREDC is explained. Finally, the results of the testing are presented and explained. In addition, the outcome of sustainable development based on the SREDC is briefly explained.

Sustainability challenge – market approach

In an online research, a total of 34 well-known real estate developers in the German market were examined. The aim was to identify specific measures or strategies of the developers that help them to deal with or adapt to the current challenges. Of the 34 developers, only 7 had publicly available information about their sustainability strategy. For 18 out of 34, no public information was available. Therefore, it was not possible to determine whether and how these developers are addressing the challenges. 10 developers had limited information available on their website. They did outline their sustainability goals in a statement on their website, but it was not clear what actions or strategies they were taking to achieve these goals. For the analysis in this section, the focus was on the 7 developers with available reports that were analysed and compared. The detailed comparison is presented in Appendix A.

When reviewing the developers' sustainability reports, two commonalities were evident. First, they all use the ESG (environmental, social, governance) structure to guide their report. These three pillars were thus used to define their sustainability goals and related strategy. Secondly, each ESG pillar was defined once at the company level and once at the project level. Thus, the developers indicated what they are willing to do as a company (internal) and how they intend to make their projects sustainable (external). The measures and goals at the company level focus, for example, on improving the working environment or questioning internal processes with regard to emissions. Measures and goals at the project level focus, for example, on reducing building and operational emissions or creating new living and working concepts. Although each developer defined its goals individually, it was noticeable that the environmental area is more advanced at the company and project level. However, the setting of social and governance goals seemed to be more advanced at the company level than at the project level.

Furthermore, almost all of them mentioned achieving net-zero emissions within the company and with their projects within a certain deadline as an environmental goal. The reason for this uniform target is the EU Taxonomy Regulation, in which the criteria for the climate change mitigation and adaptation targets have already been defined and published, while the other targets (water protection, circular economy, pollution prevention, biodiversity) are still in progress, as mentioned in chapter 3. Another aspect that was mentioned is green building certificates such as from DGNB, LEED, BREEAM. Almost all developers aim for the highest certificates for their projects. One possible reason for this is that by implementing the criteria associated with the certificates, their projects are certainly ESG-compliant and thus also meet the requirements of the EU taxonomy. The certificate is therefore a kind of official confirmation.

Some developers not only follow the ESG structure, but also incorporate the United Nations Sustainable Development Goals into their sustainability strategies. Usually, they do not refer to all 17 goals, but select those that are most important from their perspective. The use of this framework creates synergies with ESG structures, as these goals can be broken down into these three criteria.

In addition to the defined goals and measures, some developers also explicitly mention the integration of an ESG board that accompanies the defined measures in the different departments of the company. These boards act across departments and meet regularly and decide on certain measures or provide assistance with certain issues.

All in all, the sustainability reports analysed are the developers' response to national and international regulations. By using ESG structures or referring to the UN Sustainable Development Goals, developers follow government structures, which provides certainty when regulations are further elaborated by authorities. Although the reports were quite well elaborated, there were still some open gaps in terms of social sustainability and governance sustainability at the project level. However, it is noticeable that the target definitions for both the strategic level and the project level were set by the development companies. This therefore shows that the developers deal with sustainability on both levels, but have not yet achieved synergies and coordination between the two levels.

Case description

In order to test the SREDC and establish a link between the levels explained earlier, a case, i.e. a development project in its initial phase, is needed. For this purpose, a plot of land owned by the developer was provided. The plot is located in the centre of the district of Feuerbach, which is on the outskirts of the German city of Stuttgart. The plot is located on a busy road and close to Feuerbach's main railway station. It is therefore easily accessible both by car and by public transport. The property is surrounded by various types of buildings that are used in different ways, e.g. for offices, residential or even commercial purposes. The site itself is currently occupied by a petrol station with car wash and a 1.5-storey building housing the shop and the operator's office. Figure 4.1shows the current situation. The current use therefore does not fill the full building potential of the site, as the airspace above the 1.5 storey building is undeveloped (see Figure 4.2). The developer is therefore keen to exploit the full potential of the land and thus take advantage of what is known as air-right value.

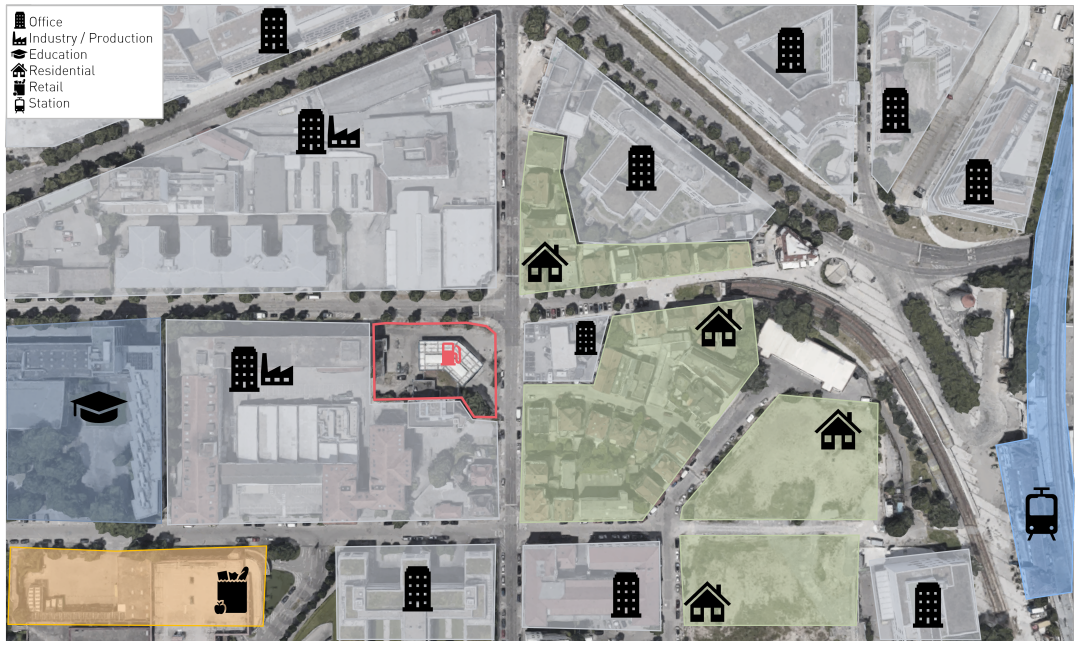

Figure 4.1: Surrounding area of the case

When considering the SREDC for this particular case, the developer did not have a clear idea of how the land should be developed. However, as the petrol station operator is a liquid and reliable tenant, the developer was looking for a sustainable concept that would incorporate the current tenant. Nevertheless, the concept should move away from a traditional petrol station and incorporate the current uses through a different concept that allows the development to be sustainable.

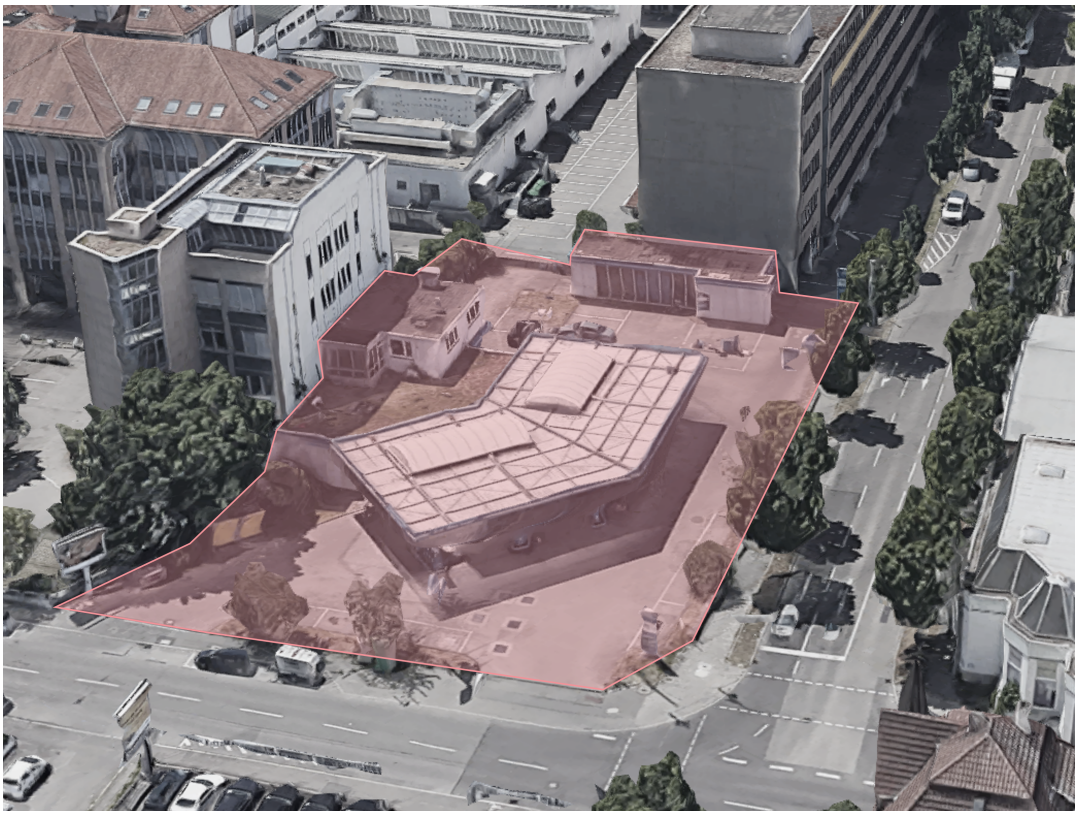

Figure 4.2: Situation on site

Execution of the tool

As explained in section 3.4, before the SREDC can be tested directly, a preparatory phase is required in which the relevant stakeholders are identified and involved in the process. Based on Adams and Tiesdell, 2012 agency-based model, a total of 9 stakeholders with a heightened interest in the development of the area were identified. Table B.1 summarises all stakeholders, which are also explained in more detail below.

The first stakeholder defined was the developer as the initiator of the project and the landowner. The developer has a great influence on the project, as he has the main decision-making power, but also bears the greatest risk in initiating the project. He has been defined as the only actor covering both the strategic level and the project level. It is crucial to align his strategic objectives and views with the project level in order to achieve a sustainable concept that is also measurable at the strategic level.

In addition to the developer, several other stakeholders have been identified that contribute to the project level of the tool. As mentioned above, the developer aimed to retain the operator of the petrol station as a tenant. Therefore, two relevant stakeholders of the on-site operator and the corporation behind the petrol station were identified. Firstly, the district manager was included, who has an overview of the business behind a petrol station and represents the operator's point of view. Secondly, the sustainability manager of the group (mineral oil company) was included, as this manager also deals with sustainability issues and the general shift to sustainable practices. Additionally, important stakeholders in the planning and construction phase such as the architect, the contractor, and the municipality were considered as important stakeholders. As the tool aims to create sustainable concepts, actors along the entire life cycle had to be considered. Therefore, the investor as the later owner of the building and the land, a material consultant who can contribute to the reusability of the building materials, and a green building certification organisation were identified. Finally, citizens were included as direct users of the final product.

An invitation was sent to each stakeholder with a description of the research objective and a case description. Only 7 of the 9 actors agreed to participate in the test phase. The municipality declined to participate because it is currently preparing a new master plan for the area and does not want to provide information about the area before the master plan is published. The material consultant declined to participate without giving any reasons. Thus, two important stakeholders could not be involved. As there is no investor for the project yet, an employee of the developer was brought in who advises investors and has good knowledge of their needs and requirements. A detailed overview of the participants can be found in Appendix B.

After the preparatory phase, the first step was to work out the strategic and project level through individual interviews. First, the strategic level was filled with information by the developer. Secondly, the project level was discussed individually with each stakeholder. To obtain the information, the stakeholders were guided through the four areas of the tool by specific questions. The interviews lasted approximately one hour and were conducted both online and live. The summaries of the interviews can be found in the Appendix.

After the strategic and project level were completed, the alignment workshop was held. As not all stakeholders from the interviews were willing to participate in a workshop, it was conducted in the form of a role play. The roles were divided among the developers' employees, each of whom received the interview summary for their assigned role in preparation. The workshop was conducted in the developer's office in a time frame of 2 hours. During the workshop, the SREDC was shown on a whiteboard, with the strategic and project already filled in with the information from the interviews. The aim was to align the interests of the strategic and project level and to jointly fill in the alignment level in order to commit to a mutual development concept for the property.

Table 4.1: Overview participants

Actors / Role	Level	Interest in development
Developer / Landowner	Strategic and Project level	Increase of the current land value; Creating a sustainable, unique development
Operator station and shop Sustainability Manager	Project level	Continuing successful operation Sustainable operation of the building and the station
Municipality	Project level	Realisation of public concerns and legal requirements
Architect	Project level	Achieving aesthetic requirements and profit generation
Material consultant	Project level	Reusability of materials and use of sustainable materials
Building contractor	Project level	Feasibility of development and profit generation
Green Building Certification organisation	Project level	Implementation of sustainable strategies
Investor	Project Level	Achieve sustainable investment product
Citizen / User / Customer	Project level	User-friendliness of the site and realisation of certain user requirements

4.1.1. Results – Case Study

This section describes the results from the individual interviews to fill in the strategy and project level, as well as the results of the alignment workshop. In addition, the sustainable development concept for the plot is explained as a result of the alignment workshop.

Strategic and project level – Developer

First, the strategic level was worked out together with the developer (Figure 4.3). The development company has emerged from a company that currently provides services in the real estate sector such as project management, portfolio management, feasibility studies, etc. While the business model for the subsidiary is still under development, the guiding aspects of the SREDC have helped to briefly identify the strategic direction as well as the issues that need further elaboration. In terms of desirability, the intention is already quite clear, and the developer knows what his vision is. The sustainability issue has not yet been elaborated in detail. Certain sustainability goals for the company itself have yet to be defined. However, the focus here is on reducing emissions through employee mobility and striving for a paperless office. For the development projects, on the other hand, the developer intends to define the sustainability goals for each project individually and not to define an overarching strategy. Regarding feasibility, successful management approaches have been tested in the parent company and are therefore adopted by the development subsidiary. These include the introduction of flat hierarchies and the pursuit of cooperative management strategies. Finally, concerning viability, the developer intends to follow a trader-developer approach. However, in order to compensate for the higher front-end costs due to higher sustainability standards, the developer also intends to generate medium- and long-term profits from the investment after exit.

Second, the project level was elaborated together with the developer (Figure 4.3). Here the aim was to fill in the four aspects for the future development of the plot from the developer's point of view. In terms of the desired outcome, the goal for the developer is to develop the full potential of the site. Therefore, the maximum building capacity should be achieved. Furthermore, it is important that the building is constructed in a modern way, e.g. through modularity, so that the building can be dismantled at the end of its life cycle. In terms of use, the developer is open to all types of use, it has to meet the current demand in the market. Concerning sustainability, it seemed quite difficult to define profound sustainability goals at such an early stage. However, a high flexibility of the building is very important, as well as the enhancement of the neighbourhood by the project and the use of sustainable construction. The definition of more detailed sustainability goals might be a process in the context of further progression.

The next point, feasibility, was only briefly addressed, as the interview time was too short to go into this point more intensively. However, the developer mentioned two main tasks for the first phase until planning starts. Firstly, to conduct a feasibility study and secondly, to form a planning team. If more time had been available, all tasks, measures, and also the developer's needs could have been identified. In terms of viability, the developer is definitely looking for a trader's profit. Medium and long term profits are desirable but need to be identified. In addition to the monetary added value, the project must be a flagship project, as it is to be the developer's entry project into the market.

Project level - Investor

For the investor (Figure 4.4), one of the most important issues that encompasses the desirability and sustainability aspects is compliance with ESG requirements in relation to the European taxonomy rules. This is due to the mandatory disclosure of investments. Thus, when investing in real estate, preference is given if the buildings meet sustainability standards in every area of ESG. In addition to meeting the ESG requirements, clear documentation of those measures is also desired. Furthermore, the investor wants a project that enhances the neighbourhood but is not a satellite. This means that the project should work in the long term, i.e. a complex design or inflexible spaces that cannot be converted or lose their appeal are not desired. With regard to the use of the building, the investor has no fixed wishes, but it must meet market demand. Another desired aspect for the investor would be that the building is realised quickly, which allows for a fast cash flow. Finally, due to the current market situation (high interest rates, rising construction costs), the investor requires that the construction costs be controlled in detail (transparency). From the point of view of feasibility, there are currently not many starting points that the investor can contribute to the realisation of the project. This is because it is rather unusual for an investor to enter a project so early, usually investors only enter shortly before a project is completed. However, it could have a positive impact if the investor enters earlier. This way, his requirements can be taken into account. However, early involvement also requires time and resources that investors not often have. However, apart from direct involvement in the development process, the investor can contribute with some pragmatism in the purchase agreement between him and the developer. This means that if the developer is able to conclude good tenancy agreements for the building, the investor can reward this with a higher payment at handover. In terms of viability for the investor, the most important interest is the return on investment and the long-term stability of the building's value. However, non-monetary aspects such as reputation are also important.

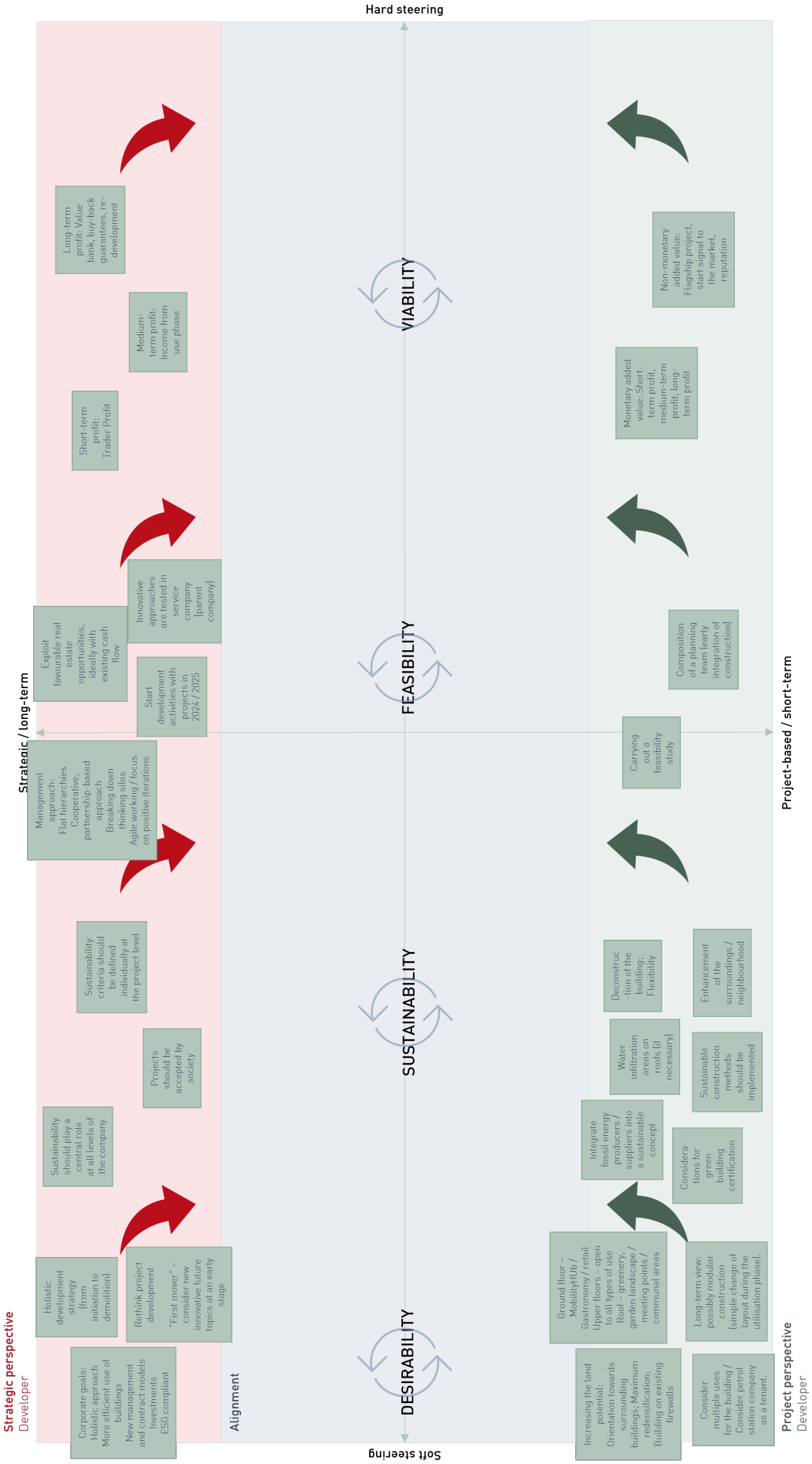

Figure 4.3: Interview results developer

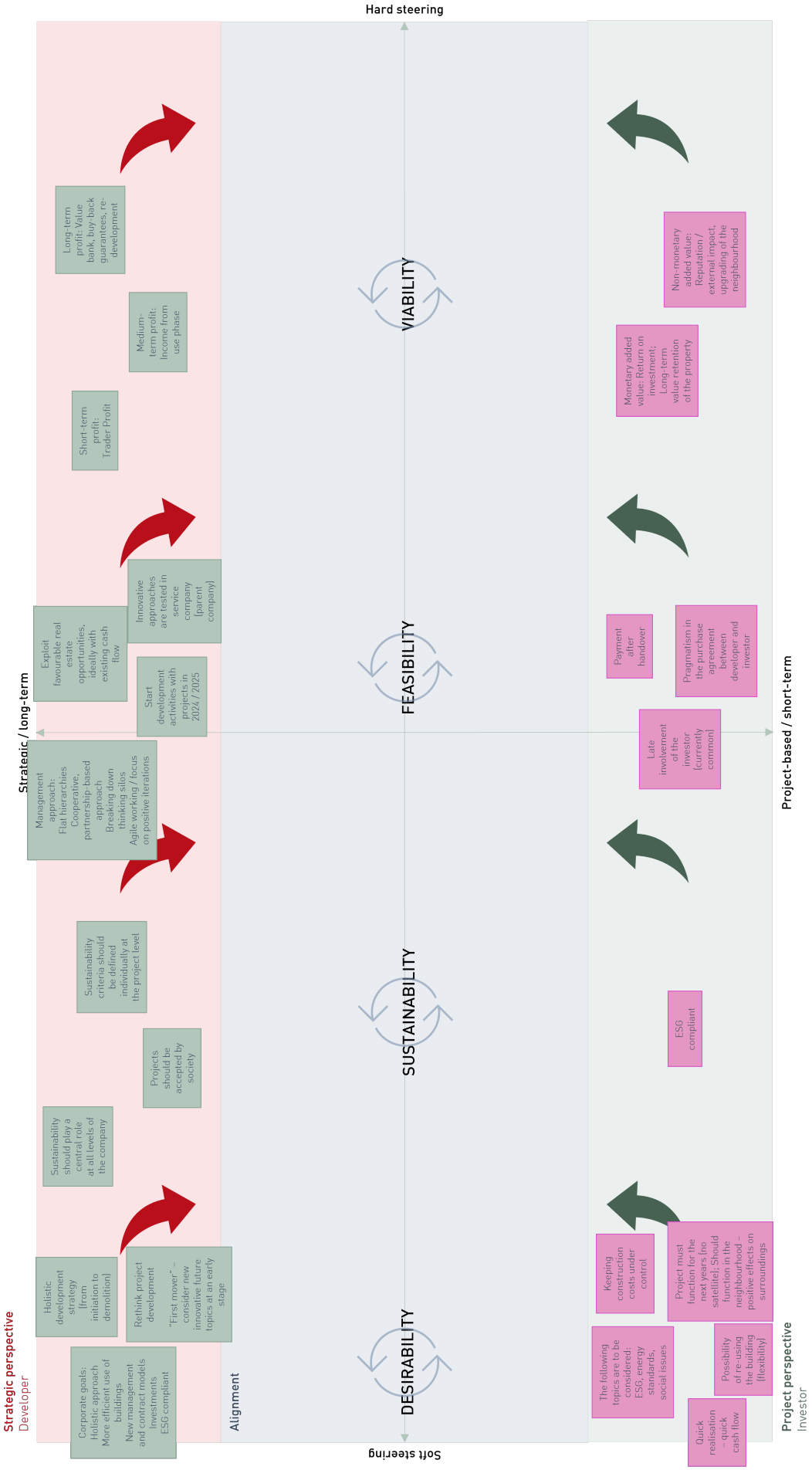

Figure 4.4: Interview results investor

Project level - Architect

As one of the few architects in Germany working on the conversion of petrol stations into mobility hubs and creating designs that enable the use of the air right, a number of design requirements were mentioned that need to be taken into account (Figure 4.5).

- Clearance height of 4 to 4.5 m required. Since the ground floor is used by cars and trucks that need fuel, the height of the ceiling must allow safe traffic. Accordingly, the first normal floor can only start from 6 m.
- Since petrol stations or mobility hubs are open 24 hours a day, 365 days a year, an attractive common area is required.
- Since other uses are possible from the first floor, multiple entrances and thus at least two staircases and a lift are required. This is necessary because the users of the upper floors should not have to take the shop entrance of the mobility hub to reach their office or floor.
- A modern mobility hub has the same number of e-charging stations as petrol pumps, if not more.

In addition to these requirements, the architect's main concern is to fill the cityscape and carry out so-called urban repairs. From the architect's point of view, due to the current use of the petrol station, something is missing that needs to be remedied by a holistic design. In terms of sustainability, the concept of building the project from the first floor upwards in timber construction seems quite innovative. Such a construction in combination with a mobility hub has not yet been realised in Germany and would be a flagship project. Another important aspect in this area, which was also mentioned by the previous stakeholders, is the demand for flexibility. However, the architect goes into more detail about the flexibility of the ground floor. The fuel tanks that supply the pumps with fuel should be placed outside the building so that they can easily be taken out of the ground when the pumps are no longer needed. In addition, the entire structure of the mobility hub, such as petrol pumps, charging stations and canopies, should be able to be dismantled and reused. This way, for example, the ground floor area can be closed with a glass façade and used by gastronomy or retail. In addition, measures such as the use of solar cells, roof, or façade greening and urban farming are also conceivable. The architect plays an important role in terms of feasibility, but due to time constraints, only the overarching tasks for this early phase are mentioned here. As a first step, the architect conducts a feasibility study that examines the form of the building and its use. The study serves as a basis for the discussions with the municipality on the approvability. With regard to viability, economic aspects also play an important role for the architect. However, the architect focuses on the non-monetary value. The most important point mentioned here was that it is important for him to build his reputation in this type of project, i.e. converting petrol stations into mobility hubs. Secondly, another added value mentioned was that they want to help the oil companies with sustainable solutions.

Project level – Contractor

It is rather unusual for the contractor to be involved at such an early stage, as he usually only joins the project team when an idea already exists or a certain stage of planning has been reached. Therefore, it was difficult for the contractor to form a concrete opinion about the development. However, in terms of desirability, the contractor mentioned two points (Figure 4.6). Firstly, he could imagine a modular timber construction for the project, as this is part of his area of expertise. Related to this, the second point, he mentioned that it could be interesting to create some kind of challenge by completing the project in 12 minus "x" months. Regarding the aspect of sustainability, the contractor mentioned that from his point of view the whole life cycle should be considered, but with a strong focus on the operational phase. This was justified by the fact that a building can be built as climate neutral as possible, if the operation is not climate neutral, it does not matter because the operation phase lasts longer than the construction phase. Concerning feasibility, the contractor mentioned that it is quite common nowadays to join the project team as a construction partner at a certain planning stage and to advise from an execution point of view. However, if joining even earlier, the contractor would only consider some kind of sparring partner model to provide input on specific issues. In terms of viability, the contractor also seeks economic success. The non-monetary value for the contractor lies in driving innovation and developing his own skills. In addition, value is also added when he successfully involves and engages his own staff in the cultural change of business processes and practices.

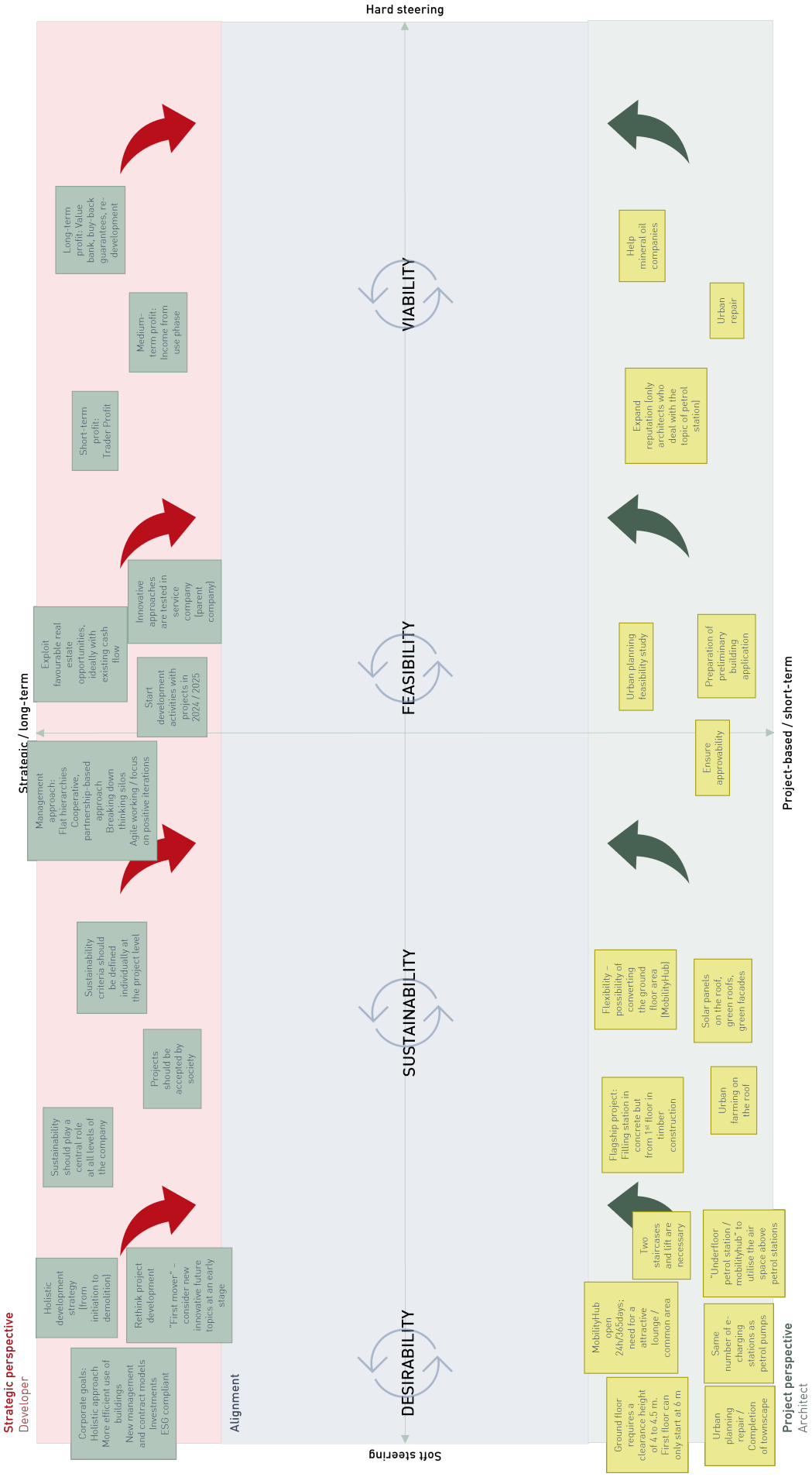

Figure 4.5: Interview results Architect

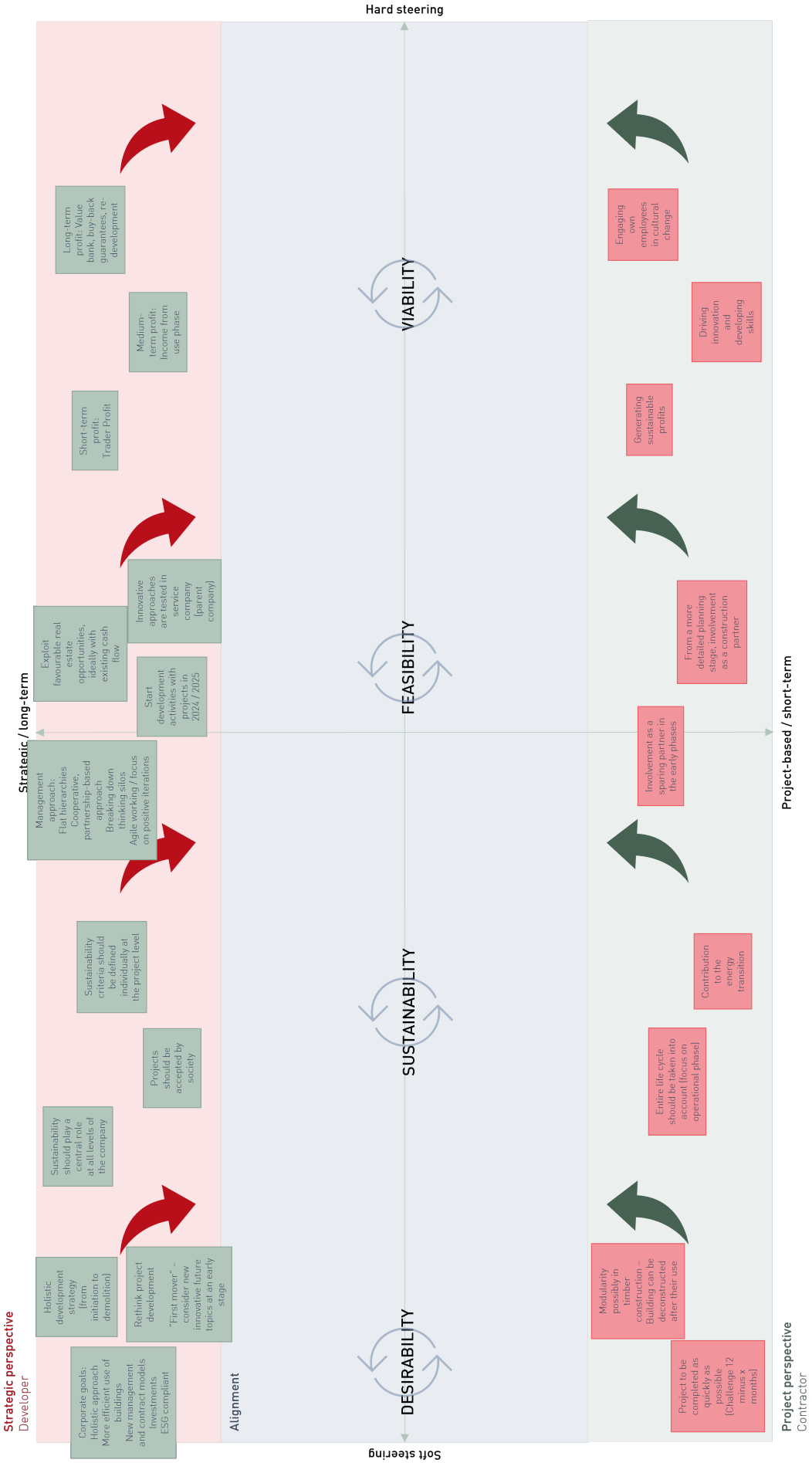

Figure 4.6: Interview results contractor

Project level – Green Building Certification Organisation

For the certification body, it is desirable that the project fits into the overall context of the whole area, i.e. the development should enhance the neighbourhood and be accessible to the public as the site is in a prominent location (Figure 4.7). Furthermore, a life cycle assessment should be carried out with particular attention to grey emissions, i.e. emissions for production, construction, and deconstruction should be kept low. Finally, with regard to the current use of the petrol station, the issue of contaminated soil should be considered and clarified so that further uses are not constrained. In the sustainability section, specific issues that should be considered in the context of the development were discussed in more detail. Reference was made to the organisation's defined criteria for sustainable construction. In addition, all materials should be recorded in a kind of material database. Finally, a climate-neutral or climate-positive orientation of the building's operational phase was also mentioned. Regarding the implementation of the project and the contribution of the organisation to the process, a certification consultant can be involved in at an early stage, who can also carry out a pre-check of the project in terms of sustainability. Finally, the project is successful for the non-profit organisation if the project is sustainable at any level.

Project level - District Manager

In terms of desirability, the district manager focused strongly on the aspects that are already working well in the current operation of the petrol station (Figure 4.8. For example, he mentioned that the car wash should be kept as it is quite profitable for the operator. Also, unlike the other stakeholders, he opposed a permanent stay for the petrol station users. The current layout, which is designed for short-term stays (bar tables, food-to-GO, etc.), should be retained and is more economical. However, he sees potential in the possibility of offering a public Wi-Fi network in the mobility hub, which is currently not offered at any petrol station but would allow users to bridge certain waiting times. There are currently no e-charging stations on the site, but these should be integrated according to the district manager. He believes that the mobility hub needs the ground floor and possibly the first floor for its shop and potential services. With regard to sustainability, the district manager sees topics such as sustainable building, photovoltaics and noise protection. In addition, he believes it would be advantageous to create a pleasant working atmosphere so that employees enjoy coming to work and feel comfortable there. Finally, he believes it is important that the mobility hub continues to meet, if not expand, the following three needs:

- Impulse purchases – spontaneous purchases when using the filling station / mobility hub.
- Food-for-now – food that can be consumed immediately.
- Food-for-later – food that is prepared and packaged.

The operator sees his influence on the feasibility in the fact that he is included early on in an optimal area design (paths, delivery, etc.). In addition, the technical and constructional requirements for petrol stations/mobility hubs must be met. In terms of profitability, the project will only be successful if the current profitability is maintained, if not increased. This means that an increased rent for the space of the mobility hub must be proportionate to the revenue (the most important point for the operator).

Figure 4.7: Interview results Green Building Certification Organisation

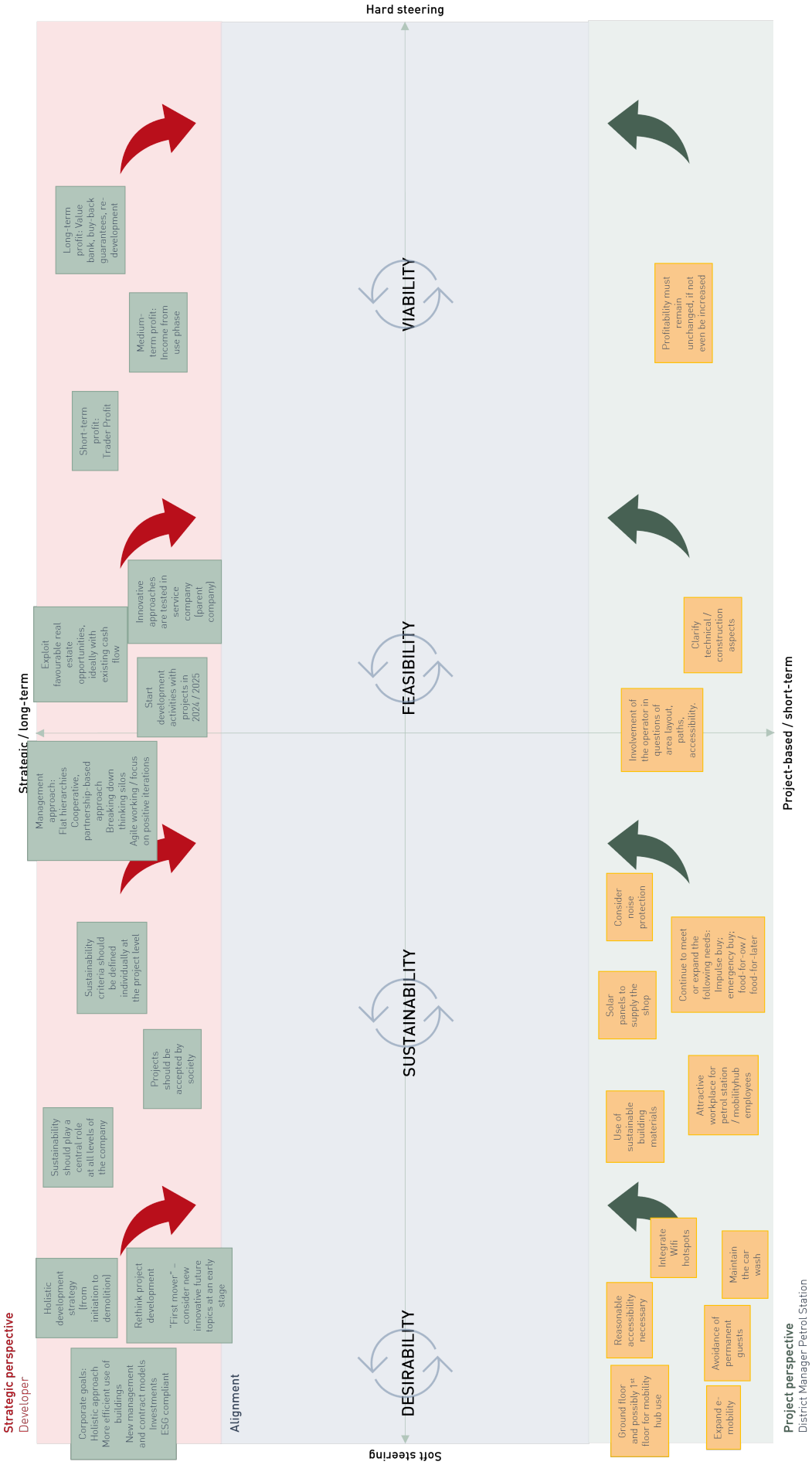

Figure 4.8: Interview results District Manager

Project level – Sustainability Manager

As the goal of the sustainability manager is to establish sustainable practices in the business model of the mineral oil company, thus sustainability is covered within the first two aspects of the SREDC (Figure 4.9). The first desirability target for the sustainability manager is for the mobility hub to achieve a 15-20 % reduction in the carbon intensity of fuels. This can therefore only be achieved through the expansion of e-charging stations or through fuels with a higher biogenic content. In addition, sustainable construction methods and materials as well as the installation of solar systems are important aspects for the sustainability manager. Another focus was put on the operational efficiency of the mobility hub as well as the shop, i.e. it should be more energy efficient (currently there are many open fridges). In addition, it would be useful if there was a focus on local products in the shops. In contrast to the district manager, the sustainability manager sees potential in the expansion of permanent stays on site through further service offers (a model that so far only exists abroad). Finally, the entire life cycle should be considered, i.e. the possibility of dismantling the mobility hub and reusing it elsewhere should be taken into account. With regard to feasibility, the Sustainability Manager can accompany the entire planning process and provide advice. In addition, numerous other internal stakeholders of the oil company must be involved in the implementation of the mobility hub. Finally, the focus for the sustainability manager is on the non-monetary added value in terms of viability. This means that if all sustainability criteria are implemented in the best possible way, it will be a successful development.

Project level - Bank

The bank's main interest is the long-term security of the borrowed money (Figure 4.10). Accordingly, the main focus in the point of desirability is that all contingencies and risks are recorded before the start of the project. The background to this is that the return of the loan is guaranteed, and no more money is needed due to the occurrence of unconsidered risks. Another important point is the flexibility of the building, so that the space can be adapted to different market requirements. In terms of sustainability, the bank focuses on economic sustainability, i.e. front-runner projects must be clearly justified to the lender, otherwise the conservative option is always preferred. Nevertheless, the current legal requirements with regard to sustainability are to be complied with. With regard to feasibility, there is no commitment on the part of the bank for particularly sustainable or innovative projects; here, reference is made to funding institutions that are available to promote such topics. In principle, the bank's interests are largely independent of any sustainability aspects, but relate to general economic success.

Project level – Citizen

The citizen wants an "open" building that should be easily accessible (Figure 4.11). It should also be a place that creates encounters and contributes to sustainability through more greenery. Basically, the above-mentioned topics also fulfil the point of sustainability, i.e. the focus here is mainly on social issues. Citizens are not in a position to participate in the planning process in depth, but they can provide opinions on intermediate statuses of the design. A successful project for the citizen is when more of their needs can be met on site (saving time) and when the development contributes to the enhancement of the cityscape (a nice place to go to).

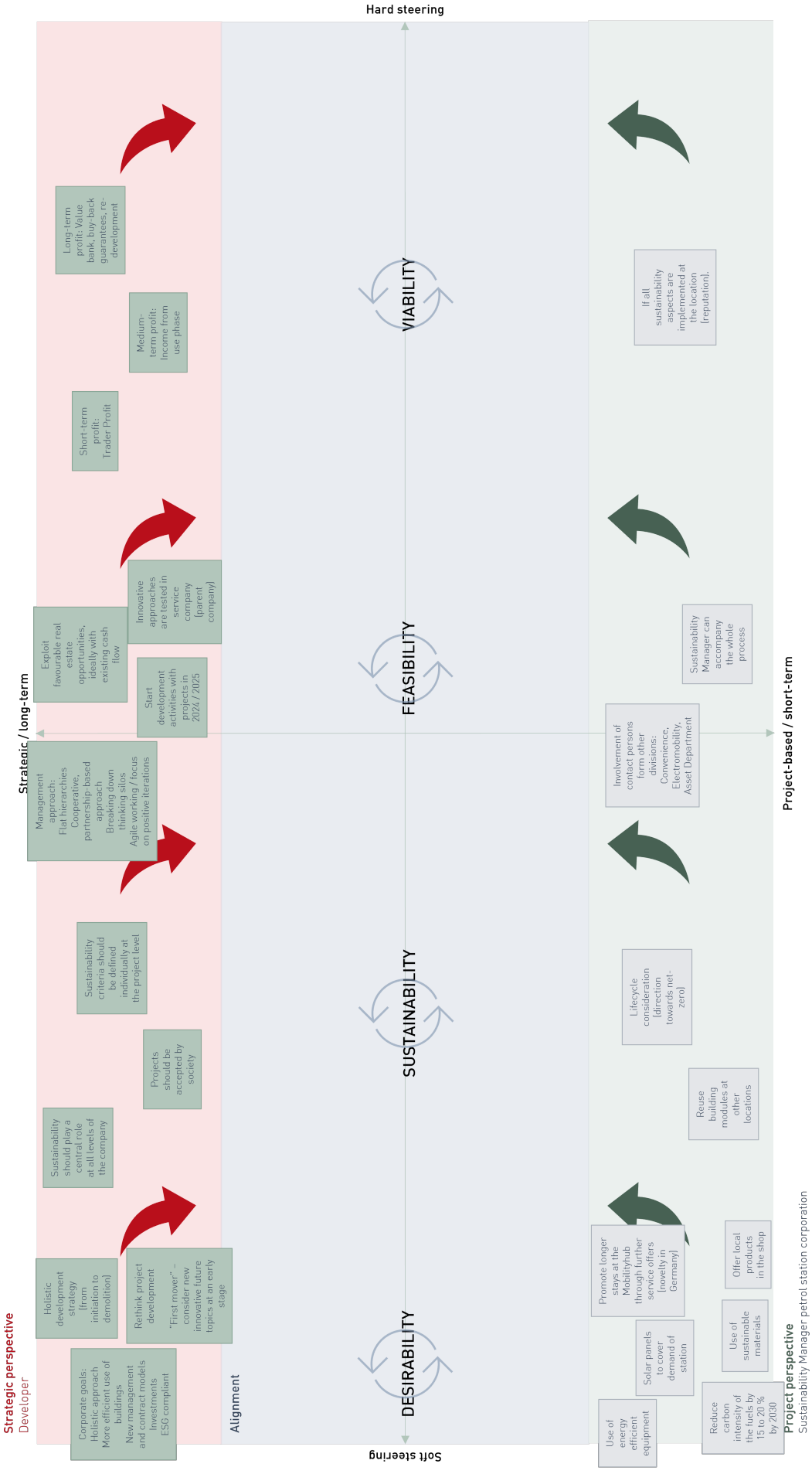

Figure 4.9: Interview results Sustainability Manager

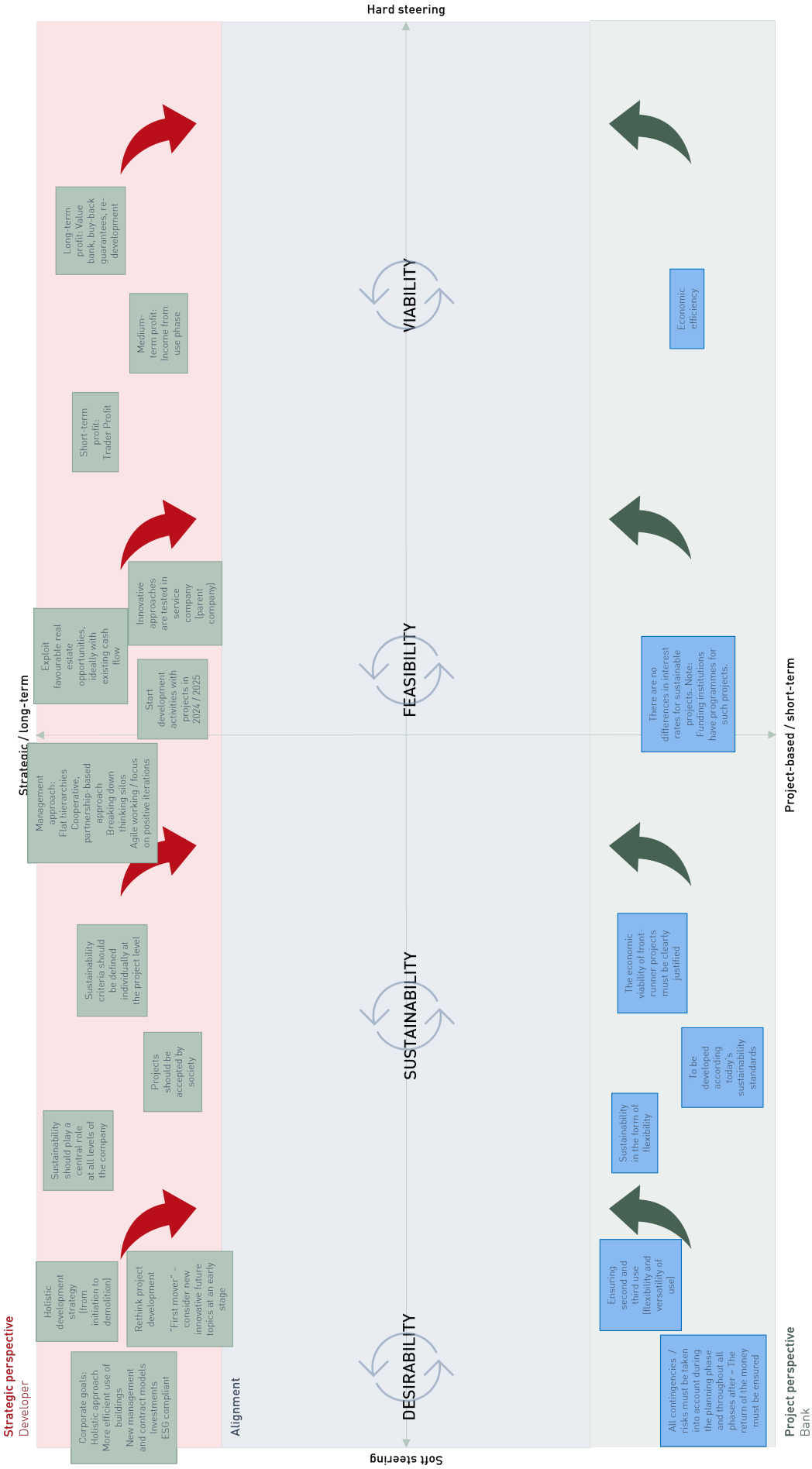

Figure 4.10: Interview results bank

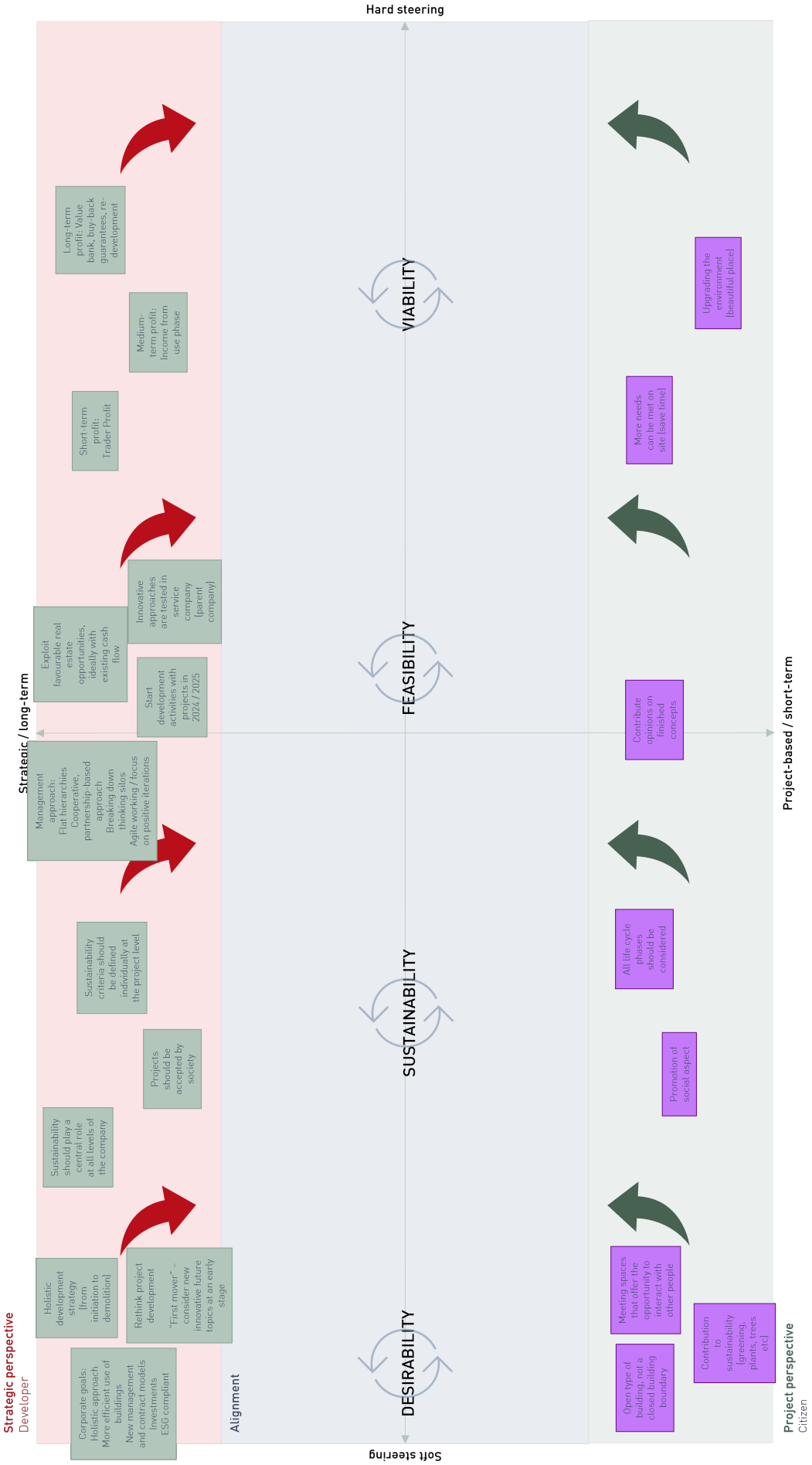

Figure 4.11: Interview results Citizen

Alignment level

Figure 6.10 illustrates the results of the alignment workshop. The light grey contributions in the blue alignment layer of the SREDC are the conceptual goals committed to by the stakeholders for the development. In a two-hour time frame, all aspects of the SREDC were covered, but most of the time was spent on the desirability topic, so the other topics were not covered as extensively. However, a commitment to a development concept was achieved among the stakeholders.

DESIRABILITY. Since most of the input in this area was generated at the individual levels, it also took a long time to commit to certain aspects. Thus, the individual wishes had to be weighed against each other and finally a common goal had to be defined among the stakeholders. This process required some discussion and the participants had to explain to the others why certain things could work from their point of view and why not. In the end, however, the participants were able to agree on a possible use concept for the building as well as on the construction method. In addition, the participants agreed on certain requirements for the building both for the design and construction phase (e.g. less glass) and for the operational phase (e.g. same number of charging stations and refuelling stations; reduction of the building's energy demand).

SUSTAINABILITY. Instead of defining specific goals for the building, the participants agreed on certain guiding goals. The most important point, which was also mentioned repeatedly in the individual interviews, was the aspect of flexibility. The participants agreed that the floor plan should be as flexible as possible so that the spaces can be easily repurposed. Participants also advocated a sustainable building process and the use of sustainable products. Furthermore, the goal of CO^2 neutrality in the construction and operation process was set. However, due to time pressure, no clear measures for these goals could be defined. Another important aspect, which the investor and the bank in particular considered important, is the achievement of sustainable rents and returns, which could be achieved, for example, through long-term leases.

FEASIBILITY. In this aspect, the participants focused mainly on what steps need to be taken immediately, such as conducting a feasibility study, both from an economic and urban planning perspective. Furthermore, an early involvement of the contractor as well as possible users was agreed upon in order to already gather their requirements (e.g. what are the requirements of micro-apartment operators?). In addition, open questions from the previous discussion in this area were summarised for these steps, which needed to be answered, e.g. is the mineral oil corporation willing to use more space for additional services?

VIABILITY. First and foremost, the participants, especially the investor, the developer, and the bank, agreed that the project must achieve a sustainable return on investment. In addition, there must be cost certainty from the very beginning of the project. Apart from these hard economic factors, the participants agreed to take an innovative approach to achieve a flagship project that adds to their reputation.

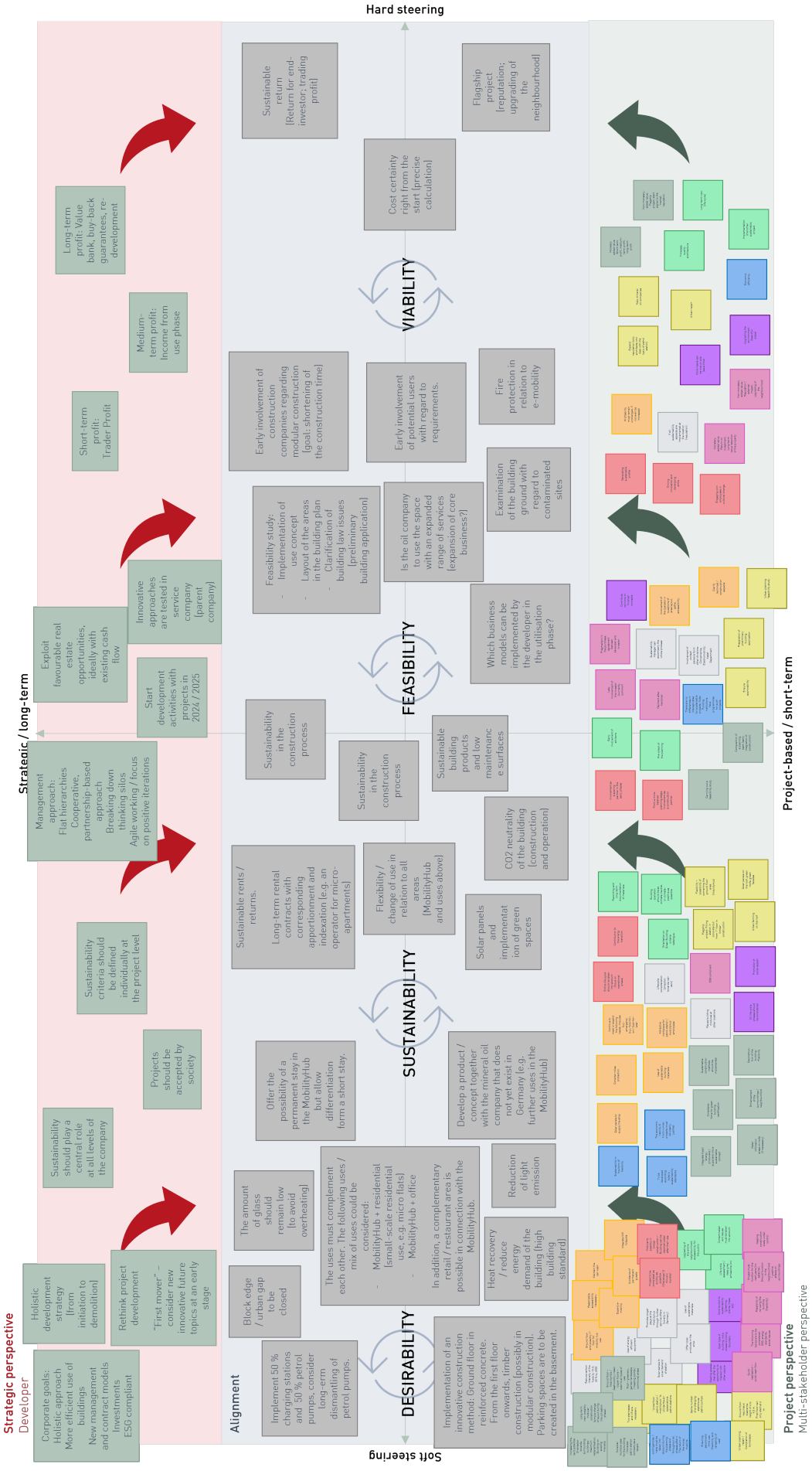

Figure 4.12: Workshop results

Sustainable concept based on the results of the alignment workshop

The SREDC aims to establish sustainable real estate development concepts by aligning the strategic orientation of the developer and the objectives at project level. So far, the practical implementation of the SREDC, especially the process behind it, has been described. In this section, the jointly developed development concept for the property on which the case study is based will be described.

Figure 4.13: Development layout and building mass potential

Two utilisation concepts were defined for the building, which can be harmonised with the envisaged mobility hub. The first idea comprises a combination of the mobility hub with a small-scale residential use, the second idea comprises the combination of the mobility hub with an office use. In addition, further areas for uses / services such as retail, gastronomy or coworking are to be secured in connection with the mobility hub. It is planned that the mobility hub will extend over the first two floors (ground floor and first floor), all floors above this are intended for other uses (office or residential), the decision in this regard must be evaluated in the further process.

The mobility hub should continue to take up topics that are currently still offered as part of the petrol station, such as the shop, car wash and petrol pumps. As already announced, the mobility hub is to be expanded to include various uses that also promote a longer stay. Such a concept has so far only existed abroad and would be a novelty on the German market. In addition, the petrol pumps are to be replaced by electric charging stations in the long term. The project will start with 50 % e-charging stations and 50 % petrol pumps.

In terms of constructional aspects, the building is to be realised in a timber hybrid construction from the first floor upwards. The ground floor area must be constructed in reinforced concrete due to fire protection issues. Such a construction method would also enable a quick realisation due to a certain degree of prefabrication. In general, the energy demand of the building should be reduced.

Another objective is to close the existing urban gap with a suitable floor plan. A possible shape is shown in Figure 4.13.

With regard to sustainability, the main aim is to achieve a high degree of flexibility in the building, i.e. the spaces should be able to be used for a variety of purposes. In particular, the mobility hub area should offer the possibility of being used for other purposes. In addition, a CO^2-neutral operation should be achieved, as well as a resource-saving construction process.

In order to implement such a concept, a feasibility study must be carried out and potential users/operators of the areas must be involved. In addition, some questions still need to be clarified, e.g. which services can be offered by the developer during the utilisation phase, or to what extent the oil company is willing to offer further services in connection with the mobility hub?

Finally, with regard to economic viability, a sustainable return should be achieved and cost certainty created at an early stage. Furthermore, a flagship project is to be developed.

4.2. Evaluation

The practical testing of the SREDC is completed with the commitment to a sustainable concept by the stakeholders in the alignment workshop. In a next step, the SREDC approach and the results obtained are evaluated by a panel of experts. For this purpose, a panel of four executive functions of the developer was formed. The expert panel was conducted in a time frame of one hour. First, the process behind the SREDC was presented and then the results of the testing phase were demonstrated. Based on the input given, the experts were able to ask questions, raise concerns and suggest improvements.

Overall, the experts found that the SREDC facilitates a well-structured process, especially with regard to ESG and disclosure requirements (taxonomy). The framework clearly documents the development approach and sets out the reasoning behind it. The foundation of the approach is a set of commonly defined objectives in each aspect area of the SREDC - desirability, sustainability, feasibility, and practicability. These can be easily categorised into the different areas or ESG. Many goals are mentioned under the aspect of sustainability, but the “S” is also reflected in the area of desirability by considering all desires while developing a common idea with the stakeholders. The “G” is also reflected in feasibility or viability by defining and pursuing cooperative approaches and creating sustainable financial models.

Next, the experts mentioned that one advantage of SREDC is that conflicts between stakeholders are stirred up at an early stage to find solutions and answers. By involving numerous stakeholders at an early stage, interests emerge that are sometimes contradictory. Through the workshop, the stakeholders get the opportunity to agree and explain certain facts to each other, which leads to understanding for certain points of view. In this way, agreements can be reached and misunderstandings avoided. This is an advantage over projects where the interests of certain stakeholders are only taken into account at a later stage, so that explanations are only given when certain progress has been made in the planning. This often leads to conflicts and negative iterations in the design process. The SREDC therefore tries to consider multiple interests at an early stage to avoid negative iterations later on.

Finally, the experts assess the commitment of the stakeholders that resulted from the alignment workshop as positive. For example, the experts believe that the stakeholders develop a certain sense of responsibility for the project, which could lead to constructive interaction in the course of the process. This point also corresponds with the previous paragraph, as the experts hope that this responsibility will prevent negative iterations, as the stakeholders were involved from the beginning.

Apart from the positive feedback, the experts also identified areas of improvement for the SREDC. Table 4.2 summarises the most important considerations.

Table 4.2: Feedback Expert Panel

Improvement points	Rationale
Level of stakeholder involvement	Not all issues concern all stakeholders, so the circle of people to be involved must be precisely defined.
Professional moderation by neutral person	Opinion leaders in discussions must be avoided. In addition, the depth of the discussion must be evaluated. For this reason, the workshop should be moderated by a neutral and professional person.
Continuous monitoring of the results in the follow-up	The topics should be followed up and worked on in a kind of conflict or stakeholder management.
Integration of dynamic developments during the development process	SREDC should be able to adapt to dynamic changes, if new issues emerge during the development process (continuous discussion).
Evaluation of results (legal security)	It must be clarified in advance how the influence of the stakeholders is to be evaluated from a legal point of view.

The first concern expressed was about the multi-stakeholder perspective. The experts see the danger here that too much integration of different interests is not target-oriented and, moreover, not all information is intended for all participants. The experts referred in particular to the information on economic aspects. In particular, concern was expressed here about the confidentiality of the information. It was also commented that the involvement of too many actors could lead to unfeasible and expensive projects. Therefore, the circle of stakeholders needs to be clearly defined.

A second improvement considered necessary is the “proper” implementation of SREDC in a project setting. The experts note that such an approach requires the facilitation of a neutral person, e.g. a consultant outside the development company and someone who is not involved in or connected to the other stakeholders. This is necessary because the developer, as a stakeholder in the process, has a biased position and is therefore unable to lead through the interviews and workshop with a natural attitude.

As a third point of improvement, the experts mentioned that the elaborated results require continuous monitoring during the course of the project in combination with some kind of stakeholder or information management. By offering stakeholders the opportunity to participate in the development of the overall concept, it is necessary to keep them involved or informed throughout the development process. For this reason, some kind of management process is required.

In addition to continuous monitoring of results, the experts mention that the SREDC must be able to integrate or react to dynamic changes. This refers to sudden changes in the market or emerging interests. However, it must be prevented that already defined interests can be changed randomly by stakeholders.

Finally, concerns have been raised about the legal nature of the jointly agreed development concept. This relates to the aspect that the concept should not be legally binding from the developer’s point of view if, due to certain circumstances, the developer intends to take a different direction with the development.

Overall, the experts acknowledged the advantages of the SREDC, but were also critical about certain aspects. In particular, the follow-up processing of the result is mentioned as an important aspect that needs to be further improved. But also certain aspects such as the disclosure of information or the legal nature of the concepts require a rethink on the part of the developers. Transparency is an essential part of the process and must therefore be considered and dealt with in order to achieve a sustainable concept.

5 Discussion

The research provides an approach to the identified gap between the strategic (business) level and the project level, which need to be aligned in order to achieve sustainable real estate development concepts. The SREDC is based on the theoretical input from Heurkens's multi steering role in real estate development and Baldassare's SBMI Pilot Canvas. Within the SREDC, both business model innovation and product innovation come together and are initially dealt with individually, in the strategic level by the initiator of the development and the project level by a variety of stakeholders. Through an alignment workshop with all stakeholders, both levels are aligned and joint agreement on a sustainable development concept is reached. In the following sections, the results are interpreted in more detail and the contribution to the theory presented in chapter 3 is explained.

5.1. Contribution to real estate development

The research made a specific contribution to the field of real estate development, as its intention was to provide an approach that helps steer a development in a sustainable direction. Figure 3.1 illustrates a real estate process with its different phases; the framework was originally developed for the project initiation phase. However, during the testing phase it became clear that some stakeholders need to have an initial idea of the development given by the developer or initiator of the project in order to form their own opinions and interests, otherwise the boundaries are too wide. This was particularly evident when interviewing the contractor and also the citizen. The contractor explained that he usually enters a project when there is already a certain amount of planning, so for this framework, a certain starting point is needed to provide input. Similarly, the citizen found it difficult to define their interest without an initial idea. However, by mentioning the mobility hub and the possibility of developing a public space, the citizen was able to provide more insight. Therefore, an initial idea is needed to build on before starting with the SREDC. Transferring this to the real estate development process, the approach could be better integrated at the end of the initiation phase and/or at the beginning of the design phase.

The SREDC challenges the conservative view of developers that results from the high risks of development (Brown, 2018). By involving a wide range of stakeholders at an early stage, a high flow of information is achieved, which is usually not the case in development projects at this stage. Through this early involvement, risks or potential points of conflict can be addressed and managed earlier. Furthermore, by aligning the strategic and project levels, a commitment of the stakeholders is achieved and thus a certain security for the developer and the development is created. However, the approach requires the developers to step out of their comfort zone and not only rely on their own experience and know-how (Ciaramella and Dall'Orso, 2021). Nevertheless, this attitude is required from all stakeholders involved. Only through a transparent and unbiased process can the SREDC minimise risk and increase the level of optimisation, and even lead to innovation.

The original research idea started from the goal of creating a framework specifically for trader developers, i.e. actors in the field of developer-led development. However, the non-specific structure of the SREDC and the associated approach makes it useful for other types of development situations as well. In the following, the implementation for each type of private sector-led development by Heurkens, 2018 is discussed.

Developer-led development: The actors falling under this typology have a short-term commitment, as mentioned in the literature review. Due to the multi-stakeholder perspective of the SREDC, actors in this area might be more inclined to take more innovative steps, as more information and certainty is available at an early stage. Since in an ideal process the potential buyers (investors) already bring their interests into the framework as well, the short-term view can be overcome by the long-term view of the buyers. This scenario is also reflected in Figure 3.3. under private-private relationships, which will be discussed in more detail later. Furthermore, it was noted in Figure 3.3. that developers with a short-term commitment could extend their scope to the operational phase, for example by offering certain services. The SREDC, due to its multi-stakeholder perspective, could help identify specific needs on the basis of which the developer could define services and adapt its business model.

Investor-led development: As investors take a holistic approach due to their long-term commitment, the framework could also be used by them. Due to the detailed information flow through several stakeholders, especially potential users, the investor can develop a project that works in the operational phase and meets the demand sustainably. By linking to the strategic level, the investor can also directly indicate whether the development fits into his portfolio or not.

Community-led development: Parties in this typology are non-real estate participants and have a short-term commitment. As this area usually involves smaller scale projects, the framework may not be suitable as the effort is too high in relation to the outcome.

Corporation-led development: Companies that do not come from the real estate sector aim to optimise their real estate assets, especially in the operating phase. They therefore take a long-term perspective. The SREDC could contribute to a sustainable real estate development of companies, as it allows to identify their strategic orientation (independent of real estate) and to transfer it into a sustainable real estate strategy.

All in all, SREDC can be used for larger scale projects that have more of a public interest, thus making it suitable for all types of privately-led developments, except for actors in the field of privately-led development. A key word mentioned in the context of developer-led development was “private-private partnerships”, basically a construction where two or more private players come together to develop real estate, be it a developer with an investor, a developer with a company or all three together. This partnership is particularly helpful for developers to overcome their short-term view. Moreover, the framework could be the basis for such a partnership, however, the strategic level of the two partners in such a case needs to be considered. In retrospect, when testing the framework during the research, the strategic orientation of the mineral oil company should also have been taken into account, as the company was treated as a partner rather than a stakeholder. The same would have been the case if the investor had already been known in this project. Consideration of the strategic direction of the partners would likely have affected the final concept, as the decision would have been made strategically.

Finally, to briefly touch on the theoretical models of real estate development, the framework specifically supports the agency-based model of real estate development. Although real estate development is a combination of all models, as described in section 3.1, the SREDC places a strong focus on multi-stakeholder collaboration and alignment to achieve sustainable real estate.

5.2. Contribution to sustainable business model innovation

To cover the strategic level, insights from the field of sustainable business model innovation were used. Research in this area is concerned with the sustainable transformation of business models, which is seen as a way to gain competitive advantage by opening up new opportunities (N. M. Bocken and Geradts, 2020; He and Ortiz, 2021; Inigo et al., 2017). To accompany this change, numerous tools and practices have been developed by various researchers. The basis for this study and the development of the framework was the SBM Pilot Canvas by Baldassarre et al., 2020, which aims to create small-scale (business model) pilots by equally assessing the aspects of desirability, sustainability, feasibility, and viability. The SREDC builds on this idea and extends it by using the aspects not only for the strategic level but also for the other two levels (project and alignment level). In this way, a link is established between all three levels, which helps to better align the interests defined for each aspect at the strategic and project level. During the testing of the framework, the aspects helped the developer to define, question and, if necessary, expand its business model. Furthermore, it helped to develop a strategic direction when the business model is not yet (fully) developed. As the framework is to be used at the beginning of a development project, this leads to a constant questioning and refinement of the strategic direction at the beginning of the real estate development process. Business model innovation is therefore not a one-off measure, but lives dynamically with each project. This triggers a permanent process of improvement, which can lead to a market advantage over other participants.

In addition to this holistic and dynamic process of business model improvement, the SREDC is partly confronted with the “design-implementation gap” that sustainable business models often struggle with, i.e. sustainable business models hardly make the step from idea to implementation (Baldassarre et al., 2020; Minatogawa et al., 2022). With regard to this gap, the SREDC distinguishes itself from the tools from the SBMI field. The focus of the framework is on developing a sustainable development concept for a specific property. Therefore, sustainable business model innovation is to some extent encompassed by the strategic area, but the main intention of the framework is not to transform the business model, but more to elaborate on the strategic direction and to align and link this view with project level interests. However, as mentioned above, the framework is able to identify gaps and optimisation points in the business model, which in turn can be progressively adjusted or improved from project to project. Sustainable business model innovation is, thus an ongoing process. With regard to the “design-implementation gap”, the framework can either serve as an analysis tool for the current strategic direction, but also offers the possibility to test new business models within the framework of a project and thus partly helps with the implementation of new business models.

This research also contributes to the exploration of SBMI’s dynamic capabilities. Dynamic capabilities are deeply rooted in an organisation and enable operational practices. As mentioned in the literature review, dynamic capabilities are an emerging area of research for SBMI (Minatogawa et al., 2022). The framework developed can help identify those capabilities that contribute to innovation and the development of new sustainable business models, as it takes insights from the field of SBMI and combines them with operational practices. This aspect in combination with the gradual SBMI process could help in the exploration of dynamic capabilities.

5.3. Addressing the identified challenges for real estate development

Within the literature review, several challenges for real estate development were identified. One possible solution to address these challenges, literature suggests, a change at the project and business model level. This approach was the original starting point for the development of the framework. However, the following section elaborates on how the framework can actually address the challenges.

Complex market conditions, as illustrated in Figure 3.5 by Ciaramella and Dall’Orso, 2021, the market environment has evolved from a known to an unknown and unpredictable market. In these circumstances, real estate needs to be able to adapt to current and future needs. The framework offers a different approach to defining the real estate development concept. In contrast to defining the concept on the basis of the developer’s internal knowledge and findings from a market analysis, an approach is taken here in which the strategic orientation of the developer and the interests of the various stakeholders are incorporated into one concept.

Through this approach, market-driven concepts can be created. However, as mentioned by Ciaramella and Dall'Orso, 2021, the business methods of market participants are constantly changing and thus affect the properties and their value. In the case study research, only the strategic orientation of the developer was considered, but since the investor or the oil company as the main user are tied to the property in the longer term, it would have been useful to analyse their strategic orientations as well. By actively including strategic considerations of e.g. the main users, such as the mineral oil company, the long-term view and vision could have been incorporated into the decision-making process and the outcome concept might have been different and more sustainable with regard to the changing market contexts.

As Brown, 2018 and Ciaramella and Dall'Orso, 2021 have noted, real estate development is often dominated by **conservative views**, which in turn leads to innovation being stifled. Another challenge related to the conservative mindset is the **"crisis of formats and content"**, i.e. the tendency to stick to common approaches, concepts, and formats (Ciaramella and Dall'Orso, 2021). Both challenges are addressed by the SREDC. As mentioned above, the approach requires developers in general to leave behind their conservative views and engage with new and different interests. It also requires the developers or initiators of the project to give stakeholders a say in the concept development, i.e. to distribute decision-making responsibility among all stakeholders, including the developer, in order to achieve a sustainable real estate development concept. By distributing the decision-making power, different ideas can evolve, as not only the developer's knowledge is included. This point was also a result of the test phase. Through the different contributions of the stakeholders and the joint alignment, topics such as the construction method and the use of the building were discussed from different angles, which ultimately led to new results. A good example of this was the discussion on the expansion of the mobility hub in terms of use. In addition to the services that remain from the petrol station, such as the shop, the stakeholder saw the possibility to expand the mobility hub (business model) with different services (co-working, restaurants, retail).

Furthermore, new ideas or concepts can be more easily pursued and agreed upon through the SREDC in the alignment phase, as the stakeholders explain certain implications to each other. Thus, innovative or different approaches are discussed and the negative and positive impacts are explained by the experts with specialised knowledge. In addition, these stakeholders can explain the cost implications and are able to identify the measures needed to implement new approaches (both aspects play a role in feasibility and viability). One idea that was intensively discussed during the testing was the topic of timber construction from the first floor onwards. The participants agreed on the innovative character, but also pointed out issues such as fire protection that need to be further investigated. Another point that was discussed at length was the topic of the urban farming and green façade. Although most stakeholders found the ideas intriguing, the investor noted that these measures often lead to high costs, especially in operation, and provide little benefit. The explanation given to the other stakeholders led to these ideas not being pursued further. However, if there had been more time, the stakeholders might have found a solution that could have led to implementation.

Another challenge in real estate development is the **low productivity and efficiency** of the sector (Ciaramella and Dall'Orso, 2021). This aspect can hardly be solved by the application of the framework alone, but it can help to obtain certain agreements during the workshop that will help to increase overall productivity. This was also recognised during the testing phase. The contractor suggested in the one-on-one interview that some kind of challenge, i.e. completing the construction in 12 minus "x" months, would be an interesting option for him in terms of reputation. This option was then also discussed during the alignment workshop and found interesting, especially for the investor, as faster construction would lead to faster cash flow. Thus, the framework can lead to certain agreements that could increase overall performance. Additionally, this finding could contribute to the research field of multi-party or incentive contracts (foundation for private-private partnerships).

The SREDC's most significant contribution is made to the identified challenge of **insufficient involvement of the society** by specifically calling for a multi-stakeholder perspective that includes participants outside the internal project team (Ciaramella and Dall'Orso, 2021). Theoretically, there are no limits to the number of stakeholders involved, but the number must be manageable to ensure an effective process. Therefore, stakeholders need to be carefully selected. Using the agency-based model to identify stakeholders resulted in a manageable group of participants.

Nevertheless, who and whom to involve needs to be further explored. In terms of stakeholder involvement in the case study, the two-stage approach of first conducting individual interviews and then bringing all stakeholders together to agree on a concept resulted in a wealth of information and ideas. Especially, the individual phase helped the stakeholders to take an unbiased view of the project and to focus on their own interests. During the alignment workshop, the stakeholders were able to broaden their view, put it into a wider context or even take a different point of view through in-depth discussions with the other stakeholders. The workshop is basically the most important part of the SREDC as it aims to achieve a sustainable development approach through stakeholder involvement and engagement. Through this practice, stakeholder involvement is surpassed, and they become an integral part of the concept.

Another important contribution of the SREDC is the promotion of **environmental awareness in society and among national and international authorities** (Ciaramella and Dall'Orso, 2021). As mentioned in the literature review, the demand for green solutions has increased and is also demanded by the authorities. In particular, the European taxonomy and ESG have a major impact on real estate development. As this topic becomes more and more important, sustainability has been recognised in the SREDC and implemented as one of the four guiding aspects. Sustainability does not only consider environmental aspects, but also social and governance aspects. Regarding the sustainability aspect, the case study participants were able to name their sustainability goals. However, the interests were mainly related to overarching environmental goals, and the participants struggled to assign concrete measures or figures to the named goals. Social sustainability and governance aspects were recorded rather vaguely. However, with regard to these two points, it has to be acknowledged that by involving stakeholders in concept development and following the SREDC, both aspects are partly covered. The definition of detailed actions for "governance" and "social" is also a challenge that the European Union has to face in the further detailing of the EU taxonomy (Kempeneer et al., 2021; Robinson and McIntosh, 2022).

Finally, the SREDC can only partially counteract challenges that are mainly caused by circumstances beyond its control, such as the development of supply and demand and general market conditions. Nevertheless, as already mentioned, the joint concept development and the commitment of the stakeholders provide some certainty for further implementation. However, the question of how the framework can respond to dynamic market conditions during the planning and implementation phase was also a point of discussion in the expert panels. So, the SREDC needs to be able to adapt to dynamic changes during the course of the project.

5.4. Limitations

While it has been pointed out that the research has made a significant contribution to the existing theory and practical environment of real estate development, it also has its limitations as time and resources were limited. The limitations are discussed in detail below.

Firstly, the SREDC was only tested in a single case study and partly under ideal conditions, i.e. the alignment workshop was role-played as stakeholders were not willing to participate in a full workshop. In addition, time constraints for the interviews and the workshop led to aspects within the framework sometimes being dealt with only superficially. Therefore, the findings identified may not be transferable to other contexts, nor is the applicability of the SREDC. Related to this limitation is the fact that the framework has only been tested in one very specific case, i.e. on a property with a petrol station. Although the SREDC has no case-limiting aspects, the framework needs to be applied and tested for other projects with other uses. In order to optimise and generalise the SREDC, it is necessary to test the approach again in several case studies and draw lessons. Each trial could be seen as an iterative step through which the SREDC can be further developed based on the lessons learned.

Also, as mentioned above, the findings on stakeholder engagement have not been considered in the context of this work. However, as the multi-stakeholder perspective is a fundamental part of the tool, this element should be considered in more detail in further research. This applies not only to the implementation of the tool, but also to the handling of stakeholders and the collected information after the process has been completed. Stakeholders must be involved in the development process in the long term and their interests must be taken into account.

5.5. Recommendations for practice

In general, the SREDC can contribute to the realisation of sustainable real estate development concepts. It is therefore a framework that can be used by anyone who wants to initiate a project. Nevertheless, the approach challenges some conservative and still established attitudes in the real estate market, which is why it requires open-minded participants and a distancing from familiar processes in the initiation phase of a project.

With regard to the practical implementation of the SREDC, some points were identified during the testing that need to be carefully considered. These points are discussed in more detail in the following sections.

First, as was also noted in the expert panel, such an approach requires facilitation by a professional and neutral person. Since the developer is also a stakeholder in the whole process, he does not have a neutral position towards the other stakeholders, which is necessary to conduct the interviews and the workshop. For this purpose, a person, or facilitator is needed who is not associated with any of the stakeholders and can thus lead through the approach in an unbiased manner.

Secondly, such professional facilitation would also ensure that all aspects are equally considered. During the practical implementation of the alignment workshop, it became apparent that it was difficult not to forget the insights from the strategic level. Therefore, the stakeholders mainly focused on advocating for the interests gathered at the project level. However, consolidating interests from the strategic and project levels is the main idea of the SREDC, so better implementation in terms of alignment is needed.

Also, as mentioned earlier, an initial idea is needed. Many stakeholders found it difficult to identify their interests without having a starting point, i.e. an idea of the developer's use or intention for the property. Therefore, it would be useful for the initiator of the project to rule out certain scenarios as a first step and set a limit before starting the SREDC.

Finally, the transparency of information was also addressed in the expert rounds. The experts criticised that the information disclosed in the process is not intended for every participant. Since full transparency is required in this collaborative environment, a solution must be found on how to secure the information within the stakeholder circle.

5.6. Recommendations for further research

Based on the results of the previous discussion, a number of issues have been identified that can be explored in more detail in further research. In addition to further developing the SREDC by conducting various case studies, it could also be explored whether other practices or methodologies from the field of sustainable business model innovation could be useful for implementing the framework in practice. Also in terms of practical implementation of the SREDC, further research is needed on including more than just one strategic orientation, i.e. exploring whether it could be useful to consider the business model not only of the developer but also of other key stakeholders in order to achieve more sustainable approaches.

Furthermore, it was found that due to its structure, the tool could contribute to different research areas.

Firstly, the SREDC could be used to complement existing research on stakeholder engagement and management because of the multi-stakeholder aspect and the way in which participants were involved. Especially since, in addition to the involvement of stakeholders at the beginning for the joint elaboration of the development concept, it was also recognised that there is a need for continuous monitoring of the results and thus a continuous flow of information to the stakeholders. Further research is needed to implement this consideration.

Second, as outlined in section 5.2, the SREDC could be used to identify the dynamic capabilities of sustainable business model innovations. As it has been pointed out that this is an emerging field, the approach could provide a basis for identifying capabilities required for SBMI. This is particularly interesting as the tool maps sustainable business models directly into a practical environment.

As it turned out that the approach could lead to certain (innovative) agreements between the parties. Accordingly, the SREDC could add value in the formation of multi-party contracts or cooperation agree-

ments. Thus, further research is needed to verify whether the SREDC can add value to cooperative and integrated project delivery.

Overall, further research in those areas is essential to fully assess the potential of the sustainable real estate development canvas and ensure its effectiveness in practice. By further exploring and refining the approach through research and testing, it may be possible to establish it as a valuable tool for improving sustainability in real estate development projects.

6

Conclusion

This research started from the problem that while it has been identified that the strategic level and the project level need to be aligned in order to develop sustainable real estate concepts and for developers to perform well in the market, there is no approach that guides developers in aligning both levels. This problem was solved by developing the Sustainable Real Estate Development Canvas to guide this process in a project environment. While testing the tool in a case study, the approach helped to reach a sustainable development concept that involved multiple stakeholders in a structured way. The multi-stakeholder approach resulted in a great flow of information, which is unusual at such an early stage of a development project. Thus, the SREDC makes an important contribution to stakeholder engagement and management within development projects. Furthermore, the tool enriches the research field of sustainable business model innovation with a new instrument and by providing a basis for the identification of dynamic capabilities for SBMI. The developed approach leads to a constant review of the developer's strategic orientation in a project context. Thus, business model innovation becomes a dynamic improvement process rather than a one-time affair.

To conclude the research work, the research questions are listed and discussed in more detail.

How can the strategic and project levels of a developer be aligned to achieve a sustainable real estate development concept?

The overarching research question was answered with the development of the SREDC, which provides a way to align strategic (business model) intentions with project interests in a sustainable real estate development concept. As the question is how to align the two levels, the following points need to be considered when implementing the SREDC:

- A multi-stakeholder perspective is required. For the development of the project level, the interests of relevant stakeholders must be identified, which is why the circle of participants must be defined in advance.
- Transparency regarding the interests in the strategic and project level is required. All participants must be open about their interests and goals. For this reason, the interests are captured individually in a first step, without the influence of other stakeholders.
- The alignment of the two levels is achieved by bringing all stakeholders together, the so-called alignment workshop. In this context, it is important that the stakeholders consider the interests from the strategic and project level and work out a joint development concept on the basis of the results.

The overall research question was answered by working through the sub-questions. These are considered in more detail below.

What research findings / streams play a contributing role in the development of the theoretical framework for real estate development?

To answer the first sub-question, a literature and document study was conducted. A closer look was taken at real estate development and the different types of private-led developments. In addition, challenges that real estate development is currently facing were identified. All these findings were relevant to understand real estate development in its entirety. Furthermore, it was worked out which characteristics the actors in real estate development need in order to be able to cope with the challenges. An important insight here was Heurkens' theory on the multi-steering role in real estate development, which identifies aspects that need to be covered by real estate developers in order to function well in today's market. This essentially identifies the alignment required between the strategic and project levels. The structure of the model served as the basis for the SREDC. As the strategic level was identified as equally important as the project level, the field of sustainable business model innovation also played an important role, in particular the SBM Pilot Canvas by Baldassarre et al., 2020. The models and insights from Baldassarre et al., 2020 and Heurkens, 2020 formed the basis for the SREDC.

How can the theoretical framework be conceptualised in practice to achieve sustainable real estate development concepts?

Conceptualisation was achieved through the testing phase, i.e. through the practical implementation of the tool in the context of an in-depth case study. Individual interviews were conducted to collect information for the strategic and project levels. The strategic level was only filled in by the developer/initiator of the project. For the project level, on the other hand, the interests of all identified relevant stakeholders are requested. Therefore, individual interviews were conducted with each stakeholder to identify their interests. Finally, in order to align both levels, a so-called alignment workshop was held. Here, all stakeholders came together to discuss the individual contributions from the project and strategic level and to jointly agree on a development concept.

Is the framework helpful and usable for future real estate developments?

Finally, to answer the last question, an expert panel was conducted. The results of the testing phase were presented to the experts. On this basis, the experts assessed the applicability of the SREDC. In summary, they found that the approach can prevent conflicts at an early stage that might otherwise occur at a later stage. Furthermore, it was mentioned that the early involvement and commitment to a concept gives the stakeholders a certain responsibility towards the project, which can contribute to a constructive cooperation. Finally, the structured documentation of the results was acknowledged, also with regard to the obligation to documentation in terms of ESG. Nevertheless, topics for improvement were also mentioned, including the depth of stakeholder involvement, also with regard to the information disclosed. It was noted that the SREDC requires professional implementation by a neutral person. In addition, it was mentioned that the results must continue to be monitored afterwards, and the stakeholders involved must continue to be informed. It was also said that the tool should respond to dynamic developments during the process or incorporate them in some way. Finally, the legal binding of the jointly agreed concept was questioned. In summary, the experts still see some open aspects that need to be considered, yet the SREDC offers potential for integration into practice.

The research has shown a way to align the strategic level (business model) with the project level to achieve sustainable real estate development concepts. The results of the testing indicate that the approach can lead to sustainable concepts. However, as only one case study was conducted, further research is needed to achieve generalisability. Beyond that, the study has shown several possibilities for further research, which can be carried out apart from the approach developed in this thesis.

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A

Document review

Document review				
Developer	Environment	Social	Governance	Additional Remarks
Nr.1 - Accumalata	Reducuction of electricity, water and waste to a minimum; Waste seperation / paperless office; 100 % green electricity; Co2 neutral commute; Sustianable office supplies, energy-efficient technology, regional and sustainable products; Maximum reduction in primary energy demand; expension of renewable energies;builidng opertaion / consumption monitoring and optimisation; intelligent control of lighting, temperature, ventilation and shading; repositioning before demolition / new construction;life cycle analysis across all phases; use secondary raw materials and recycled materilas; documentation of all materials and products in material passport;buidling certification	Social Day where company participates in social and environmental projects; support biodiversified compensation areas; offer high-quality and pleasedn working environment; improving female ratio / diversified employee structure	ESG measures in organisational handbook, compliance manual, internal policies; Transperent ESG reporting; ESG board	sustainability management; Establishment of ESG in both company and project level
Nr.2 - Momeni	Net zero by 2025 (corporate level); Reduction of emission and net zero by 2035; use of renewable energies; 100 percent green leases; green building certificates; monitoring of wateruse; responsible use of material and waste	Establish ESG-measures in entrie company; comply with human rights; diverisfication of the company; including users and stakeholder in order to integrate their requirements	ESG measures in organisational handbook, compliance manual, internal policies; Transperent ESG reporting; ESG board and uniform understanding of compliance;transparent communication and reporting; regular esg reportng and sustainability management	Establishment of ESG in both company and project level

Document review				
Developer	Environment	Social	Governance	Additional Remarks
Nr.4 - Quantum	Use of renewabel energy; Disposal concept for the office; Sustainable standards for builidngs (Rainwater retention basins, use of grey water, roof greening, use of district heating and the use of regional materials as standard);Certification (highest level incl. ESG-verification); Building material passport, us of alternative builidng materials; Use existing building structure instead of building new	Sustainable and resource-saving works, healt and security of employees;New living an working concepts	Recurring sustainability reports; Work on how social sustainability can measured in the living-sector; Sustainability workshops for the employees; Use of green leases	Establishment of ESG in both company and project level
Nr.5 - ubm	Increase share of wood-cosntruction; green building certifications; reduce CO2-intensity by 30 % unitl 2030; increase brownfield development for new constructions by 66 %; circular economy in projects; increase use of renewable energies by 30 % by 2025; Increase use of vehicles with alternative fuels;	prevent employee fluctuation; Increase women rationin leading positions; ESG training for all employees	voluntary check of ESG-reports; code of conduct für partners; ethic codex for employees	Establishment of ESG in both company and project level
Nr.6 - venovia	Nearly climate-neutral building stock by 2045, consistent refurbishment and use of renewable energy	Reliable rental structures, establishment of innovation and new technologies	Transparent governance (orientation international corporate governance codex)	Establishment of ESG in both company and project level

B

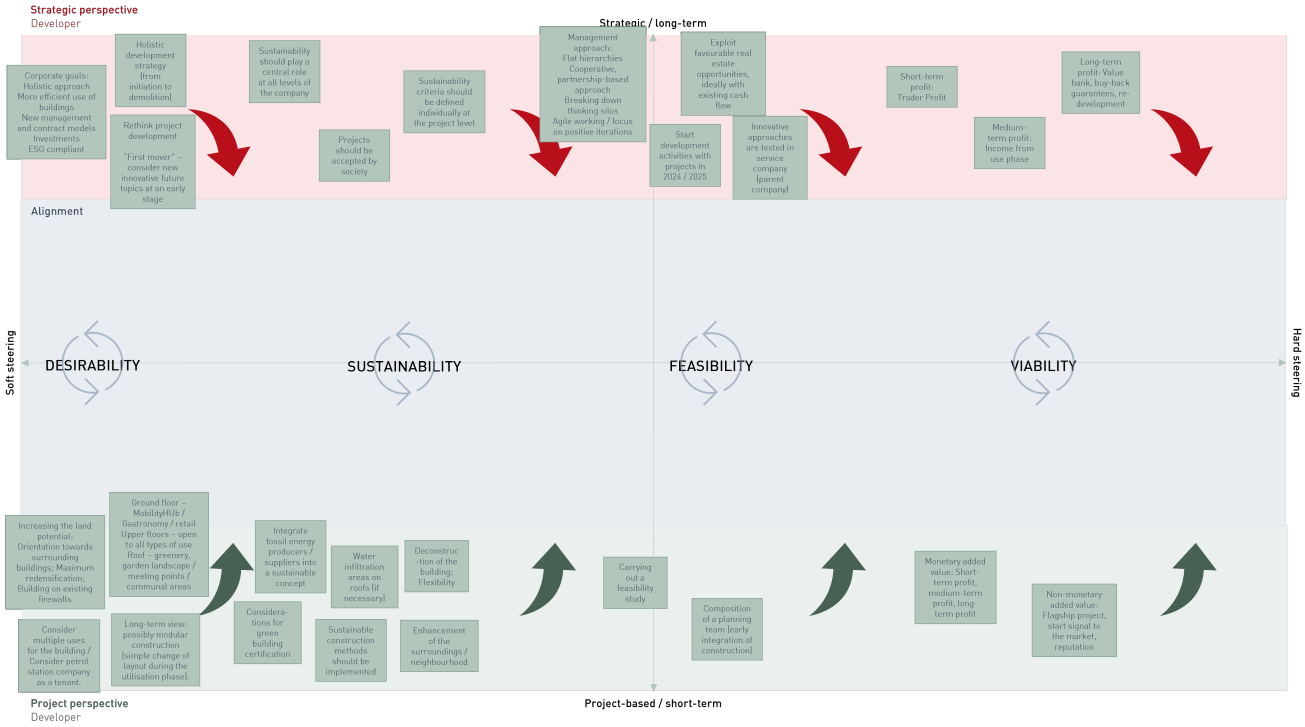
Overview interview participants

Table B.1: Overview participants

Nr.	Participants	Duration
1	Management position | Real Estate Developer	54 minutes
2	Former bank employee in the real estate department	40 minutes
3	Head of Department Certification DGNB	40 minutes
4	Citizen / student	20 minutes
5	Managing Director Builidng Contractor	50 minutes
6	Employee in the transaction area (investor perspective)	40 minutes
7	Architect	60 minutes
8	District manager (mineral oil company)	52 minutes
9	Sustainability Manager (mineral oil company)	90 minutes

C

Interview summary Developer



Participant	Developer	Date	Location
		24.01.2023	Office Developer
		Time:	
		09:00 till 10:00	

Summary

DESIRABILITY	
Question	**Answer / Notes:**
What is the developers' vision?	The vision is to change the way we think about the project development business. As a "first mover", the developer will consider new innovative future topics at an early stage and integrate them into the product development.
What mission is being pursued to achieve the vision?	A holistic development strategy (from the initiation to the deconstruction phase) is to be pursued for individual projects in order to be able to tie in with further business models after the exit, if applicable. Accordingly, all topics that are relevant for an exit of the developer but also for the maintenance of the portfolio should be considered. The customer benefit (investor) must be balanced with the interests of the tenants. Accordingly, users and stakeholders should be involved at an early stage. The technical and commercial know-how of the parent company, which offers services in the real estate sector, will be used to develop a sustainable and high-quality product on the part of the project developer.
What corporate goals have been defined?	1. Holistic approach 2. Efficient use of buildings 3. New management and contract models 4. Investments 5. ESG compliant

SUSTAINABILITY	
Question	**Answer / Notes:**
What are the developer's sustainability goals, both at the corporate level and at the project level?	In principle, sustainability should play a central role in the parent company and all participating companies. On the company side, the focus is on topics such as a mobility policy (focus on e-mobility), waste separation, paperless working, etc. At project level, sustainability goals should be defined individually (depending on location, needs, etc.). In the context of this, several

	iteration loops should rather be turned in order to plan suitable goals and measures for each project. The developer's goal is to develop projects that are accepted and used by society.
What are the benchmarks in terms of social sustainability?	On the corporate side, there are fixed budgets for the support of various social projects. In addition, numerous employees are involved in universities and higher education institutions (teaching and research).

FEASABILITY	
Question	**Answer / Notes:**
What milestones have been defined for the successful implementation of the business model?	The environment for project development is currently rather bad (inflation, interest rate issues, falling purchase factors, rising yields). The buyer and seller market is currently very divergent and must first find its balance (transaction volume has fallen sharply). Nonetheless, the guideline is to continue to look for favourable land opportunities. Ideally, properties should be self-sustaining in the first instance due to existing cash flow. It is expected that the market will stabilise again by the end of 2024 and that projects can be started in 2024 / 2025.
What structures need to be created (internally / externally) to implement innovative projects or create added value?	The management approach of the developer can be described as follows: – Flat hierarchies (also in project structures). – Cooperative, partnership-based approach (trust); building sustainable business relationships. – Breaking down of thinking systems / goal-oriented incentivisation; everyone is allowed and expected to contribute know-how. – Agile working / focus on positive iterations and avoidance of negative setbacks. Innovative approaches are already planned and tested in the parent company (e.g. management model, contract models, tenant models, etc.). The parent company will function as a know-how provider in the future. Cooperation with other know-how providers, e.g. in relation to building technology, is also being sought.
How is it ensured that the sustainability goals are also implemented in the projects?	In the long term, there will be a basic concept (possibly in the form of a list of criteria), which is oriented towards legal (e.g. taxonomy) and own guidelines. The own guidelines will be defined in such a way that it is possible to react to dynamics of the development market at any time.

VIABILITY	
Question	**Answer / Notes:**
How is short- and long-term success defined?	The economic success can be divided into 3 levels: 1. short-term profit: purchase of land according to the off-market approach - market-oriented development of the product according to own guidelines - sale to investor (= classic trader-developer or total takeover for investors who already have projects). 2. mid-term profit: income during the utilisation phase, which compensates for the additional costs of the planning and construction phase. Business models for the operating phase should already be considered during development (e.g. data collection, rental models, service offers). 3. long-term profit: building as a bank of recyclable materials; buy-back guarantees, re-development

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Participant	Developer	Date	Location
		25.01.2023	Office Developer
		Time:	
		09:00 till 10:00	

Summary

DESIRABILITY	
Question	**Answer / Notes:**
What interests does the developer have for the property? What are the development desires?	The primary goal is to increase the space potential and generate more building mass on the site. – Orientation towards surrounding buildings. – Maximum redensification – Building on fire walls With regard to use, several variants should be considered (multi-use / single-use). The aim is to continue to include the petrol station company as a tenant (strong tenant). In the context of cooperation, emphasis is placed on a cooperative approach and fewer hard contractual interfaces. Further uses are dependent on local demand as well as the current market environment and the specifications of the city. The concept must also be accepted by investors. The aim is to develop an innovative project. The ground floor area should currently be used for retail / gastronomy / MobilityHub. From the first floor upwards, the type of use is still open. The roof is to be greened or planned with other ideas such as a garden landscape / meeting points / communal area.
What ideas are there for the development in the long term?	A long-term view plays a role in the development. Possible topics are modular construction, which allows for a change in the basic layout of use.
What added value should the development deliver or what does the developer hope for?	The aim is to create added value in terms of space, use, economic efficiency, attractiveness, sustainability, and image. Further development of the classic petrol station = added value for the city.

SUSTAINABILITY	
Question	**Answer / Notes:**
What are the goals in terms of environmental sustainability? What characteristics should the development have?	The aim is to integrate fossil energy producers/suppliers into a sustainable concept (impact investing). Such users' livelihoods should be maintained but in a different concept (long-

	term sustainability aspect; sustainable subsequent use of the site). Certifications (e.g. DGNB) are being considered for the project. In principle, sustainability standards should be documented. Sustainable construction methods should be pursued (circular economy, sustainable materials). Consider infiltration areas on roofs (urban gardening, urban farming).
Are there any ideas regarding the end-of-life phase?	Deconstruction, flexibility and third-party use should be considered by the planning team.
Are there considerations regarding social sustainability?	Development should bring certain upgrading for the surrounding area. Ground floor should be accessible to the public (restaurants etc.)

FEASABILITY	
Question	**Answer / Notes:**
How can the developer contribute to the implementation of the development?	The feasibility (market, location, use, development) as well as the risks are checked at an early stage. A project team (partner) with early involvement of the construction should be established. Other stakeholders are involved in the form of advisory mandates.

VIABILITY	
Question	**Answer / Notes:**
How is the benefit for the developer defined (monetary added value and non-monetary added value)?	Monetary added value: The project must be economically viable. 1. Short-term profit: Trader profit; marketability must be given. 2. Medium-term profit through service models, data management, etc. 3. Long-term profit through flexibility and reuse. Non-monetary added value: Flagship, launch signal to the market and image.

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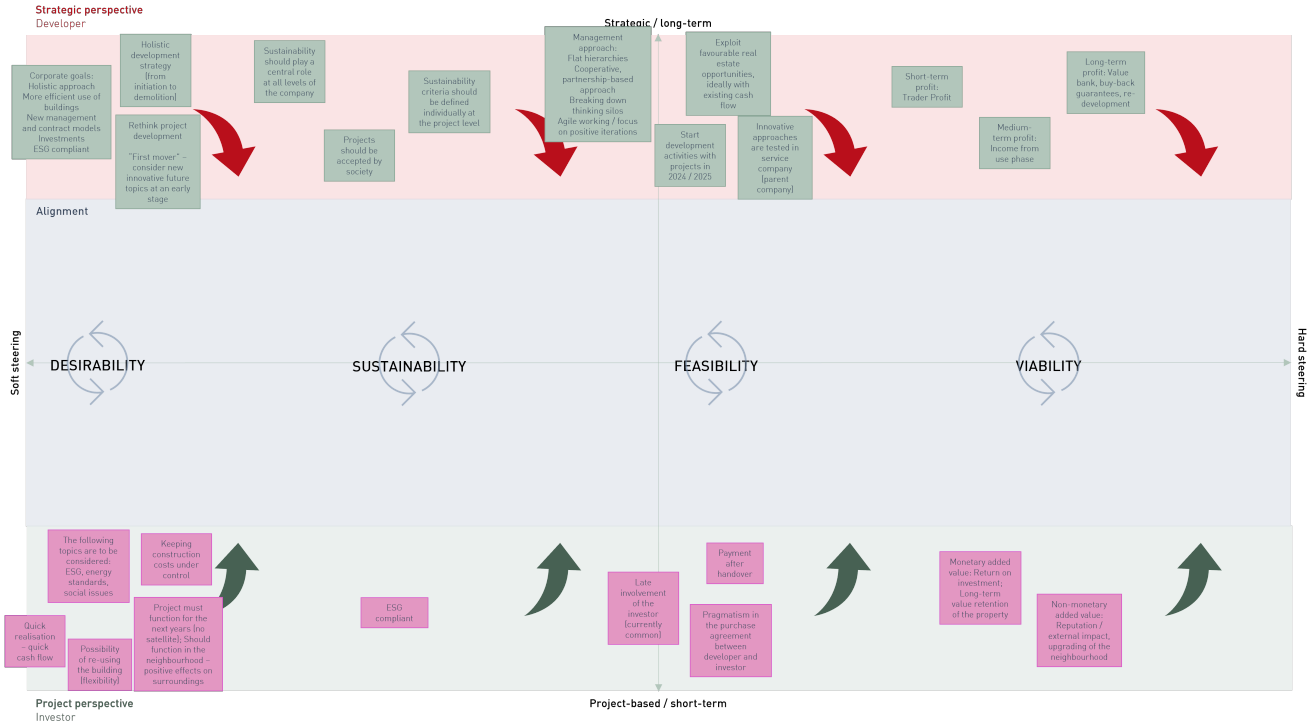
D

Interview summary Investor



Participant	Investor	Date	Location
		16.02.2023	MS Teams
		Time	
		14:00 till 15:00	

Summary

DESIRABILITY	
Question	**Answer / Notes**
What are the interests of an investor in such a development? What would an ideal development look like for an investor?	An ideal development from an investor's perspective takes into account the following issues: ESG (a project that does not meet many ESG issues will no longer be marketable), compliance with energy standards & social issues. Even more important than the above issues is the return from the product. With the current interest rate environment, it is important to have construction costs under control. Due to the current market situation, exit prices are lower compared to recent years. The development must work for the next few years. No satellite should be developed that does not work in the surrounding area / neighbourhood in the long term. The project should have positive effects on the surrounding area. The operational phase, end-of-life phase and the possibility of change of use (flexibility) should be considered. Rapid realisation of the project would be desirable in order to generate cash flow more quickly.

SUSTAINABILITY	
Question	**Answer / Notes**
Are there any requirements in terms of sustainability?	ESG as well as the Taxonomy Regulation cover all important topics regarding sustainability.

FEASABILITY	
Question	**Answer / Notes**
How can the investor contribute to the implementation of the development and to what extent does he want to be involved in the process?	The earlier the investor is in the project, the better requirements and goals can be addressed (joint venture / partnership). However, early involvement of the investor is not common on the broad market. The investor can accommodate the developer with a pragmatic contractual arrangement (e.g.

	debtor warrant = higher purchase price if developer performs well when renting out the building).

VIABILITY	
Question	**Answer / Notes**
How is the benefit to the investor from the development defined? Monetary added value / non-monetary added value	The ratio of purchase price to return must be right. In addition, the building should retain its value (flexibility, durable materials, ESG conformity). The development should have a certain external impact for the investor and enhance the neighbourhood.

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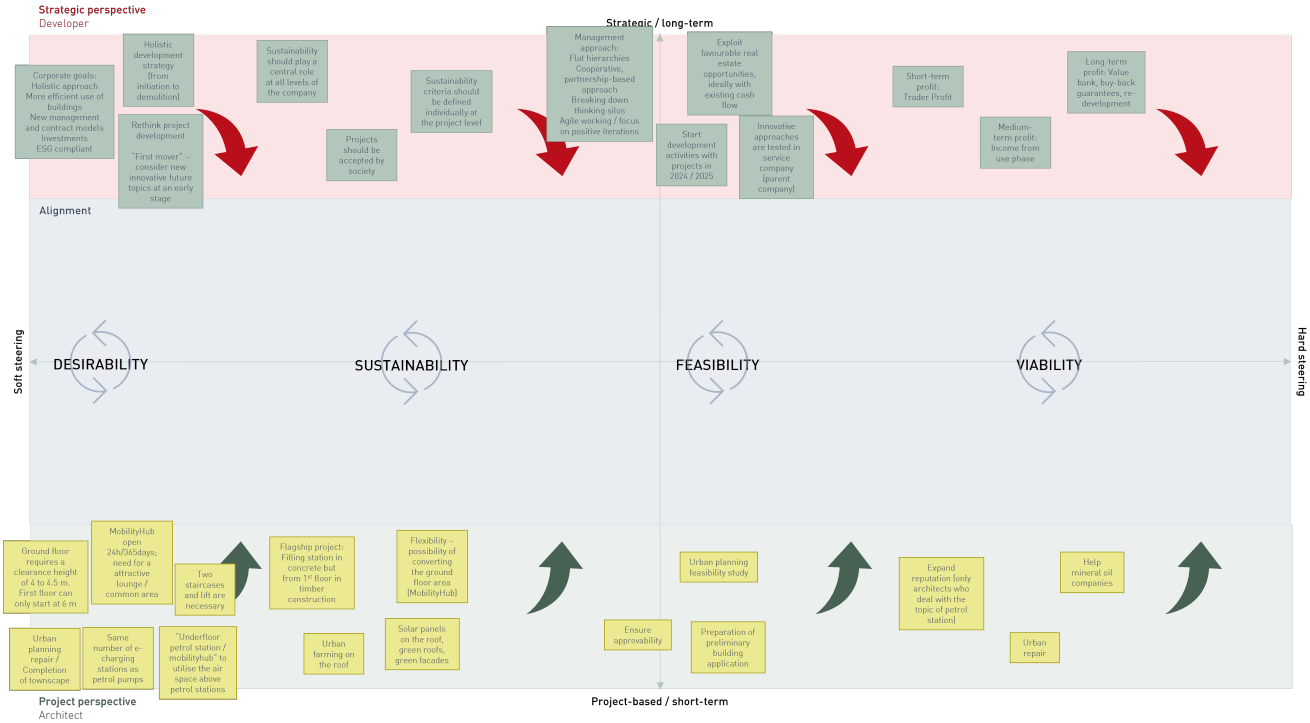
E

Interview summary Architect



Interview Architect
Project Level
27.02.2023

Participant	Architect	Date	Location
		27.02.2023	MS Teams
		Time	
		14:00 till 16:00	

Summary

DESIRABILITY	
Question	**Answer / Notes**
What are the architect's interests in such a development? What would an ideal development look like?	The location of the plot is similar to many situations in other large German cities (busy road and intersection area with petrol station). The value as well as the possibilities of such plots are not fully exploited. The area above the petrol station should be exploited. Underground filling stations (old concept) exploit the airspace above the filling station. Filling stations in inner-city locations are seen as damaging to urban development (incomplete corner). The townscape should be completed (urban design repair).
What ideas do you have for the development of the site? (Use, construction methods, etc.)	The mobility hub on the ground floor requires a high clearance height (4 - 4.5m). This is decisive for petrol station and mobility hub use. The first non-filling station floor can start from approx. 6m. Two staircases and a lift are required. Users of the upper floors need an address formation. In principle, there should be the same number of petrol pumps as e-charging stations. A lounge and recreation area should be attractively designed (bridging waiting times). Extended use is only possible on the first floor, as the ground floor is needed for Mobilityhub and petrol station use (high space requirement).

SUSTAINABILITY	
Question	**Answer / Notes**
What requirements must the development fulfil in terms of sustainability?	Upcycling difficult, as everything that exists must be demolished as part of the new development. It is possible to build the petrol station area on the ground floor in concrete and continue with timber construction from the first floor onwards. (= flagship project / innovative character). Implementation of PV on the roof and roof greening now standard. Facade greening and urban greening concepts are possible.

	The ground floor can easily be converted (flexibility, petrol station area can be used as restaurant or retail space). The underground tank can simply be taken out when it is no longer needed.

FEASABILITY	
Question	**Answer / Notes**
How can the architect contribute to the implementation of the development?	In a first step, the examination of feasibility and evaluation of realistic scenarios. Preparation of a permittable planning.

VIABILITY	
Question	**Answer / Notes**
How is the benefit from the development defined? Monetary added value / non-monetary added value	So far, the architect is the only one who deals with the further development of petrol stations (bundled knowhow). Accordingly, the reputation is to be further extended. Development should contribute to urban repair (upgrading/completion of the neighbourhood). With knowhow and new concepts, help mineral oil companies to improve their environmentally damaging image.

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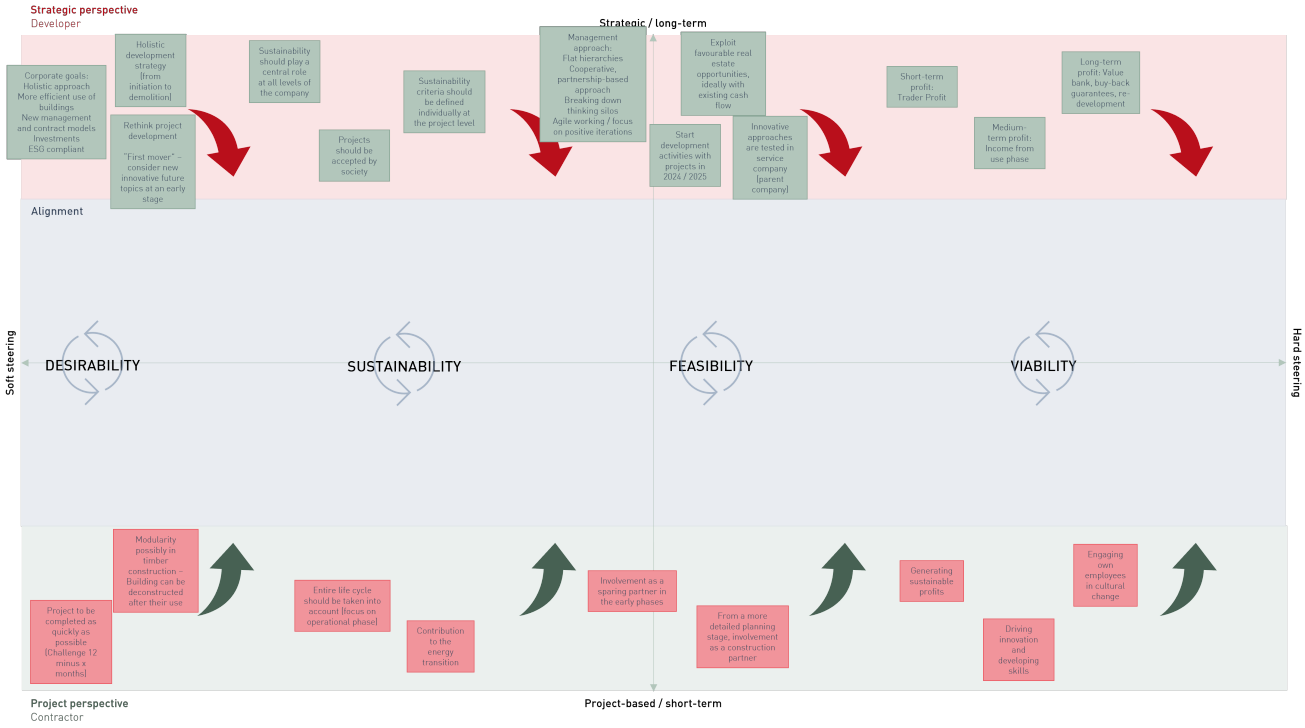
Interview summary Contractor



Interview Contractor
Project level
13.02.2023

Participant	Contractor	Date	Location
		13.02.2023	Office Contractor
		Time	
		08:00 till 09:30	

Summary

DESIRABILITY	
Question	**Answer / Notes**
What interests does a contractor have in relation to the development?	Early involvement of the construction company in the form of a partnering model (get involved as early as possible in order to create added value together). Ideally, this should begin in work phase 2 or 3. In the phases prior to this, the construction partner is available as a sparring partner to provide advice.
What concrete ideas are there in relation to the development of the site?	Modularity (modular / serial construction) possibly in timber construction. Maximum degree of pre-production; complete project as quickly as possible (within 12 minus x months). Possibility to disassemble the building after the period of use.
What added value must be created with the development to make it worthwhile for a contractor?	Develop modern and innovative project. Construction company is ready to develop and grow with the client.

SUSTAINABILITY	
Question	**Answer / Notes**
What are the sustainability requirements for such a development?	Development should contribute to the energy transition. The entire life cycle (strong focus on operating phase) should be taken into account.

FEASABILITY	
Question	**Answer / Notes**
How can the construction company contribute to the implementation of the development?	Early involvement as advisor.

VIABILITY	
Question	**Answer / Notes**
How is the benefit from such a development defined for a contractor?	In principle, sustainable profits should be generated. Promote innovation and further development of competencies (create knowhow). Take own employees along in the cultural change.

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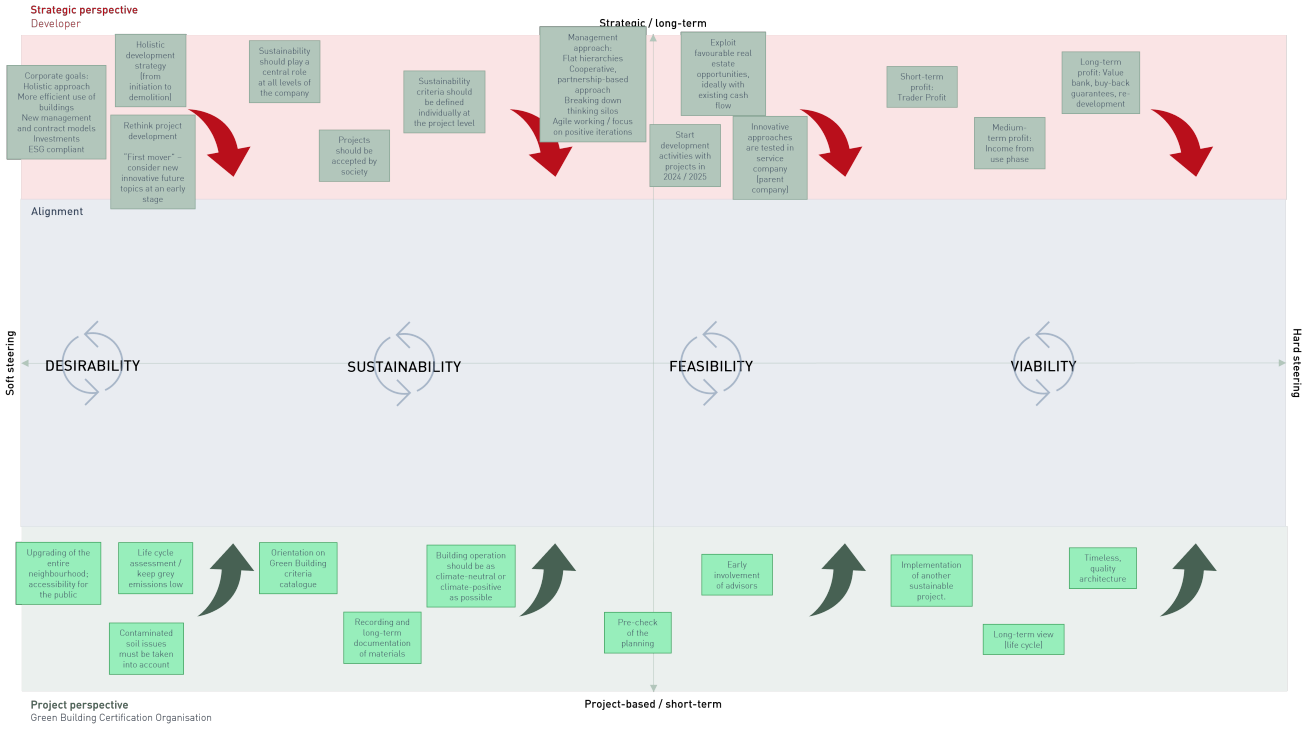
G

Interview summary Green Building Certification Organisation



Interview DGNB
Project level
08.02.2023

Participant	DGNB-certification	Date	Location
		08.02.2023	MS Teams
		Time	
		15:00 till 16:00	

Summary

DESIRABILITY	
Question	**Answer / Notes**
What are the DGNB's wishes / ideas for such a property? What would an ideal development look like for the DGNB?	With regard to the current petrol station use, it is important to ensure that the soil is examined for contaminated sites. In the context of a new development, the soil should be restored in such a way that future developments are not further damaged. A low carbon footprint should be ensured. New solutions should keep grey emissions low (overall performance must be considered). Development should improve the whole neighbourhood and be available for public use.

SUSTAINABILITY	
Question	**Answer / Notes**
What sustainability goals does the DGNB see in focus?	Basically, the DGNB criteria catalogue serves as orientation. Particular focus is placed on the recording and long-term documentation of materials in a building resource passport. The operation of the building should be as climate-neutral or climate-positive as possible.

FEASABILITY	
Question	**Answer / Notes**
What contribution can the DGNB make to ensuring that the project is implemented?	Early involvement of auditors / consultants to define goals. In a pre-check, the development can be evaluated in terms of sustainability.

VIABILITY	
Question	**Answer / Notes**
How is the benefit for the DGNB defined?	- Implementation of a further sustainable project. - Long-term consideration (life cycle calculation). - Timeless, quality architecture (less quickly demolished).

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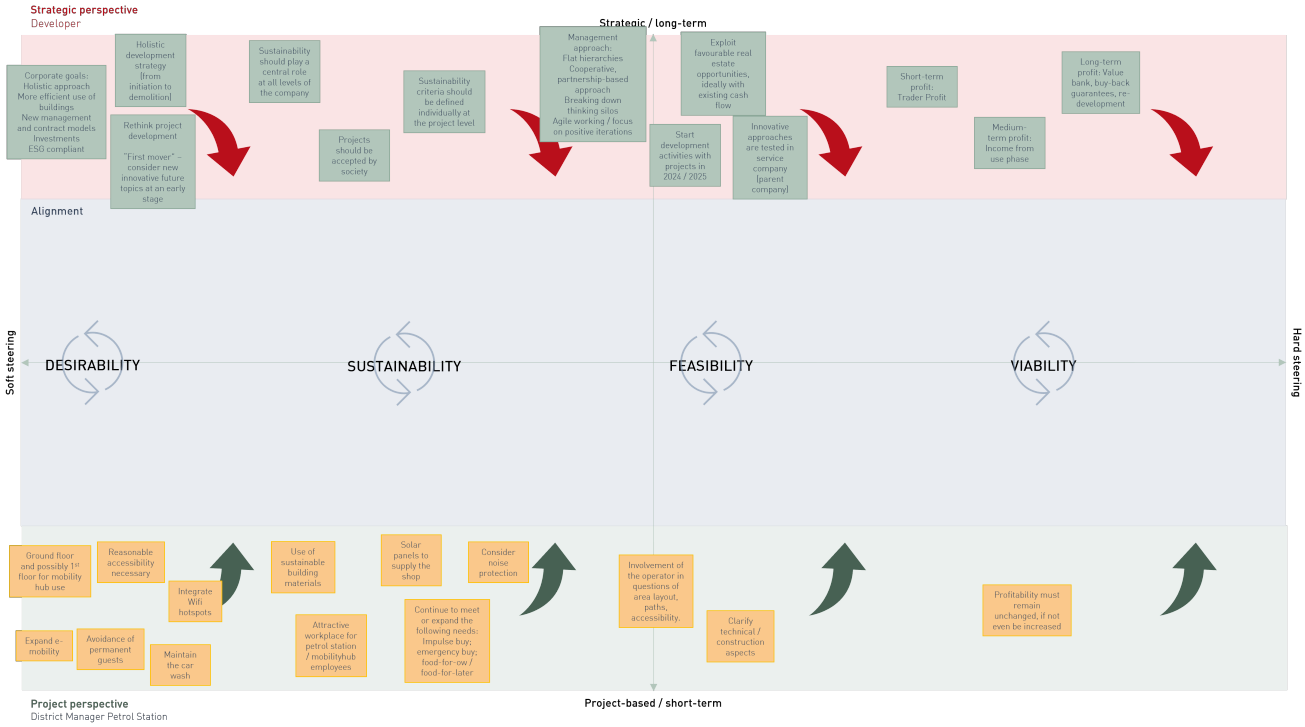
H

Interview summary District Manager



Interview DGNB
Project level
08.02.2023

Participant	DGNB-certification	Date	Location
		08.02.2023	MS Teams
		Time	
		15:00 till 16:00	

Summary

DESIRABILITY	
Question	**Answer / Notes**
What are the DGNB's wishes / ideas for such a property? What would an ideal development look like for the DGNB?	With regard to the current petrol station use, it is important to ensure that the soil is examined for contaminated sites. In the context of a new development, the soil should be restored in such a way that future developments are not further damaged. A low carbon footprint should be ensured. New solutions should keep grey emissions low (overall performance must be considered). Development should improve the whole neighbourhood and be available for public use.

SUSTAINABILITY	
Question	**Answer / Notes**
What sustainability goals does the DGNB see in focus?	Basically, the DGNB criteria catalogue serves as orientation. Particular focus is placed on the recording and long-term documentation of materials in a building resource passport. The operation of the building should be as climate-neutral or climate-positive as possible.

FEASABILITY	
Question	**Answer / Notes**
What contribution can the DGNB make to ensuring that the project is implemented?	Early involvement of auditors / consultants to define goals. In a pre-check, the development can be evaluated in terms of sustainability.

VIABILITY	
Question	**Answer / Notes**
How is the benefit for the DGNB defined?	- Implementation of a further sustainable project. - Long-term consideration (life cycle calculation). - Timeless, quality architecture (less quickly demolished).

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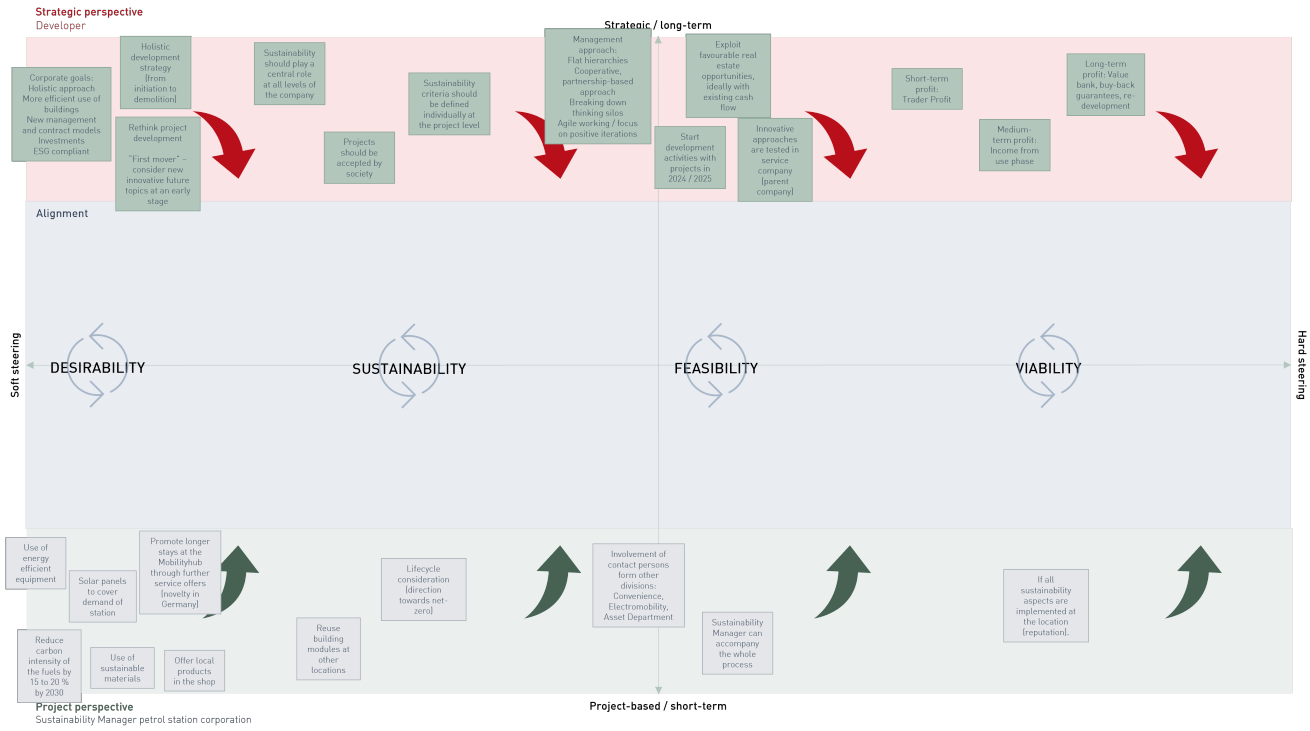
Interview summary Sustainability Manager



Participant	Sustainability Manager	Date	Location
		03.03.2023	MS Teams
		Time	
		11:30 till13:00	

Summary

DESIRABILITY	
Question	**Answer / Notes**
What interest do you have in such a development? What would an ideal development look like for you?	A successful development meets the following aspects: – Reduction of carbon intensity of on-site fuels by 15-20% by 2030. In the long term, fossil fuels should be reduced and charging stations (with green electricity), fuels with high bio content (30%) or natural gas with bio content should be increasingly offered. Exclusive e-mobility concept does not make sense (market not yet ready). – Sale of local products in the shop. – Use of sustainable building materials. – Building operation should be energy efficient. – Photovoltaics to cover the petrol station's own needs. – Green roof. – Further uses beyond the current shop concept, is quite possible (With investments involved). Promotion of longer stays is already practised in other countries. The integration of further uses within a mobility hub would be a novelty for the German market.

SUSTAINABILITY	
Question	**Answer / Notes**
What requirement must the development fulfil in terms of sustainability?	The life cycle of the site should go in the direction of Net-Zero, both in operation and in the sale of fuels (Net-Zero Operation & Net-Zero Sales). Materials should be used in such a way that they can be reused in other cycles (Use-Longer: reuse modules at other locations).

FEASABILITY	
Question	**Answer / Notes**
How can you contribute to the implementation of the development or where do you think you can or must participate?	Sustainability Manager can provide overall support for the entire development process. In

	addition, numerous other stakeholders within BP must be involved.

VIABILITY	
Question	**Answer / Notes**
How do you define the benefits from the development? Monetary added value / non-monetary added value	If all sustainability aspects are implemented at the location (reputation).

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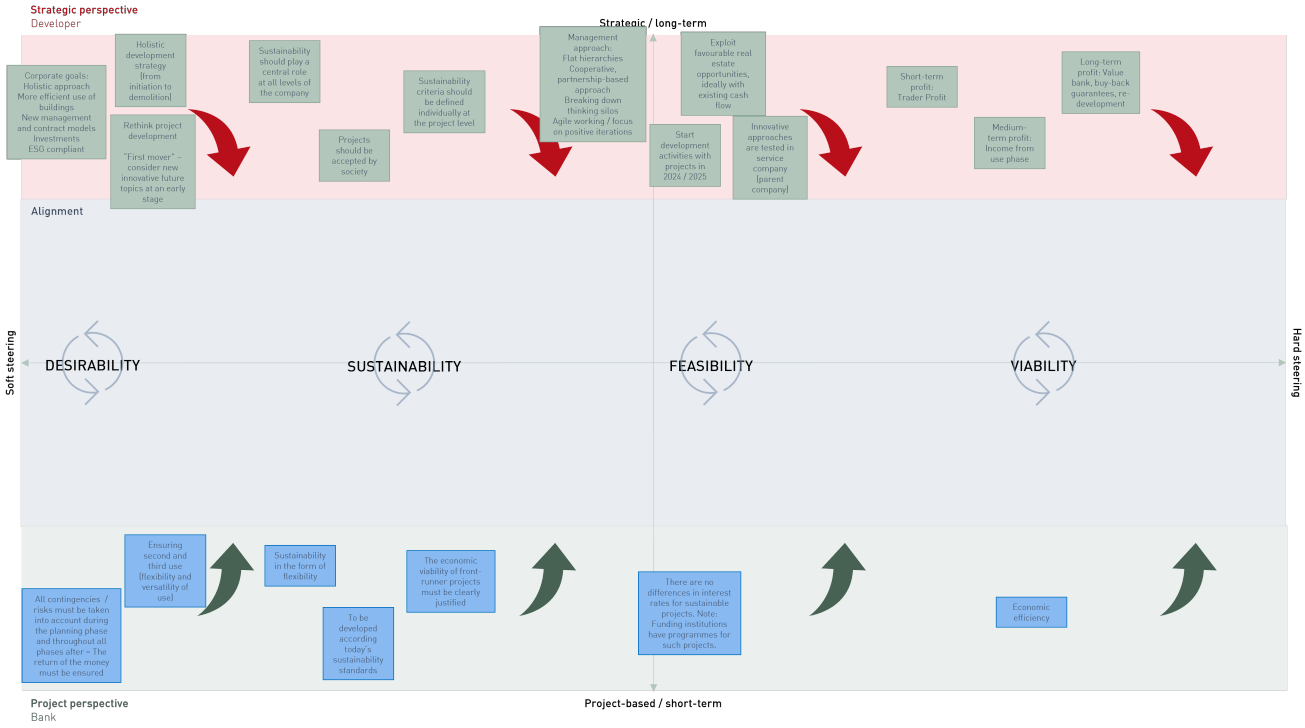
J

Interview summary Bank



Interview Bank
Project level
24.01.2023

Participant	Bank	Date	Location
		24.01.2023	Office Developer
		Time	
		14:00 till 15:00	

Summary

DESIRABILITY	
Question	**Answer / Notes**
What are the lender's interests towards the developer and the development of the property?	Above all, it is important to ensure second and third use (flexibility and versatility of use). The object should not only be tailored to one need (the more universal the object, the better). The return of the money should be secured, regardless of the current user (credit must be secured). All contingencies must be taken into account already during the planning phase, also for the construction phase. Subsequent financing must be avoided.

SUSTAINABILITY	
Question	**Answer / Notes**
Are there sustainability requirements on the part of the lender or certain ideas that are tied to the loan?	Sustainability in the form of flexibility should be given. The property should be developed according to today's standards. Security of the bank is increased if today's sustainability issues / innovation are taken into account. Added value of front-runner projects must be clearly demonstrated, i.e. economic efficiency is always in focus. All topics that go beyond the scope of a normal development must be justified (costs and innovations must be questioned).

FEASABILITY	
Question	**Answer / Notes**
How can the Bank contribute to the implementation of development, especially in relation to sustainability issues?	There are no differences in interest rates for sustainable projects. Interest rate concessions are only available from development institutions (KfW, L-Bank).

VIABILITY	
Question	**Answer / Notes**
How is successful development defined in terms of viability?	The economic viability must be given.

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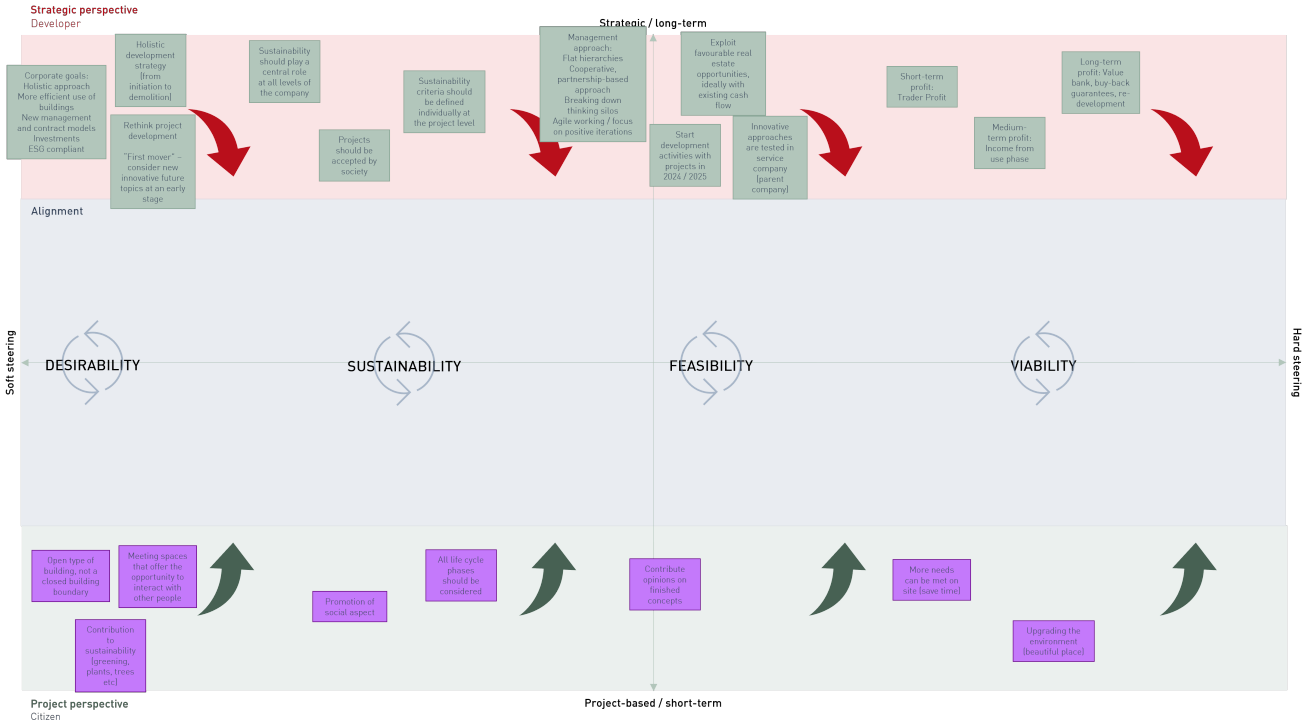
K

Interview summary Citizen



Interview Citizen
Project level
10.02.2023

Participant	Citizen	Date	Location
		10.02.2023	Office Developer
		Time	
		15:00 till 15:30	

Summary

DESIRABILITY	
Question	**Answer / Notes**
What are the wishes regarding the development of the property?	It is desirable to have an open type of building, not a closed building boundary. Meeting spaces should be created that offer the opportunity to interact with other people. Development should contribute to sustainability (greening, plants, trees, etc.).

SUSTAINABILITY	
Question	**Answer / Notes**
Are there any requirements in terms of sustainability?	Through a development that promotes coming together, many sustainability issues are already fulfilled. In addition, all life cycle phases should be considered at an early stage.

FEASABILITY	
Question	**Answer / Notes**
What could the individual contribution to the implementation of development look like?	Contribute opinions on finished concepts.

VIABILITY	
Question	**Answer / Notes**
What added value must be created in the end for successful development?	If more needs can be met on site (save time). Upgrading the environment (beautiful place).

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