Project Manager's Influence on Safeguarding Sustainability Goals and Ambitions

A Qualitative Research on Understanding the Project Manager's Ability to Influence Design Teams toward Safeguarding Sustainability Goals and Ambitions during the Design Phase of Building Projects

Master Thesis Construction Management and Engineering

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TU Delft

ARCADIS

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by

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TU Delft ARCADIS

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Lastly, I would like to thank my friends and family, who have gotten me through the highs and lows of this research. I would also like to give special thanks to my parents for their unwavering support, patience, and guidance throughout this journey.

Hopefully, this research will contribute to the existing knowledge and be applicable to Arcadis to help create a sustainable built environment for us and future generations. Enjoy reading the result!

Daniëlle Termote
Delft, May 2023

Executive Summary

Introduction

Over recent years, sustainability has become an essential topic in every industry's agenda, as building projects consume significant energy and resources and contribute significantly to material waste and CO2 emissions.

In the building industry, the responsibility for guaranteeing sustainable building construction is often put on the projects managers (Tabassi et al., 2016), as they are appointed leaders of the project teams and responsible for delivering building projects (Fewings & Henjewele, 2019; Sommerville et al., 2010; Tabassi et al., 2016). Nonetheless, project managers are still struggling to deliver sustainable buildings that meet government targets as they encounter many barriers to integrating sustainability during the design phase of building projects (Akadiri, 2015; Bon-Gang, 2018; Hwang & Ng, 2013; Kibert, 2016; Shari & Soebarto, 2012; Shi et al., 2013). This causes sustainability goals and ambitions to lose value during the design process as they become to be seen as "*nice to have*" and "*costly*" instead of a "*must need*", and focus continues to be put on the traditional criteria of delivering a project on time, within budget, and quality. For this reason, it is crucial for project managers to safeguard the value of sustainability within building projects through effective leadership and management.

Literature shows that effective leadership and management practices are needed to transform building projects towards sustainability. However, empirical studies supporting a relationship between project managers' leadership skills and sustainable building projects' success are limited (Bourne & Walker, 2004; Tabassi et al., 2016). This research aims to evaluate the aspects of leadership and management in sustainable building projects and understand how project managers can use their appointed position to influence the project team toward safeguarding sustainability goals and ambitions.

Problem Statement and Research Objective

In light of the consistent shortcomings of building projects to meet their sustainability goals and ambitions, due to projects often resorting back to traditional management practices that prioritize time, cost, and quality while neglecting the long-term environmental advantages of sustainable principles, it becomes crucial for project managers to prioritize sustainability objectives throughout the project. This is particularly important during the concept and definitive design stages, where approximately 80% of decisions are made (Kooter et al., 2021).

Therefore, this research aims to gain insight into the advances made toward sustainability in the building industry and how project managers can use their position as managers and leaders to influence project teams toward safeguarding sustainability. Hereby, studies on theory and practice are performed to respond to the research question:

How can project managers use their position to influence project teams toward safeguarding sustainability goals and ambitions during the design phase of building projects?

Research Method

The research adopts a thorough qualitative and exploratory approach, utilizing data gathered from theory and practice through literature study and multiple case study. The literature study establishes a theoretical background, which, in turn, informs the development of a conceptual framework that serves as the basis for this research. This framework highlights the crucial aspects pertaining to the project manager's role in safeguarding sustainability. Additionally, it provides guidance for the multiple case study conducted, which involves qualitative research interviews with design team members from the two selected case studies, enabling the retrieval of firsthand experiential data.

The Gioia method is employed in conjunction with flexible-pattern matching, guided by the theoretical background and conceptual framework to analyze the gathered data. This approach aids in analyzing

and interpreting the data to identify emerging patterns and themes from the qualitative research interviews. The qualitative analysis of the interviews is carried out using ATLAS.ti software, which assists in organizing the data into graphical structures. These structures illustrate the progression of the interview data, starting from raw data and evolving into concepts, themes, and aggregate dimensions.

Results and Discussion

The theoretical background revealed three critical aspects that pertain to the role of the project manager in safeguarding sustainability during the design phase, particularly in terms of their management and leadership roles. These three aspects encompass *authority*, *accountability*, and *affective influence*, to ensure the project's successful delivery on time, within budget, and to the desired quality standards determined by the client, including short- and long-term benefits associated with sustainability principles.

The three aspects are depicted in the conceptual framework in figure 1, called the *Sustainability Safeguarding Framework*, which provides a structured approach for analyzing the data gathered from multiple case studies and research discussions.

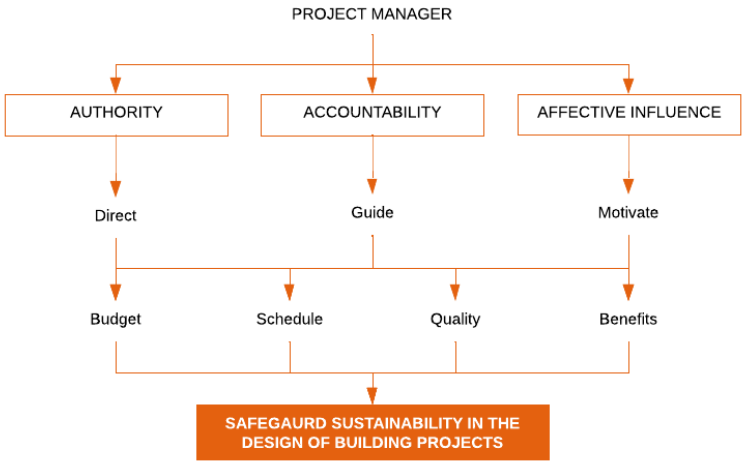

Figure 1: Conceptual framework: Sustainability Safeguarding Framework (own work)

In both cases, the project managers had an extent of *authority* during the project, as they used their power to steer toward the successful delivery of the project, on occasion resulting in making decisions at the expense of sustainability and involving experts on sustainability in the team to introduce and enthuse the client and design team members about sustainability. However, even with the involvement of such experts, the final decision often lies with the client and his priorities, exerting power over the level of sustainability to be incorporated into the project and the decisions to utilize GPR and BREEAM.

Opting for GPR and BREEAM, roles and responsibilities were divided among the design team member to achieve the minimum required GPR score and BREEM credits for the outstanding certification, making not the project manager but also the members of the design team *accountable* for the achievement. Throughout the design processes, the project managers, with the help of the sustainability experts, conducted routine checks and progress meetings to check whether the sustainability requirements were being met on the basis of documented proof submitted. In the case of A, it was exhibited that Project Manager A steered toward integrating and safeguarding sustainability, however, only to a certain extent. Caused by an insufficient understanding between the specialists, the sustainability advisors, and the generalists, the project managers, who needed to keep all aspects of the project in balance, sometimes at the expense of sustainability.

In both cases, affective influence was exhibited in promoting an integral design approach encouraging communication and collaboration, and teamwork and involving intrinsically motivated sustainability experts. On occasions hard in case A due to its inter-organizational structure, case B illustrated a pos-

itive example of affective influence by fostering informal relationships with the client and design team members, assembling the design team in a shared working space facilitated by the project manager.

The literature identifies four barriers contributing to the dilution of sustainability in building projects. In addition to the economic, technological, awareness, and managerial barriers, this research has identified two new barriers encountered by the design teams. The first one, identified in both cases A and B, concerns an unintended effect of using *Sustainability Assessment Tools and related subsidies*, which are currently perceived as drivers for sustainability in the building industry. The second barrier relates to the *organization*. The organizational barrier can be categorized into two types: the organizational structure of the design team and the sustainability background of the organization(s) involved. With respect to the former, case A illustrated that in inter-organizational structures, unintended hierarchical orders could emerge with power and position imbalance between various design team members, causing sustainability to lose value over other priorities.

Despite encountering barriers, both cases successfully safeguarded sustainability in their design processes. However, the research findings reveal that the focus on safeguarding sustainability primarily revolves around meeting the minimum sustainability requirements set by GPR and BREEAM, driven mainly by authority and accountability. Challenges arose when attempting to implement additional sustainability initiatives beyond the prescribed requirements of GPR and BREEAM. This trend was particularly evident in case A, where certain principles initially included in the conceptual design were intentionally diluted from the final design due to perceived financial burdens or a perceived lack of value in terms of subsidy eligibility.

During the discussion, a notable distinction emerged between safeguarding sustainability and actively promoting it. In Case B, the continuous promotion of sustainability, flexibility in target objectives using margins, and efforts to exert affective influence inspired the design team to explore alternative sustainability principles when initial ideas did not materialize as planned. As a result, they surpassed the required BREEAM threshold. This highlights the importance of consistently promoting sustainability throughout the design process, encouraging the design team to exceed predefined thresholds and incorporate sustainability principles that may not be fully captured or measured by assessment tools like GPR and BREEAM.

This emphasizes the importance of employing affective influence and continued promotion of sustainability in addition to authority and accountability. Additional sustainability principles can be incorporated by cultivating motivation and commitment among clients and design teams to exceed the thresholds. Therefore, continuous promotion is an essential factor toward successfully safeguarding sustainability.

Furthermore, in the theoretical background, Musawir et al. (2017) suggests the continuous alignment of the benefits envisioned in the project's goals and ambition by incorporating Benefit Management in project management. Benefit Management aims to measure the project's success based on strategic performance, including long-term sustainability impact and operational effectiveness, alongside the traditional short-term criteria of budget, schedule, and quality. While strong leadership and governance frameworks are crucial for effective Benefits Management, according to Musawir et al. (2017), the research lacks guidance on the associated leadership style or the use of affective influence.

The findings reveal that project managers with authentic and transformational leadership characteristics are well equipped to employ affective influence, which can prove beneficial in the management approach suggested by Musawir et al. (2017). Notably, the study uncovers a tendency for teams to prioritize immediate project outputs over long-term benefits once sustainability requirements are established. This indicates a lack of integration of Benefit Management in the examined cases, with GPR and BREEAM requirements treated as checklists.

Conclusion

Based on the results and discussion, in which similarities and distinctions between theory and practice are analyzed, it can be concluded that project managers employ *authority*, *accountability*, and *affective influence* during the project's planning and design. Furthermore, a strong interaction is observed between safeguarding and actively promoting sustainability, the latter being an essential factor toward successfully safeguarding sustainability.

Project managers can enhance their use of authority, accountability, and affective influence, to more effectively establish, safeguard and promote sustainability goals and ambitions. The following summary of conclusions and recommendations provides guidance on how project managers can use these aspects to influence design teams accordingly.

Project managers can use their *authority* to prioritize sustainability in the design team and among other stakeholders (f.i. clients, own organization, and others). Next, project managers should take *accountability* for sustainability (on top of other project responsibilities) and, by contractually organizing all sustainability goals and ambitions, the team's roles, responsibilities, and accountability. Lastly, employ *affective influence* – in good collaboration with sustainability advisors – to continuously promote and embed a sustainability mindset within the design team and other stakeholders. Affective influence also aims to cultivate ownership, motivation, enthusiasm, ambition, and social value within the design teams, ultimately establishing a positive work culture that actively promotes sustainability.

As in many things, a good beginning makes a good ending. The importance of well-defined sustainability goals and ambitions, including margins exceeding thresholds of sustainability assessment methods, a strong design team composition with appropriate roles for sustainability advisors/experts, and a clear organizational structure and communication lines at the start of the design phase are emphasized. The project manager should be given the opportunity and be supported to be influential in establishing this baseline for the project.

Within the project, sustainability is prioritized and should not be diluted by traditional management practices prioritizing time, cost, and quality. Being aware of the barriers, the project manager should closely cooperate with the sustainability advisors to promote and safeguard sustainability within the design and among stakeholders. The use of methods and tools, such as GPR, BREEAM, or others, are essential in monitoring project performance on sustainability. The established margins will contribute to successfully reaching goals and ambitions while offering the opportunity to enhance sustainability and add long-term life-cycle benefits to the building. It is essential to monitor and track sustainability performance throughout the design phase and implement regular progress assessments executed either in collaboration or by the sustainability advisors/experts.

Safeguarding sustainability goals and ambitions depend highly on the project managers and sustainability advisors/experts' ability to promote, influence, and embed strong sustainability values within the design team and create an environment of mutual trust, optimism, altruism, transparency, and openness, facilitating open communication, collaboration, and teamwork. For example, by co-location of the design team and organizing workshops and training sessions focused on sustainability, promoting knowledge sharing, and fostering a shared sense of purpose. Additionally, actively promoting the growth of sustainability strategy and culture within one's own organization can further support and reinforce a sustainability mindset across the organization, benefiting the underlying project and future company strategy and culture.

Whether by employing authority, accountability, or affective influence, the design team, stakeholders, and the project will benefit from implementing the above throughout the design phase. The conceptual framework, also known as *Sustainability Safeguarding Framework*, developed in this research can be used as guidance in their preparation and management of the design phase to safeguard and continuously promote sustainability.

With these conclusions and recommendations, this research provides project managers with greater insight and understanding of their influence on design teams and other stakeholders and their ability to successfully cope with the uncertainty and complexity of integrating and safeguarding sustainability goals and ambitions in project planning and design.

Recommendations for Future Academic Research and Limitations

The following recommendations can be given for future academic research based on the findings.

- An exciting avenue for future research would involve exploring the management framework proposed in this research and its potential use by project managers seeking to enhance their management and leadership capabilities and influence in integrating and safeguarding sustainability goals and aspirations in construction projects.

- Also, it could be interesting to research how to incorporate a more formal role of authority in the project organizational structure for a sustainability advisor, alongside or within the core team of the project manager, from concept to delivery. This supports the integration of sustainability and its accompanying benefits alongside cost, time, and quality within the context of the Iron Triangle. Alternatively, the same could be explored for an integrality manager with a strong sustainability background. In a more complex building environment, with the incorporation of increasing demand for sustainability, such a role could be very beneficial. In other fields of engineering, such a role is given to systems engineers; an authority accountable for managing the complexities of multidisciplinary projects and systems of systems.
- This research highlights that employing affective influence by harnessing emotion and fostering informal relationships can be advantageous in establishing a secure atmosphere of mutual trust, optimism, sympathy, altruism, transparency, and openness that is conducive to promoting sustainable practices. Consequently, it is suggested that future work on this framework should expand upon the concept of affective influence, explore and identify methods aimed at emotional involvement and the cultivation of informal relationships. Especially focusing on how such methods can be applied to strengthen collaboration and teamwork in inter-organizational design teams.
- Moreover, it should be noted that the scope of this research was restricted to just two case studies, each featuring participants from Arcadis, a company known for its strong focus on sustainability. As such, it is recommended that further research should be conducted across a more diverse range of projects, including those undertaken by organizations with lower levels of sustainability strategy and culture. This approach could potentially lead to a greater understanding of the barriers that exist in relation to sustainable practices.
- Finally, this research revealed two previously unidentified barriers related to the organizational structures of design teams and sustainability assessment methods and related financial benefits; subsidies. Although the latter is widely regarded as drivers of progress, they can inadvertently limit projects from surpassing the certification thresholds and reaching more long-term benefits. Therefore, it is recommended that future research focus on gaining a deeper understanding of these tools and exploring potential strategies for modifying them to promote higher levels of sustainability by, for instance, encouraging the use or formally incorporating sustainability margins, or awarding exceeding thresholds by a progressive subsidy scheme. Also, subject tools could be continuously adapted to the latest state-of-the-art sustainability practices and innovations, including those providing long-term lifecycle benefits.

The following three limitations were encountered in this research:

- The research had *limited scope* as two buildings were analyzed in the multiple case study, which also limited the number of practitioners interviewed and the available perspectives. While the results may not be generalized, the detailed examination of the two case studies offers a nuanced understanding of the factors that contribute to project success. Thus, despite the limited scope, the research allowed for an in-depth analysis of the management and leadership aspects that impact the success of sustainable building projects, providing valuable insights and recommendations for project managers in the building industry.
- *Language barriers* became a significant issue during data gathering and analysis as the research was written in English, whereas the interviews were conducted in Dutch. Translating spoken Dutch into written English hindered the analysis process, and imprecise word usage in Dutch further complicated matters. The validity of the research findings may have been somewhat influenced due to possible inconsistencies, interpretations, and evaluations resulting from the translation. Subtle nuances in Dutch might have been overlooked or not fully captured, impacting the interpretation and analysis of the results.
- The occurrence of *interviewee biases* resulted in the subjectivity of the data collected being problematic at times, reducing the data's quality and the likelihood of obtaining critical findings as it had to be excluded due to sensitivity. Furthermore, the possibility of *researcher bias* wherein the researcher's biased perspectives influence observations within the studied setting. This was limited by interrogating the relationship with literature and transcript validation by the interviewees.

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Nomenclature

Abbreviations

Abbreviation	Definition
APM	Association of Project Management
BREEAM	Building Research Establishment Assessment Method
COP	Conference of Parties
CO2	Carbon dioxide
EU	European Union
GBCT	Global Buildings Climate Tracker
GHG	Green House Gases
GPR	Gemeentelijke Praktijk Richtlijn,in English, the Municipal Practice Guideline
IPM	Institute of Project Management
IEQ	Indoor environmental quality
MEP	mechanical, electrical, and plumbing
KPI	Key Performance Indicator
NDC	Nationally Determined Contribution
PM	Project Manager
ROI	Return on Investment
TBL	Triple Bottom Line
TU Delft	Delft University of Technology

1

Introduction

This master focuses on understanding project managers' ability to influence project teams toward safeguarding sustainability goals and ambitions during the design phase of a building project.

First, this chapter introduces the motivation of the research and defines the research subject matter, objectives, and research questions of this research. Section 1.1 is a review of literature on sustainability in the built environment and project managers' role in this. Section 1.2 formulates an identified problem, followed by Sections 1.3 and 1.4 that present the research objectives and research questions, respectively. Section 1.5 establishes the practical and theoretical relevance of the research in the building industry. Finally, Section 1.6 provides an overview of the research outline and design.

1.1. Review of Literature

Over recent years, sustainability has become an important topic in the agendas of every industry. Especially, in the construction industry, it is increasingly recognized as a vital component of building projects. The literature confirms that building projects consume a significant amount of energy and natural resources throughout the entire life cycle from construction to disposal. Beside the consumption of energy and resources, buildings also generate waste on a large scale—waste build-up during the construction of buildings and during the on-going operations of buildings. According to the Global Alliance for Building and Construction and United Nations Environment Programme (2021), overall, buildings account for 34 percent of global energy demand and 37 percent of energy-related CO2 emissions in 2021. Illustrated in figures 1.1 and 1.2. In the Netherlands alone, the built environment is responsible for nearly 40 percent of the energy consumption and almost a third of the CO2 emissions.

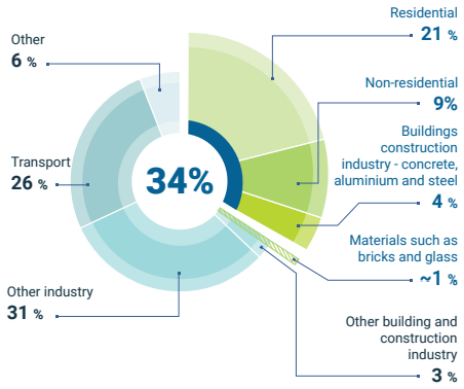

Figure 1.1: Share of buildings in total final energy consumption in 2021 (United Nations Environment Programme, 2022)

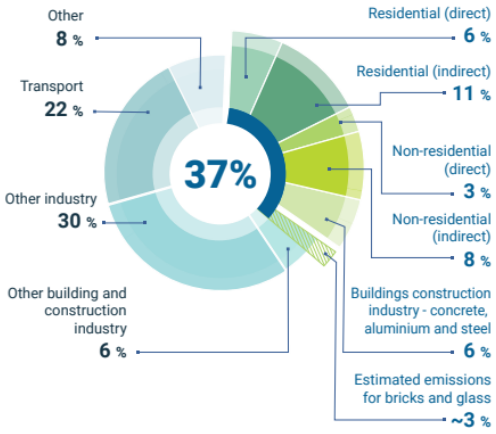

Figure 1.2: Share of buildings in global energy and process emissions in 2021 (United Nations Environment Programme, 2022)

To minimize these numbers and meet the Paris Agreement, Global Alliance for Building and Construction and United Nations Environment Programme (2021) states that the global buildings and construction sector must almost entirely decarbonize by 2050. According to the *2021 Global Status Report for Building and Construction* published by Global Alliance for Building and Construction and United Nations Environment Programme (2021), this is only achievable when building emissions are reduced along the entire life cycle of buildings through a combination of reducing energy demand (tackling behavior change and energy efficiency), decarbonizing the power supply (e.g., electrification through renewable sources and increased use of other zero-carbon heating technologies) and addressing embodied carbon stored in building materials. Additionally, emissions from materials and construction processes must be urgently addressed to ensure that the buildings being built today are optimized for low-carbon solutions across the entire life cycle. This involves maximizing the refurbishment of existing buildings, evaluating each design choice using a whole life-cycle approach, and seeking to minimize upfront carbon impacts (for example; lean construction, low-carbon materials, and construction processes), as well as taking steps to avoid future embodied carbon during and at the end of life (for example; maximize the potential for renovation, future adaptation and circularity). Decarbonizing the building industry is not only critical to delivering these emission cuts for addressing the crisis of climate change; in addition, it addresses the reduction of waste and pollution, protecting nature and biodiversity (United Nations Environment Programme, 2022).

To achieve this, the building and construction industry has been searching for ways to conserve energy, water usage, and natural resources through reuse, recycling, innovative design, and minimizing waste and pollution (Lima et al., 2021), resulting in the emergence of numerous new sustainable designs strategies, concepts, technologies, and materials. Buildings are to be designed responsibly with adaptability in mind, with reduced emissions, maximized energy efficiency, climate resilience, and flexibility over the long term. Furthermore, ideally, with the aim to positively contribute to biodiversity and ecology in the built environment.

The process of adopting sustainability in design concepts, technologies, materials, and strategies is called *sustainable design and construction*. Bajjou et al. (2017) defines *sustainable construction* as the industry that ensures the conservation of natural resources throughout the life cycle of the building (energy, water, non-renewable materials), optimizing the consumption of raw materials in order to reduce the deterioration of the environment and to ensure social and economic comfort. He also explains that a sustainable and ecological construction project must take the objectives of sustainable development into account at every stage of decisions: design, construction, use/operation, and demolition after use. This refers to the term circularity (Bajjou et al., 2017). While Asif et al. (2007) suggest that to achieve a sustainable future in the building industry, it is required to adopt a multi-disciplinary approach covering several features such as energy saving, improved use of materials, reuse and recycling, and emissions control.

More and more practitioners in the building industry are starting to see the impact that building activities have on the environment and now understand the importance of sustainable design and construction. More and more building projects include sustainability in the ambitions and objectives to reduce emissions, maximize energy efficiency, and built climate-resilient and flexible buildings over the long term. Nationally Determined Contributions (NDCs) help guide the building industry toward setting ambitious sustainability goals in project requirements. NDCs are national plans highlighting climate change mitigation, including climate-related targets for greenhouse gas emission reductions. These plans also include policies and measures that governments implement in response to climate change as a contribution to achieving the global targets set out in the Paris Agreement, such as adhering to and developing new building codes (United Nations Environment Programme, 2022).

With the introduction of sustainability in the building industry, environmental assessment methods and certifications have also been developed and introduced to examine the environmental performances of buildings. Examples of such assessment methods are the Building Research Establishment Assessment Method (BREEAM) and the Gemeentelijke Praktijk Richtlijn (GPR). These assessment methods use a list of criteria that are ranked against environmental performance to evaluate appropriately the degree to which the assessed building is sustainable (Ershadi & Goodarzi, 2021). Many advocate such environmental assessment tools, as it encourages project owners, architects, and engineers involved in a building project to set high sustainability goals and ambitions.

Despite 2021 having seen a growing number of countries committing to energy efficiency and the guidance of climate regulations for this industry set out by NDCs under the Paris Agreement in 2015, many building construction projects fall short to the level of ambition to drive the required — and achievable — performance levels that are needed for the transformation toward zero-emission, efficient, and resilient buildings (Accelerating Deep Collaboration: 26 Built Environment Climate Action Initiatives Announced at COP26, n.d.). As the Global Buildings Climate Tracker (GBCT) still indicates that the buildings and construction sector remains off track to achieve decarbonization by 2050, see figure 1.3. The GBCT is a seven-part composite index that uses a set of indicators – covering emissions, energy intensity, investments, and policy – to identify global trends in decarbonization action and impacts (United Nations Environment Programme, 2022).

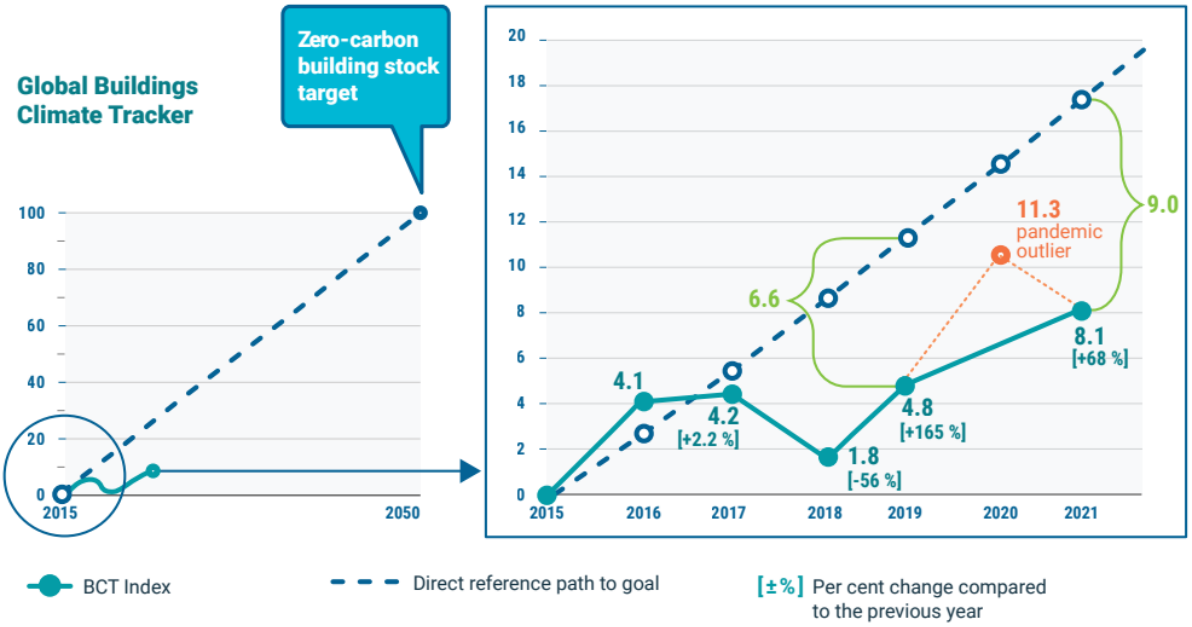

Figure 1.3: Direct reference path to a zero-carbon building stock target in 2050 (left); the period between 2015 and 2021, comparing the observed Global Buildings Climate Tracker to the reference path (right) (United Nations Environment Programme, 2022)

Although the task of setting standards for sustainable development, particularly in the building industry, typically lies with the scientific, governmental, corporate, and nongovernmental communities, the responsibility for guaranteeing sustainable building construction may fall on the part of project managers on the building industry (Tabassi et al., 2016). During the opening keynote presentation of the 2008 World Congress of the International Project Management Association (IPMA), this was asserted also by the former IPMA Vice-President Mary McKinlym, calling upon the project management profession to "*take responsibility for sustainability*" (McKinlay, 2008), as the consideration of the principles of sustainability in project management was still in its infancy. Especially, as appointed responsible for delivering building project(Sommerville et al., 2010; Tabassi et al., 2016), project managers can lead building projects and have the mandate and authority to direct, guide and motivate the project team (Fewings & Henjewele, 2019). Plus, project managers have the ability to lead and influence project teams and its client toward integrating sustainability.

Nonetheless, project managers are still struggling to deliver buildings that meet the sustainability targets required to meet the Paris Agreement. Research shows that project managers, and project teams, encounter many barriers to integrating sustainability in building projects, consequently leading to the dilution of sustainability goals and ambitions during the design phase of building projects. These barriers can be classified into four fundamental aspects: economics, technology, awareness, and management (Akadiri, 2015; Bon-Gang, 2018; Hwang & Ng, 2013; Kibert, 2016; Shari & Soebarto, 2012; Shi et al., 2013).

Since building projects are already associated with unknowns, complexity, and uncertainty, the inte-

gration of sustainability requirements creates an even more challenging environment for leadership. In this context, a need for evolving effective leadership and management practices is particularly apparent within larger sustainable development projects. Broman et al. (2013) stressed the need for transformative changes and leaders toward sustainable societies in their *'call-for-papers'* (CfPs) for a *Special Volume of the Journal of Cleaner Production* that focuses on what type of research is needed to make the necessary local, regional, national, and global changes regarding environmental sustainability (Broman et al., 2013; Tabassi et al., 2016). The CfPs asks for coordinated solutions for sustainability that require cohesive and functional leadership and actions across disciplines, organizations, sectors, and countries, thus including the building sector. According to (Tabassi et al., 2016), in sustainable construction development, a leader, by his leadership style and the way of managing the project, can transform the project toward sustainability, as well as the subordinates.

Although project managers and their leadership style have proven to be vital for the success of projects (Bourne & Walker, 2004; Tabassi et al., 2016), there are not enough empirical studies to support a relationship between project manager's leadership skills and qualities with the overall success of *sustainable building projects*. Therefore, it is essential to evaluate aspects of management and leadership in terms and understand how project managers can influence the project team in safeguarding sustainability goals and ambitions in building projects.

1.2. Problem Definition

As described in the previous section, sustainability goals and ambitions tend to be diluted with the appearance of economic, technology, awareness, and management barriers (Akadiri, 2015; Bon-Gang, 2018; Shari & Soebarto, 2012; Shi et al., 2013). Especially during the design phase in which the goals and ambitions, including those focusing on sustainability, are translated into the final design. During this phase, sustainability goals and ambitions tend to lose value in the process as they become to be seen as "*nice to have*" instead of a "*must need*". Since 80% of the choices are made during the phases in which the concept and definitive designs are made (Kooter et al., 2021), it is crucial for project managers to safeguard the value of sustainability goals and ambitions within the project team and with the client and design team of the building project, through effective leadership besides management.

Another reason for the losing value of sustainability goals and ambitions is that project managers tend to rely more on their managerial role rather than their leadership role, and, therefore, focus more on traditional success criteria. Traditional project management emphasizes pragmatic principles that focus on *"getting the job done"* within the triangle of time, cost, and quality (Dvir et al., 2006). Also known as the Iron Triangle (Atkinson, 1999). The emphasis on cost, time, and quality causes other project goals and ambitions to lose value, such as sustainability. It hinders their translation into the final design of new building projects, even though sustainability goals and ambitions have significant environmental, economic, and social benefits when implemented for the owner/client, its occupants, and society. Summarizing the literature review, the problem statement can thus be defined as:

"*Building projects continue to fail in meeting their sustainability goals and ambitions, tending to fall back on the traditional success criteria of management- time, cost, and quality, thus ignoring the benefits that come with the implementation of sustainable principles toward protecting the environment.*"

1.3. Research Objectives

As the appointed leaders of building projects, project managers are accountable and responsible for delivering a project safely, on time, within budget, and to the desired quality standards determined by the client (Sommerville et al., 2010; Tabassi et al., 2016). However, nowadays, this must also include sustainability. As leaders of the team, project managers also have the ability to transform, in other words, influence, the project team and client; they should also be able to influence the project team toward prioritizing sustainability in their projects. Nonetheless, they still struggle to deliver buildings that meet sustainability targets, which may be caused by their continuing focus on time, budget, and quality (Dvir et al., 2006).

To better understand the role of the project manager and their focus in building projects and their ability to influence the project team and the client toward not only integrating sustainability into the goals and ambitions of the building project but also safeguarding these in the design phase. This is done by investigating different themes related to project managers' managerial and leadership roles and how these can be utilized to influence project teams, in theory. Based on relevant theories and literature on the project managers' roles, a conceptual framework is established to help investigate this in practice and the advancements made by project managers in prioritizing sustainability besides time, cost, and quality, and barriers they still encounter by means of an empirical study. Therefore, the following research objective is formed:

"*Create insight into the advances made toward sustainability in the built environment and how project managers can use their position as managers and leaders to influence project teams toward safeguarding sustainability. Hereby developing a conceptual framework to facilitate project managers in this process based on literature and practice to ensure the successful delivery of sustainable buildings.*"

The final objective of this research is also to give recommendations on how project managers can use their position as managers and leaders of the projects to influence results based on the established framework. Results that ensure all goals and ambitions, including those related to sustainability, are met in the design phase and when the project is delivered. Therefore, improving sustainable project success in the building industry and combating the adverse effects this industry has on the environment.

1.4. Research Questions

To achieve the research objective and solve the problem introduced in Section 1.2, the main research question can be formulated as follows:

How can project managers use their position to influence project teams toward safeguarding sustainability goals and ambitions during the design phase of building projects?

To comprehensively answer the main research question, several sub-questions are formulated. The main research question is answered by answering the sub-questions The four sub-questions are listed:

1. *Why do sustainability goals and ambitions dilute during the design phase of building projects?*
2. *What is the project manager's role in sustainable building projects?*
3. *What similarities and distinctions can be observed between the theory and practice of diluting sustainability goals and ambitions during the design phase of building projects, and how does the project manager play a role in preventing this?*
4. *How can project managers strengthen their influencing abilities during the design phase to safeguard sustainability goals and ambitions of building projects?*

1.5. Research Relevance

The objective of this research is motivated by problems observed in literature and the lack of literature toward resolving the defined problem. There is still a lack of sufficient evidence on the project manager's leadership skills and qualities, measured against the success criteria in sustainable building projects and the project manager's ability to use these to influence teams. This research fills this gap.

1.5.1. Scientific Relevance

Over recent years numerous studies have been published on the integration of sustainability in project management practices. Sustainability has impacted project management practices over the last two decades by shifting the project scope and paradigms and the mindset of the project managers (Silvius & Schipper, 2014). Nonetheless, project managers still struggle to deliver buildings that meet all their defined sustainability goals and ambitions. More research still needs to be conducted to better safeguard such goals and ambitions in future building projects. Previous research also suggested that the

current standards for project management fail to seriously address the sustainability issues or equip project managers with the managerial and leadership skills and qualities necessary for them to integrate sustainability principles into project planning and operations (Silvius & Schipper, 2014).

For this reason, this research creates a link between project management practices and sustainability in the building industry to their leadership role in orientating the project as well as the project team toward sustainability goals and ambitions. The research contributes to scientific knowledge in specific aspects as:

- It analyses literature with respect to project managers' management and leadership roles that are important to develop and use at their full potential for steering building projects toward achieving their sustainability goals and ambitions.
- It provides empirical evidence on management and leadership practices and influencing methods currently used during the design phase facilitating the realization of sustainability goals and ambitions in building projects.
- It addresses reasoning as to why sustainability goals and ambitions are diluted during the design process.
- It enhances existing research on project managers' ability to influence the project team, and client, toward sustainability with the findings of the comprehensive literature review and validating this in practice.

1.5.2. Practical Relevance

The transition from conventional to sustainable buildings has proven hard in the building industry. Especially project managers have a hard time managing the building project teams, and clients, toward incorporating sustainable design and construction principles in their projects. Primarily due to the complexity and uncertainty that comes along with sustainability principles, but also due to barriers to which they are confronted.

Therefore, this research can provide a greater understanding and insight for managers with greater insight and understanding of their influence on design teams and other stakeholders and their ability to successfully cope with the uncertainty and complexity of integrating and safeguarding sustainability goals and ambitions in project planning and design.

Even though this research was based on a qualitative method utilizing a literature study and interviews, which limited its statistical generalization, the results are conclusive and logical as they were based on projects in practice.

1.6. Research Design and Outline

The research has an in-depth, qualitative, and exploratory research approach. The chapters of the research are divided into four phases and are included in the research outline illustrated in figure 1.4.

Chapter 2, **Research Method**, outlines the research methods used in conducting the literature study for developing the theoretical background, which serves as the foundation of this research, as well as the methods used to gather, process and analyze the data required for the empirical component of this research. The grounded method of Gioia et al. (2013) was selected in conjunction with flexible-pattern matching, noted by Bouncken et al. (2021), to analyze and interpret the data gathered. This chapter also includes the selection process of the case studies and the interviewees. This chapter concludes phase I of this research, which consists of the research preparations.

Chapter 3, **Theoretical Background**, discusses the topics of sustainability in the built environment, the planning and design phase of building projects, and the project managers' management and leadership roles in building projects. A conceptual framework is established by gathering and analyzing relevant theories and literature on these topics. This chapter represents phase II, which established the foundation of the research and helped set-up the interview questionnaire for the empirical component in phase III.

Chapter 4, **Empirical Research and Results**, contains the data results. The data was gathered through semi-structured qualitative interviews conducted by design team members of the selected case studies; Section 2 further elaborates on the data-gathering process. This chapter briefly describes the selected cases, followed by the results using a structure based on identified themes and trends related to the researched topic. This is phase III of the research, the empirical component of the research in which insight and experiences are gathered from practitioners in the building industry by means of a multiple case study.

Finally, phase IV completes the research and consists of chapters 5 and 6.

Chapter 5, **Discussion**, the similarities and distinctions between the theoretical background and the empirical research results are identified, analyzed, and discussed.

Chapter 6, **Conclusion**, summarizes the research findings, and answers the research questions established in the introduction. The study's limitations are discussed, and recommendations for further research are given. The conclusion provides practical implications for project managers in the design phase of building projects engaging in sustainability and design teams to ensure successful delivery.

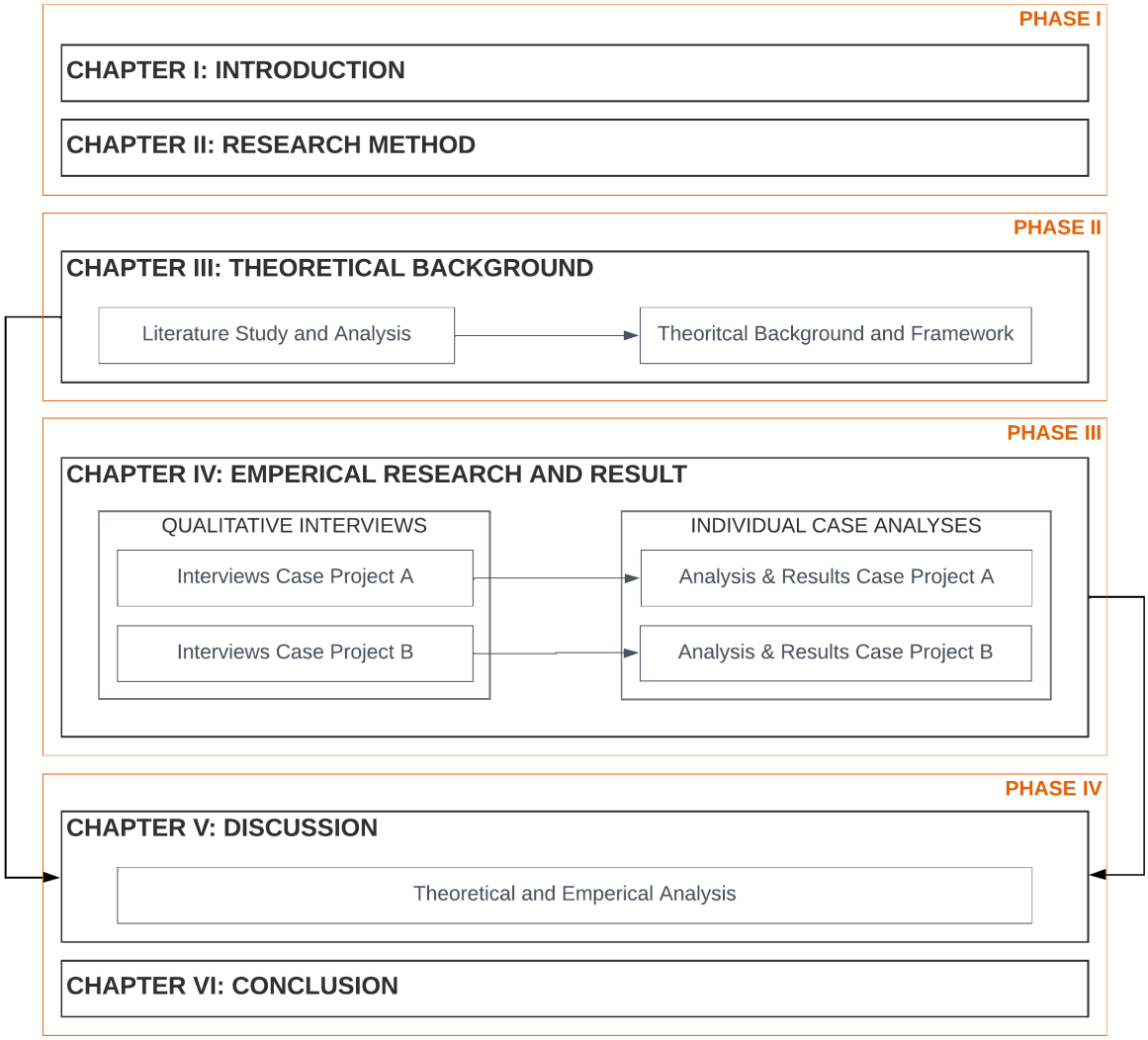

Figure 1.4: Research outline (own work)

2

Research Method

Qualitative empirical research is conducted to answer the main research question and the related sub-questions. Fellows and Liu (2015) described qualitative research as descriptive and focuses on the knowledge which can be gathered through people, reference projects, and literature. The beliefs, understandings, opinions, views, and so on of people are investigated in qualitative research. Thus, the data gathered and analyzed may be unstructured, at least in their "*raw*" form, but tend to be detailed, and hence 'rich' in content and scope (Fellows & Liu, 2015). Furthermore, in qualitative research, the subject is explored, sometimes without prior formulations. The object of qualitative research is to gain understanding and collect information and data such that theories will emerge, and so, tends to be exploratory as exemplified in grounded theory; Glaser and Strauss (2017) (Fellows & Liu, 2015). As the integration of sustainability is still relatively new to building project management and not always successfully integrated into building projects, this qualitative research is predominantly exploratory.

This chapter outlines the research methodologies pursued in this qualitative research and the approaches used to gather the data from theory and literature, reference projects, and people's knowledge and experience (Fellows & Liu, 2015). Section 2.1 initiates with a description of the literature review conducted to establish the theoretical background, which serves as the foundation of this research and provides insights into critical subjects such as building projects, sustainability, project management, project managers' managerial and leadership roles, and competencies. Subsequently, Section 2.2 discusses the empirical component, which concerns knowledge gained through the experience of practitioners in the building industry (Fellows & Liu, 2015), and in this research, gained by means of a multiple case study. Section 2.3 details the methods and tools employed to collect data for the theoretical background and multiple case analysis. Finally, Section 2.4 elaborates on the methods employed during and after the data-gathering process.

2.1. Theoretical Background

Fink (1998) describes a literature study as a systematic, explicit, and reproducible design for identifying, evaluating, and interpreting the existing body of recorded documents. In this research, a literature study is conducted to establish what research has been previously conducted and identify, evaluate, and interpret insightful information about the research topic and problem. Besides collecting information, the literature study helps establish the theoretical background and accompanying conceptual framework, which serves as the foundation for this research. The theoretical background is necessary to understand the foundation of project management principles and practices and how these have changed over the past two decades with the introduction of sustainability, in addition to leadership. The following topics were analyzed during the literature study for the theoretical background:

- Sustainability in Building Project
- The Planning and Design Phase of Building Project
- The Project Manager's Management and Leadership Roles

The first searches used for the literature study were *sustainability in building projects*, how the introduction of sustainability has affected practices in the built environment, and the barriers project managers still face when incorporating sustainability. Next, literature on *the planning and design phase in building projects* was analyzed to understand the importance of this phase in setting project goals and ambitions. Followed by a study on *the project manager's management and leadership roles* for which first, the changes in traditional project management practice led by the introduction of current-day challenges, such as the introduction of sustainability in the building industry, are identified, evaluated, and interpreted. To help understand the project manager's roles in a building project and their ability to influence their design teams to accomplish more demanding and more challenging organizational and project goals with the introduction of sustainability in building projects (Anantatmula, 2010; Latiffi & Zulkiffli, 2021).

As described in Section 1.6, the Gioia method is used in conjunction with flexible-pattern matching to guide the analysis and interpretation of the gathered data. These patterns are derived from the theoretical background and conceptual framework and will help structure the multiple case analysis, as noted by (Bouncken et al., 2021).

2.2. Multiple Case Study

The empirical component of this research consists of a multiple case study. Case studies are a research method that enables in-depth investigation of particular instances within a research subject (Fellows & Liu, 2015). This method can involve various data collection techniques, including qualitative interviewing, to gather rich and detailed data. The aim of case studies is to gain a deeper understanding of a research subject and potentially discover new theoretical insights.

Whilst a single case study needs only to focus on one case, multiple case studies compare at least two cases in one study to generate a still broader appreciation of the research topic. A multiple case study is also beneficial for establishing generalizations and identifying patterns across different cases (Eisenhardt, 1989; Yin, 2009). Moreover, Yin (2009) described that multiple case studies involve in-depth exploration of similarities and differences between cases with a view to supporting empirical generalizability and predictions made from theory. For this reason, a multiple case study is utilized in this research by means of semi-structured qualitative interviews to gather data, further elaborated on in Section 2.3. Thus, the multiple-case strategy allows this research to empirically analyze sustainability and project management in several building projects in an in-depth and contextualized way, as well as compare cases and map emerging patterns between the selected cases that represent the project manager's role and responsibilities in integrating and safeguarding sustainability in building projects. However, the cases should be carefully selected and replicate each other precisely or systematically to enhance the research's validity (Fellows & Liu, 2015; Yin, 2009), Section 2.3.4 elaborates on this more thoroughly.

The multiple case study is based on multiple sources of information listed below, but more thoroughly elaborate in Section 2.3.

1. Desk research on material published in reports and similar documents that are made available for this research.
2. Exploratory interviews followed by semi-structured qualitative interviews with practitioners of the cases studied.

The interviews are conducted to gather additional qualitative data on the integration, barriers and safeguarding of sustainability in the design phase of building projects, plus project managers' management and leadership roles and their influence in practice. The data obtained from these interviews is based on experiences from project managers, sustainability advisors, or other involved roles. The selection of the interviewees is described in Section 2.3.4 .

The theoretical background and framework developed in the first phase of the research will be tested and validated by analyzing and comparing the experienced-based data from the two case studies.

2.2.1. Case Selection

To gain empirical evidence, two building projects are selected for the multi-case analysis to provide a deeper understanding of the topics researched. Yin (2009) and Fellows and Liu (2015) describe that the cases should be carefully selected and replicate each other precisely or systematically to enhance the research's validity as well as the possibility of comparison. For this reason, four criteria were used for the selection of the cases:

1. **A building project that includes sustainability principles:** As this research focuses on preventing dilution and safeguarding sustainability goals and ambitions, it is essential that the selected projects have sustainable goals and ambitions. Thus, distinguishing the project from conventional building projects.
2. **A completed building project:** The selected project must be completed as it needs to exhibit a reduction in the sustainability goals and ambitions during the design phase. This is necessary to enable reflection on the design phase processes that contributed to the dilution of these goals and ambitions.
3. **A building in the process of being designed (in the design phase):** The selected project may also be in the design phase as the research focuses on the design phase. Team members may not recall all factors that led to the dilution of goals after completion. Thus, it may be relevant to consider ongoing experiences to understand and analyze the circumstances in design teams. However, when selecting a project in the design phase, the project must already show difficulties in translating sustainability goals and ambitions into the final design.
4. **A building project with the possibility to interview the project manager:** As this research focuses on project management, it is essential that the project manager can be interviewed. Arcadis undertakes many projects with-in house project management. However, they also participate in inter-organizational projects, which involve two or more organizational actors from distinct organizations working jointly to create a building (Jones & Lichtenstein, 2008). In such projects, the client can for example, appoint an external project management firm to manage the project. If this is the case, it should also be ensured that the external parties can be interviewed.

Based on the four selection criteria, two projects (cases) were selected in collaboration with Arcadis Nederland B.V. through desk research and exploratory interviews within the Arcadis organization. In both projects, Arcadis is part of the design team in different ways; this helped to facilitate the setup and completion of the interviews for data-gathering.

1. **Case A**: A completed commercial building where people gather to engage in various forms of entertainment and activities by an inter-organizational design team in which Arcadis carries out various advisory roles, including sustainability. In this project, project management was outsourced by the client to a project management firm.
2. **Case B**: A completed logistics building where processes converge around receiving and shipping goods, including food products such as fresh vegetables, bread, and meat, carried out based on a turn-key contract with Arcadis, including project management.

2.3. Data Gathering

This section gives an overview of the different methods of data gathering and analysis used for this research.

2.3.1. Literature Study

The data gathering for the theoretical background of this research is primarily focused on reviewing and analyzing existing literature and research on this topic. This process involves collecting and analyzing data from academic journals, books, research reports, and other relevant resources retrieved from online databases and libraries such as Google Scholar, Elseviers' ScienceDirect, and university libraries, including the one of the Delft University of Technologies. Sources frequently used are *The International*

Journal of Project Management (IJPM), *The Project Management Journal* (PMJ), and T*he Journal on Renewable and Sustainable Energy Reviews*.

Even though sustainability is a new concept in project management practices, much research on this subject has been conducted and published. Research by Sabini et al. (2019), shows that in the period between 1993 and 2017 already 770 items have been published reviewing sustainability and project management. Therefore, it is important to use good filters when gathering literature that meets the research scope. Examples of applied filters are the construction industry, building projects, green buildings, sustainability, sustainable construction, sustainable goals and ambitions, green building technologies, project management, the Iron Triangle, leadership, influence, communication, and teamwork and collaboration.

Throughout and after the data-gathering process, the quality and relevance of the identified data are evaluated, critically analyzing the information to identify key concepts and themes relevant to the research subject. The process involves synthesizing information from multiple sources to develop a comprehensive understanding of the topic and identify gaps or limitations in existing theory. Ultimately, enough information was gathered to develop the theoretical background to formulate a conceptual framework that substantiates this empirical research and addresses the research questions.

2.3.2. Exploratory Interviews

Exploratory interviews were conducted to develop ideas for the research. In addition, the interviews served as a place to explore possible ways of gathering relevant data for the theoretical background as well as supporting the case study selection and accompanying interviews.

These interviews used an informal and unstructured format to allow for the brainstorming of ideas. The interviews can be characterized as "*kennismakingsge- sprek*", which in English translates to an "*introductory interview*".

The exploratory interviews were conducted with various people within the building industry. The interviewees were mainly from Arcadis Nederland B.V.

2.3.3. Desk Research

Desk research refers to secondary data that can be collected without fieldwork, such as published reports and statistics collected from internal sources, the internet, libraries, trade associations, government agencies, and published reports (Hague, 2006).

Arcadis Nederland B.V. serves as an internal source and provided documentation contributing to a clear picture of the two cases. Documentation included, for instance, the program of requirements, progress reports, and proposals on sustainability. These materials give insights into requested and defined sustainability goals, ambitions, and management aspects such as organizational structures.

2.3.4. Qualitative Research-Interviews

Qualitative research interviews are also referred to as intensive or in-depth interviews. The primary goal of an in-depth interview is to hear what respondents think is important about the topic at hand and to hear it in their own words (DeCarlo, 2018). In this case, the focus is on gathering the experiences and interpretations of the respondents on the topic of sustainability integration in building projects and how this was or was not properly managed and safeguarded throughout the design process. The interviews help summarize and understand the drivers and barriers of sustainability and allow for comparison between cases, which is needed to provide recommendations for this research.

Qualitative research interviews are considered semi-structured, which is neither a free conversation nor a highly structured questionnaire. The researcher has a particular topic for the respondent, but questions are open-ended and may not be asked in the exact same way or order to each respondent (DeCarlo, 2018). The approach combines a pre-determined set of open questions that encourage conversation with the ability for the interviewer to explore particular topics or responses further (Knowledge Learning Skills Best Practice Researchers' Alliance, 2018). Open-ended questions are questions

that a researcher asks but without providing answer options for it. These types of questions are more demanding of participants than closed-ended questions, for they require participants to come up with their own words, phrases, or sentences to respond (DeCarlo, 2018). Thus, the approach combines a pre-determined set of open questions (questions that encourage conversation) with the ability for the interviewer to explore particular topics or responses further.

To ensure that all pre-determined questions are asked during the interview, an interview protocol is constructed beforehand, including the list of topics and accompanying questions. The interview protocol, i.e., the questionnaire, is structured based on the patterns found in the theoretical background of sustainability and the project managers' management and leadership roles in building projects, and the conceptual framework, as noted by Bouncken et al. (2021).

While the interview protocol outlines pre-determined questions, the interview itself is driven by the interviewee. As a result, not all questions are addressed during the interviews, and the questions may evolve throughout the research process. This aligns with the Gioia method, as Gioia et al. (2013) states, "*we follow wherever the informants lead us in the investigation of our guiding research question.*" The interview protocol presented in Appendix A.2 is thus a summary of the questions that have been most frequently answered during the interview process; it does not provide an exact representation of the questions asked. This approach enables the discovery of new, unexpected patterns that were not previously identified in the literature or anticipated to be significant in this research, as asserted by Gioia et al. (2013).

The interviews are conducted in a hybrid manner, depending on the interviewees' preferences. However, most interviews are conducted online via digital platforms such as Teams. To collect and maintain the information, audio recordings are made during the interviews, which are later transcribed in order to analyze the research. The interview transcripts are sent back to the interviews to verify the statements made during the interview. This is formalized y means of an interview consent form which is provided to the interviewees before the interview.

The interview consent addresses the interview procedures and the use of the information derived from the interview. The consent form is provided in the Appendix Section A.3.

The interview consent form validates the interviewees' voluntary participation and that the interviewees are aware of how the retrieved information will be used and stored, and that the research will be published publicly on the educational repository of the Delft University of Technology. Furthermore, it informs the interviewees that the interviews will be recorded and stored for the purpose of this research. Lastly, the consent form also notes that the case study will be made anonymous and that information that may lead to the identification of the case study will not be used or will be disguised in the research if interviewees indicate that this is not allowed due to privacy reasons of the case project.

Interviewee Selection

For the purpose of this research, it was decided to interview project managers and other members of the design teams, including, for example, architects and sustainability advisors. By interviewing the other design team members, it was possible to ascertain how others perceived the project managers and their roles during the design process: attaining multiple perspectives on the topic helps to understand project managers' management and leadership roles in safeguarding sustainability.

Additionally, the research findings become more valid, reliable, and representative by considering multiple perspectives. Moreover, conducting interviewees with different parties can enhance the credibility of the research when different accounts converge and the potential impact of the result by providing a more nuanced and comprehensive understanding of the topic (Vogl et al., 2019).

The following three criteria were used for the selection of the interviewees:

1. **At least one project manager per case:** The research focuses on project managers; therefore, it is crucial to interview the project manager for each case project to obtain their perspective on project management, particularly in relation to safeguarding sustainability. This was also one of the case selection criteria.

2. **At least one sustainability expert per case:** The research focuses on sustainability; therefore, it is crucial to interview someone from the design team responsible for each project's sustainability. This could be an installation advisor, sustainability expert, or advisor.
3. **Must have been part of the design process:** The research is centered around safeguarding sustainability during the design phase; therefore, it is essential that the interviewees were part of the project team during the design phases of the case projects; otherwise, he or she cannot provide experiences and interpretations on the topic of this research.

Respondents were selected primarily from Arcadis Nederland B.V. However, due to the fact that two of the case projects were inter-organizational in nature, external respondents were also interviewed. This was considered a valuable approach, as it enabled the gathering of additional insights and perspectives for the study.

At the conclusion of the interviews, the interviewees were asked if they knew of any other design team members who would also be relevant to conduct an interview regarding this research topic. As a result, several additional interviews were arranged. Table 2.1 shows the conducted interviews per case, including the interviewee's roles, organization, and interview date. In total, thirteen interviews were conducted for this research.

Table 2.1: Interviewees empirical research

Project	Role	Organization	Date
Case A	Project Manager A [1]	External	20/01/2023
	Project Manager B [2]	Arcadis	28/11/2022
	Sustainability Advisor B [3]	Arcadis	10/02/2023
	Architect [4]	External	21/02/2023
	Sustainability Advisor A [5]	External	13/02 /2023
Case B	Program Manager [6]	Arcadis	24/01/2023
	Project Manager [7]	Arcadis	25/01/2023
	Architect [8]	Arcadis	02/03/2023
	Installation Advisor and BREEAM Expert [9]	Arcadis	13/01/2023

2.4. Data Analyses

As mentioned in Section 1.6, this research uses the Gioia methodology in conjunction with flexible-pattern matching.

The Gioia methodology is a grounded theory which, according to Bouncken et al. (2021), is one of the most cited qualitative research methods in business and organization studies. Gioia et al. (2013) describes that this method provides deep and rich theoretical descriptions of the contexts within which organizational phenomena occur, revealing dynamic relationships among the emergent concepts that describe or explain the phenomenon of interest. Moreover, it emphasizes the establishment of clear connections between data and theory (Gioia et al., 2013). For these reasons, this research also uses the Gioia method to analyze and interpret the data gathered from the multiple case study. This method starts with the data and identifies patterns that emerge through bottom-up partial pattern matching. Thus, it does not necessarily start with a theoretical foundation, as it is primarily a data-driven approach to qualitative research (Bouncken et al., 2021). Significantly, the qualitative research interviews also adhere to the Gioia method, allowing for the discovery of new and unexpected patterns that were not previously identified in the literature or anticipated to be significant in this research.

However, in this research, the Gioia method is used in conjunction with flexible-pattern matching guided by the conceptual framework established based on emerging aspects in the theoretical background

related to the project managers' role as managers and leaders to find patterns and themes that emerge from the data. According to Bouncken et al. (2021), this feature gives this research a firm grounding in literature,i.e., theory, by shaping the initial theoretical background and conceptual framework, which will also help develop an interview guide that integrates into the data analysis process. Bouncken et al. (2021) describes this combined method as flexible-pattern matching; patterns deduced from the theories are constructed before the data collection and vice versa. Based on the combined analysis method, the analyses of this research can be divided into three steps:

1. **Theory:** A literature study.
2. **Practice:** A empirical analysis by means of a multiple case analysis.
3. **Theory versus Practice:** Theoretical and empirical analysis.

Theory

The initial phase of this research involves conducting a literature study and analysis to establish a theoretical background and conceptual framework, as outlined in Section 2.1.

During this phase, the identified literature is assessed for quality and relevance, with a critical examination of the information to identify key concepts and themes that are pertinent to the research subject. The process may entail synthesizing information from multiple sources to develop a comprehensive understanding of the topic and identify any gaps or limitations in existing theory. Ultimately, the literature study establishes the theoretical background and conceptual framework in Chapter 2.1, *Theoretical Background*. These components substantiate the empirical research and provide a structured framework for both the discussion and addressing the primary research question.

Practice

After conducting and transcribing the semi-structured interviews, the analysis of the two case studies is carried out using Gioia's coding and analyzing method, combined with flexible-pattern matching as described by Bouncken et al. (2021). This combined method produces output in the form of a three-order hierarchical data structure, consisting of 1st-order concepts, 2nd-order themes, and aggregate dimensions obtained from the raw interview data (Bouncken et al., 2021; Gioia et al., 2013).

First, following the Gioia method, 1st-order concepts are derived from the raw interview data through the inclusion of quotes. Subsequently, these 1st-order concepts, which represent empirical observations, are iteratively matched with theoretical patterns derived from the literature. These patterns are derived from the conceptual framework established from the theoretical background of this research, which includes the examination of safeguarding sustainability through authority, accountability, and affective influence.

A total of 600 quotes relevant to the research topic are identified. These quotes are organized and presented in tables, providing a structured visualization of the encountered topics, including barriers, safeguarding, and promoting. The structures represent the analysis process, depicting the progression from raw data to concepts, themes, and aggregate dimensions. ATLAS.ti software was employed throughout the coding and analyzing process. ATLAS.ti is a qualitative data analysis tool that aids researchers and students in managing, analyzing, and visualizing their research data (ATLAS.ti Scientific Software Development, 2023).

The identified and analyzed interview quotes are processed in Chapter 4, *Empirical Research and Results*. Due to the large number of quotes, summaries of quotes are structured and visualized in the tables presented in Appendix B. Condensed tables illustrating this combined analysis approach, excluding the raw data, are also presented in tables in Figures 2.1 and 2.2, which are also utilized during the analysis and composition of Chapter 4 in relation to safeguarding sustainability.

Theory versus Practice

Chapter 5, *Discussion*, compares the findings from theory and practice. This analysis explores similarities, distinctions, and patterns between the theoretical concepts and real-world experiences derived from interviews conducted in the multiple case study. The insights gained from this analysis contribute

to addressing the main research question in Chapter 6 and form the foundation for the research's recommendations.

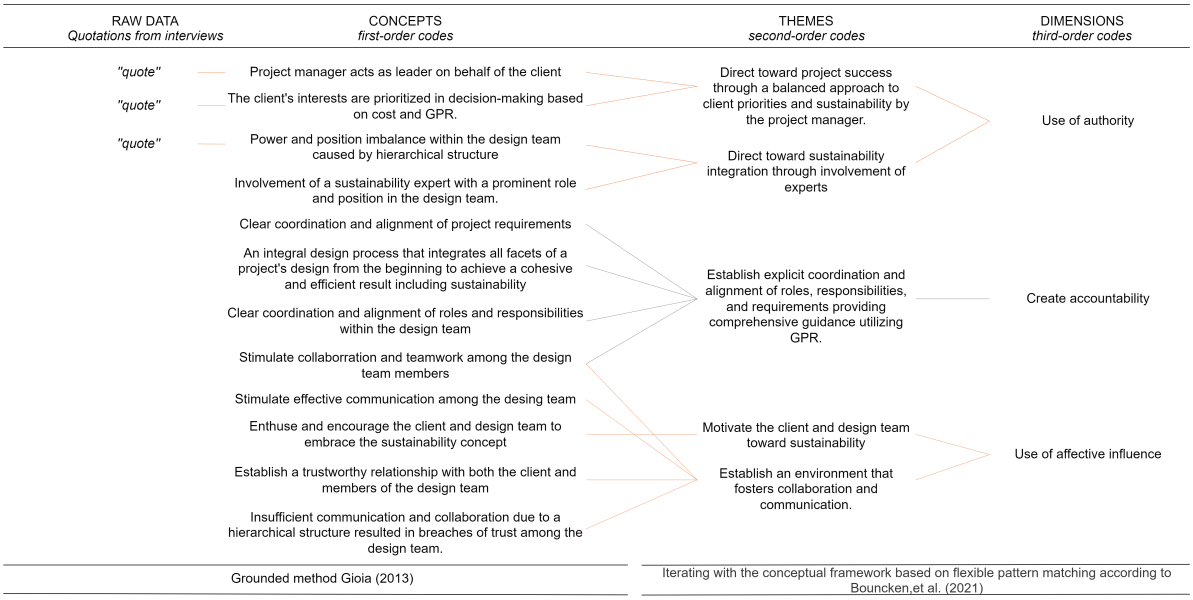

Figure 2.1: Condensed data structure of safeguarding sustainability in case A

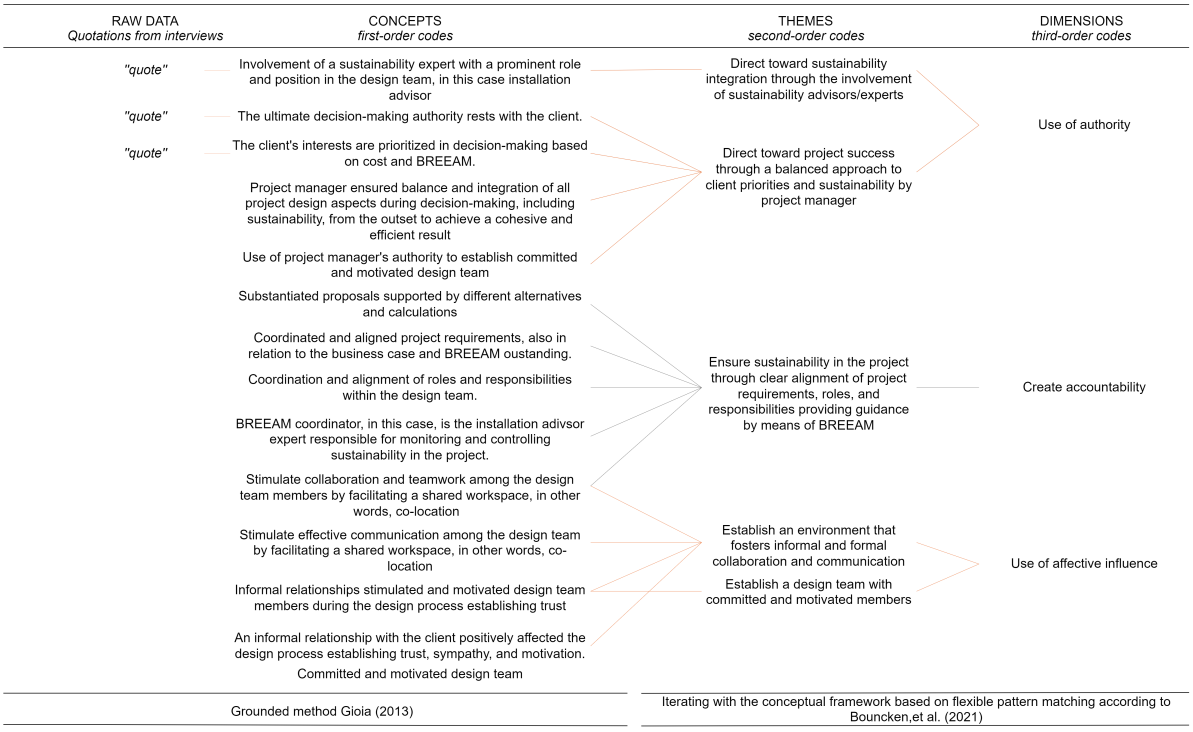

Figure 2.2: Condensed data structure of safeguarding sustainability in case B

3

Theoretical Background

This chapter provides an overview of the existing literature on sustainability variables in the building industry, as well as the roles of project managers in managing and leading to safeguarding sustainability ambitions and goals in building projects.

First, Section 3.1 defines advances made toward sustainability in the building industry, as well as the drivers and barriers that hinder the integration of sustainability principles. Section 3.2 elaborates on the design phase of a building project in which the sustainability goals and ambitions are defined. Section 3.3 discusses the project managers' management and leadership roles in building projects and how these have changed with the introduction of sustainability. The theoretical background, combined with the conceptual framework introduced in Section 3.4, serves as the foundation of this research and will help structure the qualitative research questionnaire of the multiple case study and its analysis.

3.1. Sustainability in Building Projects

In the last 20 years, sustainability is increasingly viewed as a desired goal of development and environmental management (Brown et al., 1987). The term has been used in numerous disciplines and in a variety of contexts and is strongly dependent on the context in which it is applied and on whether its use is based on a social, economic, or ecological perspective. Brown et al. (1987) described that sustainability may be defined broadly or narrowly, but a useful definition must specify explicitly the context as well as the temporal and spatial scales being considered.

3.1.1. Sustainable Development

One of the first definitions of sustainable development was presented by the UN World Commission on Environment and Development in *The Brundtland Report* by Keeble (1988) as:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The report discusses two concerns that should be reconciled: development and environment. References to development and the environment can also be interpreted as needs versus resources or as the short versus the long term. However, today, sustainability is almost always seen in terms of three dimensions: social, economic, and environmental. Also known as the Triple Bottom Line concept, defined by Elkington, which was embodied in the definition of sustainability adopted by the United Nations in its Agenda for Development (UN. General Assembly (51st session : 1996-1997), 1997):

"Development is a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development, and environmental protection are interdependent and mutually reinforcing components of sustainable development."

Herein it is stated that sustainability is not just environmentalism; it is also necessary to bear in mind economic development and social equity (Gomes Silva et al., 2022). The Triple Bottom Line concept

asserts that organizations and businesses should commit to measuring their social and environmental impact, in addition to financial performance, and solely focusing on generating profits.

3.1.2. Sustainable Design and Construction

Buildings contribute substantially to the realization of sustainable development. The building industry is focusing more and more on the growing concerns related to sustainability and its significant contribution to the consumption of energy and natural resources (i.e. water, wood, energy, materials) as well as the production of waste and emission of greenhouse gases (GHG) such as CO2 emissions, throughout the entire life cycle of building projects. Not addressing this can result in serious environmental problems. The concept of sustainability in the building industry has initially focused on limiting the use of resources, especially energy, and reducing impacts on the natural environment with emphasis on technical issues such as materials, building components, construction technologies, and energy-related design concepts. An appreciation of non-technical issues (soft issues) has recently grown, recognizing economic and social sustainability concerns that have become equally important and interrelated. Thus, considering the Triple Bottom Line, that is, environmental, economic, and social sustainability, as mentioned in 3.1.1. The building industry must be alert and cautious of sustainable alternatives to improve not only the environmental impact but also its societal and economic impacts. The building industry can address this by incorporating sustainability principles into its projects and practices. When considering sustainability principles in this research, principles are meant to fight environmental degradation and encourage economic and social improvement, as noted by Munyasya and Chileshe (2018) in their definition of sustainable infrastructure. Munyasya and Chileshe (2018) defines sustainable infrastructure as:

"The adoption of principles of sustainable development in infrastructure development projects execution by striking a balance between environmental protection well-being and economic prosperity for the benefits of both the present and future generations."

Infrastructure refers to utilities such as buildings, roads, ports, railways, water pipes, power generation buildings, sewer plants, and other tangible structures. The interrelationship of sustainability principles in such infrastructure helps create a favorable built environment that meets the present needs without degrading the ecological sustainability and jeopardizing the ability of the future generations to meet theirs(I. Y. Chan & Liu, 2012; Munyasya & Chileshe, 2018). Addressing and incorporating sustainability principles in building practices and projects, plus safeguarding these throughout all project stages, can ultimately contribute to sustainable development and fight climate change.

Over the recent years, the building industry has been challenged to develop and implement advanced functioning building, including sustainability principles, aimed at minimizing energy consumption in combination with the preservation of non-renewable natural resources while at the same time creating comfort and satisfaction for its owners and users over a long lifetime. Subsequently leading to many new terms and definitions for buildings that integrate resource-efficient strategies and energy-saving technologies, such as green buildings, sustainable buildings, energy-efficient buildings, or high-performance buildings, which can be used interchangeably. Recently attention has been given to circularity and climate adaptability. Liu et al. (2022) define green buildings as buildings that relate to optimizing designs by adopting renewable energies, passive building design technologies, and scientific and systematic waste management techniques to minimize waste diversion to landfills. Moreover, Gupta and Chakraborty (2021) describe an energy-efficient building as a building that creates a comfortable living environment with the least possible amount of energy consumption, maximizing efficiency in the use of resources by balancing all aspects of energy use in a building by providing an optimized mix of passive solar–design strategies, energy-efficient equipment, and renewable sources of energy. In this research, the focus is on sustainable buildings. A building that is designed, constructed, operated, and maintained in an environmentally responsible and resource-efficient manner and intends to reduce the environmental impact that the buildings have on its surrounding environment by conserving energy and water, minimizing waste, and improving indoor air quality. At the same time, enhancing the quality of life allows people to live in a healthy environment with improved social, economic, and environmental conditions (Akadiri et al., 2012). Thus, beneficial not only for the environment but also for society and profitable in the long run. Even though the different building types differ in scope, objective, and context of the building's design, construction, and operation, they share the same benefits, including

environmental, economic, social, and health and safety aspects (Liu et al., 2022).

The construction of sustainable buildings is called sustainable construction. However, it is argued that there is no universal definition for sustainable construction since it is continually developing as the concepts of sustainability become clearer. In November 1994, at the First International Conference on Sustainable Construction held in Tampa, Florida, USA, the conference convener J. Kirbert defined sustainable construction as "creating a healthy built environment using resource-efficient, ecologically-based principles" (J Kibert & International Council for Building Research, Studies and Documentation., 1994). In his book *Sustainable Construction: Green Building Design and Delivery*, Kibert (2016) further emphasizes the need for sustainable construction and notes seven core principles for sustainable construction across the building's life cycle:

1. Reducing resource consumption
2. Reusing resources
3. Using recyclable resources
4. Protecting nature
5. Eliminating toxins
6. Applying life cycle costing
7. Focusing on quality

These principles would be used to support decision-making during each phase of the design and construction process, continuing throughout the building's entire life cycle.

On the other hand, Reffat (2004) addresses the economic and social issues surrounding sustainable construction and argues that the concept of sustainable construction now goes beyond environmental issues to include economic and social sustainability issues with the view of adding value to the quality of life of individuals and communities. Followed by Bajjou et al. (2017), adding that sustainable construction is mainly defined by the industry that ensures the conservation of natural resources throughout the life cycle of the building (energy, water, non-renewable materials), optimizing the consumption of raw materials in purpose to reduce the deterioration of the environment and to ensure social and economic comfort. Thus, sustainable construction is a way for the building industry to move toward achieving sustainable development, taking into account environmental, economic, and social issues.

The focus should, however, not only be put on the construction of sustainable buildings. Shafii et al. (2006) describe sustainable construction as the appropriate management of all phases of the building life-cycle, including the design, construction, operations, and operational stages, in order to significantly reduce the overall cost of a building, improving the performance of buildings, both in environmental and financial terms, throughout every stage. Kibert (2016), Shafii et al. (2006) emphasize the design stage as a crucial stage in sustainable building projects as it establishes the development of the building in an efficient and effective way. After all, sustainable design is needed in order to construct. Sustainable design refers to the process of designing a building that minimizes its environmental impact and maximizes its efficiency and functionality (Bragança et al., 2014; Tam & Le, 2019). Therefor, it is essential to consider sustainability principles in design, not only because of environmental concerns but also due to economic and social issues, as they promote architectural quality and have economic advantages. Besides reducing the buildings' environmental footprint through efficient design, a sustainable design also contributes to a more comfortable and pleasant environment for its users and allows economic benefits (Bragança et al., 2014). During the design phase, the focus is put on the decision-making regarding subjects such as room and building functional, environmental, and spatial performance, comfort practices, energy requirements, and so forth, as well as concerns on building use, heating, cooling, lighting, ventilation, water, waste, site-works, and materials. Additionally, the design stage deals with selecting procurement methods, project and sustainability procedures, building design lifetime, organizational structure, maintenance, project cost, and timescale. Thus, it is essential to acknowledge and address sustainability in all of these design decisions, as they may impact the environment and social and economic benefits of buildings. For example, the selection of materials has a significant impact on cost and the environment.

A sustainable building can thus be defined as a building that is designed and constructed to:

1. Minimize or eliminate impacts on the environment, natural resources, and nonrenewable energy sources to promote the sustainability of the built environment
2. Enhance the health, well-being, and productivity of its users
3. Cultivate economic development and financial returns for its owners

The use of natural resources and renewable energy sources not only reduces energy consumption and GHG emissions but can also lead to significant economic savings during the operations of the building by improving life cycle costs and increasing the value of the building. Moreover, they create a safe and healthy environment for its users. A sustainable building can therefore be regarded as an integral project which focuses on balancing environmental, economic, and social impact and benefits over the life cycle of a sustainable building (Liu et al., 2022), which are elaborated below.

Environmental Benefits

The building industry substantially influences the environment, as buildings consume a significant amount of energy and natural resources at each stage of a building project, from design and construction to operation and final demolition. The building industry contributes 5.5% to the national gross domestic product (GDP) ("Housing in Europe - Construction sector", n.d.). However, it is considered a "*resource-intensive industry*" that annually consumes a large quantity of energy and natural resources, including over 40% of energy, 40% of raw materials, 16% of water, and 25% of timber consumed worldwide (Boyle, 2005). And it is responsible for nearly 40% of worldwide GHG emissions. Thus, energy and resource efficiency improvements and environmental performance in buildings are the core of sustainable buildings.

The energy use in a building's life cycle perspective includes the energy needed for operational and embodied energy. The *operational energy* of a building is the energy used to maintain the environment inside that building through artificial lighting, heating, cooling, ventilation, and hot water use, including energy from electricity, gas, and burning fuels such as oil or coal, which generate harmful greenhouse gasses. The consumption of energy can be reduced by improving the buildings' energy efficiency. Liu et al. (2022) note that this can be achieved through passive and active design. Passive design uses airflow and sunlight to provide a relaxing indoor atmosphere while reducing the energy demands of heating, ventilation, and air conditioning (HVAC) equipment. In comparison, active design is the application of advanced technologies and systems to improve energy efficiency and reduce the resource consumption of building operations (Liu et al., 2022). The application of advanced technologies and systems is an effective means to lessen greenhouse gas emissions and slow down the depletion of non-renewable energy resources by using energy generated by natural and renewable energy sources (Dincer & Rosen, 2021; Yap, 2017). Such technologies and systems provide more cost-effective and environmentally beneficial alternatives than conventional energy sources. Instead of burning fossil fuels and gas, these new technologies use natural resources such as sunlight and wind. They reduce the greenhouse emission levels of building operations and combat the depletion of non-renewable natural resources. Another advantage of renewable and advanced energy technologies is that the energy sources are not depletable and provide a reliable and sustainable energy supply almost indefinitely. Incorporating such technologies in buildings can conserve 40% more energy than traditional buildings, increasing energy efficiency and decreasing CO2 emissions (Liu et al., 2022).

Additionally, building materials play a significant role in the resource and energy efficiency of a building. The selection of renewable natural, local, and durable materials with low embodied energy, using methods for minimizing material wastage during the building construction process, and providing opportunities for recycling and reuse of building material, will help eliminate waste and minimize the industry's energy consumption and impact on natural resources (Akadiri et al., 2012; Yap, 2017). This comes from the concern of the increasing depletion of non-renewable natural resources and the high level of embodied energy buildings have. Akadiri et al. (2012) define the embodied energy of a building as the total energy required to create a building, including the direct energy used in the construction and assembly process and the indirect energy required to manufacture the materials and components of buildings. Indirect energy includes the energy required from raw material extraction through processing and manufacturing and the energy used to transport materials. Choosing materials with low embodied energy will help to reduce energy consumed through extracting, processing, manufacturing, and trans-

porting the materials. Low-carbon materials have been demonstrated to reduce life-cycle emissions of buildings by up to 30% (Liu et al., 2022). Furthermore, handling construction and demolition wastes plays an essential role in developing sustainable buildings. The value of the recovery rate in construction wastes should be over 90%, which can distinctly reduce the effect of waste generation. The choice of materials, therefore, plays a crucial role in sustainable buildings.

Building design should strive for conserving energy and reducing emissions by means of resource and energy efficiency. Through this, sustainable buildings can achieve high environmental performance and contribute to realizing the sustainable development of low-carbon construction and minimizing the consumption energy and natural resources as well as waste.

Economic Benefits

While most of the attention of sustainable buildings goes to the positive environmental impacts, research has also shown that sustainable buildings have economic benefits (Neyestani, 2017; Robichaud & Anantatmula, 2011). Sustainable buildings have been found to lead to significant economic savings by improving the operation and maintenance costs after completion. The savings are associated with improved building performance through improved energy efficiency and decreased energy consumption, as mentioned in the previous section. The operating costs of sustainable buildings are expected to decrease between 8-9% (Robichaud & Anantatmula, 2011). The US Green Building Council (2007) stated that building with integrated planning, site orientation, energy-saving technologies, on-site renewable energy-producing technologies, light-reflective materials, natural daylight and ventilation, and downsized HVAC and other equipment save 20–50% in energy costs. Even though the initial investment in advanced technologies and systems may be high, Zuo and Zhao (2014) noted that the cost savings during the operational and maintenance stages will help offset the initial investment. Neyestani (2017) also explained that the financial benefits of sustainable buildings are nearly ten times more than the average initial investment required to design and construct a sustainable building.

In addition, investments in energy efficiency and saving measures can also increase the value of buildings. Popescu et al. (2012) pointed out that the value of a building increases when investments are made in energy-saving technologies and systems. Furthermore, Robichaud and Anantatmula (2011) noted that the value of buildings invested in sustainability would increase by 7.5%.

Social Benefits

The social benefits are associated with the health and well-being of the occupants of sustainable buildings, as research has shown that the design of buildings has a significant influence on the occupant's (mental) health, well-being, and work efficiency by improving the indoor environmental quality (IEQ) (Balaban & de Oliveira, 2017). Liu et al. (2022) note that the improved IEQ is the most critical component of social benefits of sustainable buildings, including indoor lighting and contaminants. In addition to the indoor quality, indoor thermal comfort also has a significant effect (Balaban & de Oliveira, 2017; Liu et al., 2022; Zuo & Zhao, 2014). Zuo and Zhao (2014) noted that the improved indoor environmental quality in sustainable buildings positively affects the health conditions and levels of productivity of its users. Ries et al. (2006) mentioned the same in their research and found an increase of 25 % in productivity and a significant decrease in absenteeism in sustainable buildings compared to conventional buildings. However, the building industry is still uncertain of the health and productivity benefits as the benefits are not well documented in literature due to lack of uniform measures of the impact (Zuo & Zhao, 2014).

3.1.3. Sustainability Certifications and Assessment Methods

Over the past years, the introduction of sustainability certifications and assessment methods has helped stimulate the integration of sustainability principles in building design and construction by making sustainability more measurable. The certifications and assessment methods use specific themes related to environmental sustainability principles but can also include social and economic sustainability principles. In the Netherlands, two commonly used certifications are the Building Research Establishment Environmental Assessment Method (BREEAM-nl) and Gemeentelijke Praktijk Richtlijn (GPR) for sustainable design and construction (Akadiri et al., 2012). Kibert (2016) notes that these environmental

assessment methods use a number of distinct characteristics. First, the criteria measured with these methods are technically defined and rely on quantifiable, measurable, and comparable metrics, which are assumed to provide an accurate measure of the building's overall green performance. Secondly, the building's success is determined by adding up the weighted scores achieved for each individual performance issue, either implicitly or explicitly. The criteria measured focus on different themes and are constantly redeveloped and updated to complement current sustainable design and construction principles (Akadiri et al., 2012), which is done every five years in the United Kingdom for BREEAM (Taylor & Ward, 2016). For instance, BREEAM-nl focuses on management, health, energy, transportation, water, materials, waste, land use and ecology, and pollution. In comparison, the GPR focuses on energy, the environment, health, quality of use, and future value. However, both have the common objective; to design buildings that reduce the overall impact of the built environment on human health and the natural environment. Often these certificates are linked to subsidies offered by the government to encourage sustainable design and construction in the Netherlands, such as the Milieu-InvesteringsAftrek (MIA) and the Willekeurige afschrijving milieu-investeringen (Vamil). With the MIA, the customer benefits from an investment deduction of up to 45 % of the investment amount that comes on top of usual investment deductions. With the Vamil, the customer can write off as much as 75% of the investment costs ("MIA en Vamil voor ondernemers", n.d.).

Building Research Establishment Environmental Assessment Method (BREEAM-nl)

The Building Research Establishment Environmental Assessment Method (BREEAM) was established in 1990 and is still considered one of the most effective voluntary mechanisms in transforming the building industry toward sustainable development. BREEAM encourages and motivates designers and builders to stand out by being innovative and using resources efficiently to produce a sustainable environment that also increases the well-being of the occupants (Tupėnaitė & Geipele, 2021). Institutions and authorities widely adopt the assessment method as a required building environmental performance standard (Cole & Jose Valdebenito, 2013), also in the Netherlands as BREEAM-nl. The adopted Dutch version was established in 2009 by the Dutch Green Building Council (DGBC), as the industry felt a strong need to promote the concept of sustainability quantification and assessing of buildings in a manner that is clear for its users and accepted internationally (Cole & Jose Valdebenito, 2013). The most recent update of BREEAM for new construction was released in 2020 by the DGBC, whereas the last updates for BREEAM renovation and BREEAM in-use occurred in 2014 and 2016, respectively (Dutch Green Building Council, 2023).

BREEAM focuses on achieving environmental sustainability by mitigating the impact of the construction process and buildings on the built environment. It also aims to achieve economic and social benefits for its owners and occupants as well as provide an evaluation and rating system enabling buildings to be recognized based on their sustainability approach, which will help encourage the global demand for developing more sustainable buildings (Tupėnaitė & Geipele, 2021). This holds true for both new construction and renovation and in-use buildings. The assessment method evaluates and rates the procurement, design, construction, and operation of a building against specific categories with each its own credits, summed up below (BREEAM-NL, 2023).

- Management; management policies, building commissioning and procedural issues.
- Health; indoor and external environmental quality affecting the health and well-being of building occupants, e.g., thermal conditions, daylight, etc.
- Energy; operational energy (and CO2 emissions) of the completed development.
- Transport; supply of public and business transportation, proximity to facilities, and transportation plan.
- Water; efficient water use of a building and tenant services.
- Materials; responsible sourcing of building materials, material efficiency, and demountability of materials.
- Waste; waste management, climate adaptation, and building flexibility.
- Land use and ecology; site selection and ecology protection.
- Pollution; the reduction and elimination of air, water, and light pollution.

BREEAMs' rating scale consists of five levels: pass, good, very good, excellent, and outstanding. Obligatory minimum standards must be obtained per category to achieve a certification level. Once the required minimum standards have been achieved, additional credits can be scored depending on the client's ambitions and the project constraints. The more credits a building achieves, the higher the BREEAM-nl score for a project. To ensure a BREEAM certification, it is essential to register a project for BREEAM-nl certification as a building project starts, as certain credits are evaluated during the preparation stages of a project (Tupėnaitė & Geipele, 2021).

Municipal Practice Guideline (GPR)

Another commonly used assessment method in the Netherlands is the Gemeentelijke Praktijk Richtlijn (GPR), in English, the Municipal Practice Guideline. The assessment method was developed in 1996 to measure sustainability performance for residential and commercial construction, including new construction, existing construction, and large-scale renovation, and was last updated in 2021 ("Over GPR software", 2022). Like Breeam-nl, GPR encourages and motivates designers and builders to use resources efficiently and produce a sustainable environment that protects the environment and increases the occupants' well-being. The method assesses the sustainability of a building based on five categories, each with its own sub-categories ("Over GPR software", 2022).

- Energy; energy performance, demand, and supply.
- Environment; water, environmental protection, and materials.
- Health; noise, air quality, thermal comfort, light, and visual comfort.
- Quality of use; accessibility, functionality, technical quality, and social safety.
- Future value; forward-looking facilities, flexibility, and amenity value.

For each category, building are rated on a scale of 1 to 10. The total GPR score is then translated into a quality label, based on which the building is given one to five stars. A building can also receive a GPR building certificate for the permit or completion phases. Through this, buildings are eligible for the MIA and Vamil subsidies ("Over GPR software", 2022).

3.1.4. Barriers Toward Sustainable Design and Construction

Despite the introduction of numerous sustainability principles in the building industry, sustainability assessment certifications and methods, and the growing number of Nationally Determined Contributions (NDCs), many building projects fall short of the level of ambition to drive the required — and achievable — performance levels needed for the transformation toward sustainable buildings. Research has identified four main barriers that stop or limit the integration of sustainability principles in building projects; economic, technology, awareness, and management barriers.

Economic Barriers

It is well recognized that the initial cost that comes along with sustainability principles is the fundamental barrier to implementing sustainability in building projects (Bon-Gang, 2018; Hwang & Ng, 2013; Shi et al., 2013). Using sustainability principles such as water and energy-saving equipment and high-performance insulation protection often increases the initial costs of buildings projects (Shi et al., 2013). Zhang et al. (2011) calculated that using sustainable materials costs three to four percent more than conventional construction materials, primarily due to design complexity and the modeling costs needed to integrate green practices into projects.

Bon-Gang (2018) interviewed industry experts and found that the high costs of sustainability principles can be considered the most significant obstacle a project management team has to overcome. This can deter the client if the long-term benefits of sustainability principles in a building project are not transparent or well-communicated. In the interviews, 67.7% of the experts noted that educating the client on the future benefits of green construction could also solve this problem (Bon-Gang, 2018). Alternatively, government incentives for green construction projects, which are widely adopted in the European Union or by individual countries, can help offset the higher cost involved. The Dutch government, therefore, supports sustainable building projects with various schemes such as tax benefits for investments in

recognized sustainable projects (Ministerie van Algemene Zaken, 2022), as described in Section 3.1.3. However, these incentives may not be enough for smaller organizations.

The current perception from the private sector that the cost of sustainable buildings is much higher than conventional buildings also deters clients (Akadiri, 2015; Shari & Soebarto, 2012). Research by Shari and Soebarto (2012) stated that the perception that sustainable building practices would increase costs and reduce profits primarily contributes to the lack of demand for sustainable buildings. Practitioners in the building industry should be educated to change the perception of high initial costs, or emphasize a life cycle approach in the assessment of relevant costs and impacts (Shari & Soebarto, 2012; Shi et al., 2013).

Technology Barriers

Another significant barrier is the lack of technological understanding of sustainability principles in the building industry due to the inadequate information regarding the integration of technologies and materials but also the performance of principles (Akadiri, 2015; Bon-Gang, 2018; Shari & Soebarto, 2012; Shi et al., 2013). Hwang and Ng (2013) describes that sustainable technologies require complicated techniques and construction processes. If these complexities are not addressed, they will affect building projects' design and construction process. The research also addresses that the design process can be more complicated than conventional building due to evaluating alternative materials and systems. Partly, design teams lack knowledge and expertise on which of the alternative materials that are most suitable when considering sustainability. Shari and Soebarto (2012) interviewed industry stakeholders of private and public building projects and found that around 14% of the barriers were related to all members of the core project teams – including consultants, project managers, facility managers, and building operators – often did not have an adequate technical understanding of or knowledge to implement sustainable practices. For example, the use of sustainable technologies and materials can sometimes bring complexity to the architectural design of a building, i.e., the installation of solar panels usually forces the architects to spend extra time to research and address the issue of how to integrate it with the material either on the facade or on the roof of a house, as they may not have done so before (Shi et al., 2013).

Inadequate information on the performances of sustainability principles may lead to uncertainties among practitioners in the building industry. They do not know the benefits or see the need to add sustainability to their projects. Developers, architects, or engineers who lack such knowledge may be compelled to engage external consultants specialized in sustainability. However, a disadvantage is that consultants cost additional money as, in most projects, the cost involved for such consultancy is an additional amount on top of conventional consultation services, inflating the cost required to design and construct a sustainable building (Bon-Gang, 2018).

Awareness Barriers

Most studies on this topic point out the lacking awareness of sustainability as one of the main barriers when considering sustainability in building projects, including the awareness and knowledge of sustainability principles and their benefits, as well as lack of environmental awareness (Akadiri, 2015; Bon-Gang, 2018; Ershadi & Goodarzi, 2021; Shi et al., 2013). For example, the lack of awareness among the public regarding the benefits of sustainability due to insufficient research (Bon-Gang, 2018), especially on the effects of indoor air quality of green buildings on productivity and health, identified by Kibert (2016). Due to this, the traditional perception of how buildings are constructed still prevails. Causing many clients, developers, architects, engineers, and other parties that may be involved in building projects to be resistant to changing building practices incorporating sustainability. Shi et al. (2013) also described a lack of awareness of and readiness to adopt environmental auditing, causing architects, engineers, contractors, and other parties to use materials without giving much thought to sustainability and the surrounding environment. Practitioners in the building industry interviewed by Akadiri (2015) admitted to being unaware of environmental credentials of sustainable measures or alternatives that fall within their remit. Furthermore, Rodriguez-Nikl et al. (2015) identified that lack of information is a significant barrier that needs to be addressed, which is caused by the rapid pace of innovation regarding sustainability. Thus, making it hard to obtain adequate information and understand which technologies or construction methods would be less or more sustainable. Therefore, there is

a need for more knowledge and awareness of sustainability principles and their benefits (Chan et al., 2017).

Management Barriers

Project management contributes to improving the outcomes of building projects (Fewings & Henjewele, 2019) and arranges the resources for achieving sustainability as it includes practices required for effective oversight of the planning, design, and construction (Ershadi & Goodarzi, 2021). Research by Qi et al. (2010) also confirmed that management is the most significant driver for adopting sustainable practices. However, project managers experience difficulties incorporating sustainability into their management capabilities due to the complexity that comes with managing a multidisciplinary team. Hwang and Ng (2013) revealed ten critical challenges that project managers face in managing sustainable building projects:

1. The longer time required during the pre-construction process
2. Difficulty in the selection of subcontractors who provide sustainable construction services
3. Uncertainty with sustainable materials and equipment
4. The high cost of sustainable materials and equipment
5. Increased meetings and coordination required with green consultants and engineers
6. More frequent alterations and variations in the design during the construction process
7. Difficulty in comprehending the green specifications in the contract details
8. Unforeseen circumstances in executing green projects
9. Planning of non-traditional construction sequences
10. Planning of different construction techniques

In addition, Ershadi and Goodarzi (2021) identified the inadequate understanding of the potential benefits, insufficient cooperation among practitioners, research institutions, and environmental organizations, and the lack of systematic approach to pursuing sustainability goals as significant barriers that hinder incorporating sustainability in management practices.

Another challenge associated with management, is the lack of effective communication among the various members of a multi-disciplinary team, which can create a *silo effect* (Robichaud & Anantatmula, 2011). A *silo effect* occurs when there is a lack of communication and common goals between the members of an organization, in this case, a project team (Vatanpour et al., 2013). Especially when many different disciplines are involved in projects that consider sustainability; the client, architects, engineers, sustainability experts, and so on. Each has its own area of interest, protocols, and industry standards when making decisions and tracking information, which makes managing a project challenging.

3.2. The Planning and Design Phase of Building Projects

A building project typically consists of five primary phases that define the building's life cycle, from its start to completion, and provides the basic framework for managing (Project Management Institute, 2017). These phases are initiation, planning and design, tender and construction preparation, execution, and delivery phases, illustrated in figure 3.1. However, the exact project life cycles are determined or shaped by the unique aspects of the organization, industry, or technology employed, as the specific deliverables and activities vary widely with the project.

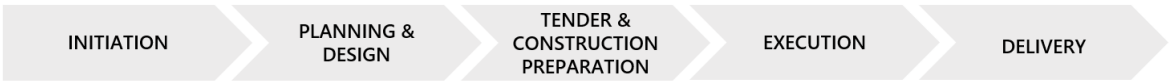

Figure 3.1: Building life cycle. Based on: Keeler and Vaidya (2016)

As described in 3.1.2, sustainability is an important issue to consider in the planning and design phase of building projects as researchers emphasize improving design strategies early in the project life cycle to develop energy-efficient buildings that minimize waste and pollution (Ershadi & Goodarzi, 2021; Liu et al., 2022). Besides the environmental impact, early consideration of sustainability will also cover economic and social issues (Bragança et al., 2014). In the design phase, the focus is put on the decision-making on long-term solutions that warrant the well-being of its occupants and minimize the need for natural resources such as land use, water, and energy. If building projects are well planned and sustainability principles are included early in the design process, it creates a greater chance of reducing the negative impacts on the environment and increasing the social and economic benefits.

3.2.1. Integrated Design Process

Sustainable buildings are primarily driven by sustainability goals and ambitions to meet a variety of energy and environmental requirements, such as improved indoor energy efficiency and renewable and non-polluting materials, as well as social and economic requirements. Owing to these requirements, an efficient delivery process is required by the multidisciplinary design team, including the owner/client, developers, project managers, architects, structural/civil and service engineers, experts, and, later on in the process, builder/general contractors, to function together in a systematic manner to achieve the desired goal. Otherwise, the development of a sustainable building might be loaded with frequent design revisions, specification changes, schedule delays, and higher project costs (Bragança et al., 2014; Ikudayisi et al., 2022), which may lead to the diluting of sustainability goals and ambitions.

Therefore, research suggests that achieving innovative sustainable design requires an integrated design process involving all disciplines, surpassing the limitations of linearity and fragmentation found in conventional design processes among multidisciplinary teams (Ikudayisi et al., 2022). Compared to conventional design processes, the integrated design process requires an intense balance between the different disciplines - and a path of priorities, roles, and responsibilities - to deliver a sustainable building successfully (Keeler & Vaidya, 2016). This process brings multi-disciplinary members of the design team together for inclusive collaboration and communication toward achieving the project's sustainability goals and ambitions (Ikudayisi et al., 2022). Creating an interdisciplinary design team in which the various disciplines are coordinated toward a common and coherent approach rather than a multidisciplinary design team in which disciplines stay within the boundaries of their fields (Giusti et al., 2017). From the beginning, all disciplines are involved and collaborate, including engineers and other experts, to consider design variables as a unified whole, allowing for optimum innovation and cost efficiency. This allows design team members to think holistically about the project rather than focus solely on their own discipline, as every new design decision will also affect other disciplines. Trumpf et al. (2007) notes that the late involvement of experts hinders a mutual understanding of the various disciplines and prevents true sustainability.

3.2.2. The Planning Phase

The design phase of building projects can be divided into four separate phases, illustrated in figure 3.2. A building project starts with defining the project objectives, which are derived from the client's goals and ambitions for the building during the scope definition phase, or the planning phase (Bragança et al., 2014). This phase includes the sharing of the project views, interests, values, and the goals and ambitions of the owner/client and the various members of a design team, when contracted to make shared decisions and co-create the project goals and ambitions, translate these to project requirements and objectives, address the risks, commit resources, and influence changes with the aim to maximize the favorable performance of the building project (Kolltveit & Grønhaug, 2004; Williams et al., 2019). Goals are conventionally defined as an object of a person's ambition or strong desire to achieve something (Webster's, 1995), e.g., be it the development of a new product or the construction of a new building. Tryggestad et al. (2010) states that the terms goals and ambitions can be viewed broadly, and summarized the two dominant perspectives found within the literature on project and construction management are:

1. Treating goals as exogenously to the project as input.
2. Considering goals as endogenous to the project, as evolving in the course of a construction project and thus conceived as output.

To ensure that the delivered project matches the client's desired goals, they are well-defined during the definition phase of building projects with the input of all project team members. Building project goals and ambitions relate to clients' preferred interests for the building aesthetics, location, use of technologies, its functional, economic, and safety aspects, as well as its sustainability. By defining the project objectives during the planning phase, all other stages of the project will be planned and positioned to accomplish those goals from the onset (Robichaud & Anantatmula, 2011).

Figure 3.2: Planning and design phase building projects. Based on: Keeler and Vaidya (2016) and Mujumdar and Maheswari (2018)

However, in most cases, the goals are unstable throughout the life cycle of building projects. Scope changes and goal redefinition result from the design team members' learning and trade-offs as uncertainties may arise due to unexpected events or lack of information, knowledge, technology, time, and money (Tryggestad et al., 2010). Additionally, as the design team gains more insights into what is 'doable' and discovers things not previously imaginable, the project objectives can be modified through experience. For this reason, it is vital to define the objectives of the building projects clearly in the planning phase before initiating design. It is also crucial to involve all disciplines in this process to (1) get a clear understanding of the project's goals and (2) implement the practices and resources necessary to achieve those goals at all subsequent project phases (Robichaud & Anantatmula, 2011). The involvement of all disciplines during the scope definition also gives them more influence on some of the most significant and essential project decisions according to what role they play, such as site selection, strategic planning, and preliminary design concepts (Kolltveit & Grønhaug, 2004; Robichaud & Anantatmula, 2011). Involving sustainability experts in this phase will help set specific goals and priorities for sustainability principles in the project objectives. Experts can thus influence the client toward integrating sustainability principles in their building project and motivate the other design team members to consider sustainability in their own processes to create an integrated sustainable design.

3.2.3. The Design Phase

The design phase of building projects includes the conceptual, schematic, and design development phases, during which the designs are enhanced to the appropriate level of detail to construct a building (Project Management Institute, 2017), as illustrated by figure 3.2. This phase aims to translate all the

project goals and ambitions, in other words, project objectives set out in the planning phase, into a final building design with detailed drawings and specifications (Mujumdar & Maheswari, 2018). During the design phase, the focus is thus put on the decision-making regarding subjects such as room and building functions, environmental and spatial performance, comfort practices, energy requirements, and so forth, as well as concerns about heating, cooling, lighting, ventilation, water, waste, and materials. Additionally, the design stage deals with selecting procurement methods, project and sustainability procedures, building design lifetime, organizational structure, maintenance, project cost, and timescale (Bragança et al., 2014). Therefore, it is essential to acknowledge and address sustainability early in these decisions, as they impact the environment and social and economic benefits of buildings. Especially since the phases of concept design and final design are decisive for the project, as 80% of the design choices are made within these stages, according to practitioners interviewed by Kooter et al. (2021). For this reason, the goals and ambitions need to be well formulated in the objectives of the project; otherwise, they do not become an explicit returning topic of conversation, and they tend to lose value (Kooter et al., 2021).

The conceptual design phase, or the preliminary design phase of the building, is considered the phase in which the overall system configuration is defined, and schematic drawings and layouts provide an early project configuration (Bragança et al., 2014; Mujumdar & Maheswari, 2018), derived from the project objectives defined during the planning phase in the definition of the scope Bragança et al. (2014) state that the conceptual design phase is crucial, as very little information and data is available, and the possibilities to design and innovate become greater.

The next phase is the schematic design phase, during which the feasibility of the planned concepts is established in collaboration will all the involved disciplines. A general shape of the building is developed through plans, sections, and elevations, as the information addressed in the conceptual phase is confirmed or modified (Bragança et al., 2014).

Finally, the schematic design is worked out in more detail, creating a building project's technical and final designs. This phase is called the design development phase, or in other words, the detailed final phase. The designs should include detailed drawings and design specifications, such as the materials and technologies to be used, how requirements are achieved, or how a building will be constructed (Mujumdar & Maheswari, 2018)

During all design phases, close collaboration and communication are crucial, and the lack thereof is detrimental as designs and design teams become more complex and multidisciplinary with the increasing number of disciplines involved, partly due to the introduction of sustainability goals in building projects. For this reason, managerial decisions need to be made to steer the design process in the right direction. The design process needs to be planned, organized, and controlled in such a way as to ensure all project goals and ambitions are translated into the final design to deliver a sustainable building. Ensuring sustainability is a returning topic of conversation and does not lose value during the design process (Kooter et al., 2021), to safeguard the sustainability goals and ambitions.

Mujumdar and Maheswari (2018) note that project managers in India generally pay more attention to the construction phase than the design phase, demotivating appropriate design iterations and structured planning during the design phase, which may lead to the diluting of sustainability goals and ambitions. Furthermore, due to lacking collaboration and communication among disciplines who often perceive their own design scope with a unique and independent visualization neglecting the holistic and integrated view of the project (Mujumdar & Maheswari, 2018). This is magnified by the various barriers affecting the integration of sustainability in buildings, including the perception of higher costs, a lack of interest of the client and the design team, and a lack of knowledge and awareness of sustainability principles and their benefits. Therefore, efforts must be taken to manage the design phase and decision-making of building projects adequately. Zerjav et al. (2013) describes a manager as an informal leader with the goal of achieving a shared integrated understanding of all disciplines in delivering a sustainable design. Additionally, complexity will not only emerge at the technical level of sustainable design but also at the social level of a design team. As a result, Zerjav et al. (2013) notes the demand for managers in possession of soft skills in interdisciplinary design, such as identification, enforcement, and anticipation.

3.3. Project Manager's Management and Leadership Roles

The transition toward sustainable design and construction requires reconsidering how projects are planned, organized, executed, and managed (Barendsen et al., 2021). It adds minimization of resource depletion and environmental degradation and the creation of a healthy built environment to the traditional management criteria of cost, time, and quality. Therefore, the transition toward sustainable design and construction has been linked to project management and the project manager's role during the design phase of sustainable building projects. For project managers to operate effectively and efficiently, they need to understand their role and position in the design team and their accountability and responsibility in delivering a sustainable building. This section elaborates on the project manager's management and leadership roles in safeguarding sustainability principles in building projects.

3.3.1. Project Manager's Management Role

Project management is an approach that combines many different parts throughout a building project for initiating, planning, executing, monitoring, controlling, and closing projects. There are many more definitions of project management. The Project Management Institute (2017) defines project management as:

"*the application of knowledge, skills, tools, and techniques to meet project requirements, enabling organizations to execute projects effectively and efficiently. It is a strategic competency for organizations, enabling them to achieve their goals and objectives*".

Managing a project typically includes identifying requirements and addressing the client's various needs, concerns, and expectations as the project is planned and carried out (Project Management Institute, 2009). Stellingwerf and Zandhuis (2013) assert that this all needs to be conducted within the agreed constraints of the projects, such as quality, schedule, budget, resources, and risks. In most organizations, project managers are accountable for successfully delivering projects within these constraints. Furthermore, Sommerville et al. (2010) describe project managers as the individuals pointed accountable by the client for delivering the project safely, on time, within budget, and to the desired quality standards determined by the client. Therefore, according to research conducted by Frank (2002), project managers have a 34-47% direct influence on the project's success.

Sommerville et al. (2010) use the term accountability in the role description of project managers. In contrast, other researchers may use the term responsibility. For example, the definition of project management by Fewings and Henjewele (2019) includes "*the responsibility to achieve goals within constraints*". The two terms are closely linked. Rezania et al. (2019) described that the relationship arises from the delegation of responsibility or transfer of resources from a principal to an agent, based on the agency theory. Because accountability is conceptualized as a social relation whereby one party demands *"reasons of conduct"* from another party, who has an *"obligation"* to present an account of, and answer for, the execution of responsibilities delegated to them (Rezania et al., 2019). In other words, a relationship where the project owner (i.e., client) transfers resources or delegates responsibility to the project. Not only making the project manager accountable for delivering the project safely, on time, within budget, and to the desired quality standards determined but also handing over the responsibility for implementing the processes necessary for the achievement of desired project outcomes, including the delegation of responsibilities to members of the project or design team. Therefore, accountability is an essential part of project governance for project success and team performance. In this research, the latter definition of the project manager's role by Sommerville et al. (2010) is referred to when considering accountability and responsibility.

Budget, Schedule, Quality and Benefits

A widely used model of constraints in project management practices is the Iron Triangle, also sometimes referred to as the Triple Constraints Model, illustrated in figure 3.4. The model represents the most basic criteria by which project success is traditionally measured; whether the project is delivered on time, within budget, and to some agreed level of quality (Pollack et al., 2018).

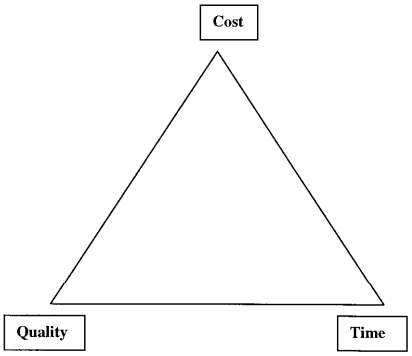

Figure 3.3: The iron triangle (Atkinson, 1999)

Over the past 50 years, the concept of the Iron Triangle has become the standard for assessing project performance. As Mokoena et al. (2013) describes, the triangle communicates the interrelationship between the three criteria and shows that the movement of one criterion can put pressure on the other criteria. For example, if the due date is moved forward (i.e., shortening the time), often the budget needs to be increased to add additional resources to complete the same amount of work in less time. However, if there is no possibility of increasing the budget, the project quality may be reduced to deliver the project in less time for the same budget. In the context of sustainability, projects are constrained by fixed budgets. If a project encounters setbacks during the design phase that require substantial financial resources, there is a diminished budget allocation for maintaining quality, as the project must adhere to the original fixed budget and meet the designated timeline. This compromise in budget allocation adversely affects the project's overall quality, leading to the dilution of sustainable alternatives and consequently diminishing the sustainability of the building due to the high perceived costs. The examples illustrate that the failure of one constraint in the triangle will likely exert negative pressure on one or both of the other constraints. In summary, altering one criterion has an impact on the other criteria, highlighting their interdependence. To successfully accomplish project objectives within the specified time, cost, and quality performance, accurate planning, monitoring, and control are imperative (Atkinson, 1999).

While the Iron Triangle concept has been valuable in addressing the necessary trade-offs inherent in most projects, research has highlighted the limitations of this concept over time. Atkinson (1999) and Bronte-Stewart (2015) suggest that the Iron Triangle represents a limited view of project perspectives as it solely emphasizes three aspects: cost, time, and quality. It leaves out many other subjective and context-specific issues in its assessment. Due to this, the concept and project managers fail to consider essential success criteria relating to emergent properties as project performance has changed with global trends such as environmental sustainability (Karrbom Gustavsson & Hallin, 2014). Similarly, the emerging properties of functionality, productivity, health, safety, and sustainability (Zuo et al., 2018).

The concept often fails to account for the long-term benefits that a project can generate. Atkinson (1999) describes in his paper that the success of a project, measured employing the Iron Triangle, is measured against cost, time, and quality at the delivery stage and excludes longer-term impact and benefits that projects may have on their client, stakeholders, and future users. Benefits are the flow of values that occurs when project outputs are used by customers (Zwikael et al., 2018), for example, related to the effectiveness and efficiency of an organization, waste reduction, and the social, economic, and environmental impact of projects. For this reason, Atkinson (1999) developed a new model of constraints, The Square Route, which also considers the long-term benefits of projects. Besides The Iron Triangle, the model includes the information system and the organizational and stakeholder community benefits projects create. These benefits include improved effectiveness and efficiency, waste reduction, and buildings' social, economic, and environmental impact. Shamhar et al. (1997) also note the importance of considering the long-term benefits of projects. They suggest that project managers need to:

> “”see the big picture..., be aware of the expected results...and look for long-term benefits.

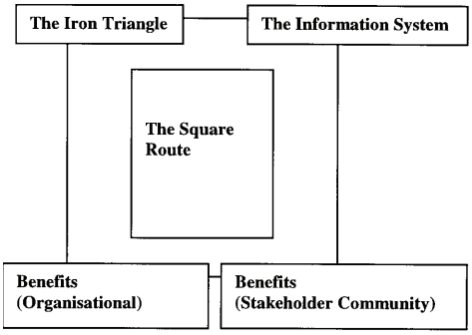

Figure 3.4: The square route by Atkinson (1999)

Moreover, Samset and Volden (2016) acknowledge a transition in evaluating the success of construction projects. Instead of solely focusing on meeting short-term targets, such as adhering to time and costs, there is a growing emphasis on assessing strategic performance. This entails considering the project's long-term viability, sustainability impact, and effectiveness throughout its operational lifespan. This means looking beyond the immediate outputs of the project measured at delivery (Samset & Volden, 2016). Research by Morris (2009) suggested the same, as he quoted:

"effective management of projects is more than just execution-oriented project management. Projects are undertaken to create value and deliver benefits. Shaping the interaction between the sponsor's goals and the way the project (or program) is to be developed, in the best way possible, absolutely crucial — probably one of the most important aspects of managing a project"

Benefits and values, on the other hand, are intangible and challenging to quantify. According to Too and Weaver (2014) they are realized when an organization utilizes the project's output (results) to generate the intended outcomes (effects), which enable the attainment of various anticipated and additional benefits, serving the project's purpose.(Samset & Volden, 2016; Too & Weaver, 2014).

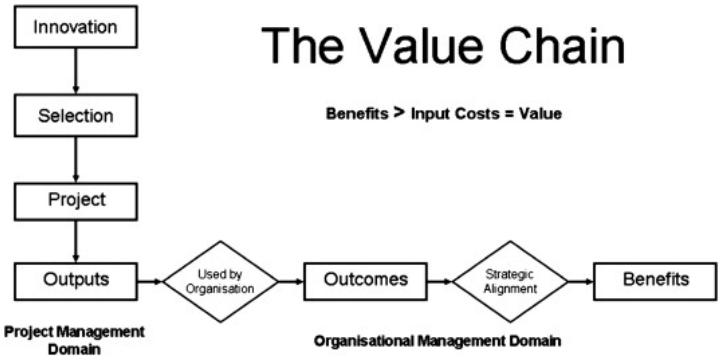

Figure 3.5: Value chain (Too & Weaver, 2014)

Given that inadequate knowledge and awareness of sustainability principles and their benefits pose significant barriers to their implementation, it becomes crucial for project managers to prioritize addressing, measuring, and controlling these benefits alongside the traditional criteria of budget, schedule, and quality. This approach ensures the incorporation of sustainability goals and ambitions in projects and their preservation throughout the design phase of building projects. To achieve this, Musawir et al. (2017) recommend incorporating Benefit Management into project management practices. This approach facilitates active management and continuous alignment between project outputs, outcomes, benefits, and organizational strategy. This approach serves as a tool for defining project requirements and acceptance criteria, informing the business case, identifying risks, engaging stakeholders such as the client and design team, and monitoring the benefits realization process throughout the project life cycle (Bradley, 2016; Musawir et al., 2017). Ward et al. (2007) confirmed the effectiveness of this approach, revealing that organizations with a strong focus on benefits orientation are more likely to

achieve their target benefits successfully. In this context, target benefits refer to the specific benefits that project funders aim to attain through their investment in the project.

In the literature, target benefits are also referred to as project business objectives, as they are *"what the project owner expects to obtain from using the project results after the project has been handed over to them from the project organization"* (Zwikael et al., 2018). Therefore, they can also be considered "strategic project goals that following project completion will enhance organizational performance". For example, the target benefits of *"reduced operational costs"* are project goals that can improve the client organizational performance after completion (Zwikael et al., 2018). A benefit like the *"reduced operational costs"* comes with the adaption of sustainability principles, as Balaras et al. (2007) indicate that utilizing high energy efficient windows and green wall technologies in housing developments can help save 14-20% and 33-60% of the operational cost. In their research on the impact of energy efficiency, Popescu et al. (2012) assert that investments in energy efficiency not only lead to long-term energy savings but also increase the economic value of buildings. Moreover, they enhance their image and reputation, have a low environmental impact, and minimize the use of primary resources. These factors collectively increase the overall value of sustainable buildings, making them advantageous not only for the environment but also for clients/developers, occupants, and society. As a result, sustainable buildings provide a range of economic, social, and environmental benefits, aligning with the increasing awareness of climate change.

Despite the wide variety of economic, social, and environmental benefits associated with implementing sustainability principles to reduce buildings' environmental impact, their implementation still encounters several barriers. These barriers include the perception of higher costs and a lack of technical understanding. However, the most significant obstacle is the lack of knowledge and awareness regarding sustainability principles and their long-term benefits. For this reason, project managers could incorporate Benefit Management suggested by Musawir et al. (2017) during the planning and design phase of building projects to:

- Inform and address the short and long-term benefits of sustainability principles.
- Incorporate these into the project goals and ambitions.
- Define them into the project's objectives and acceptance criteria.
- Engage the client, all disciplines of the design team, and other stakeholders involved.
- Continue measuring and monitoring the benefits realization throughout the project's planning and design phase.

This way, safeguarding the sustainability goals and ambitions.

However, project-based organizations often face challenges in implementing a comprehensive Benefit Management approach, even without considering sustainability. While benefits are typically taken into account during the initial project stages, they are often neglected and not actively managed during the later stages (Musawir et al., 2017). For this reason, Musawir et al. (2017) describe the necessity of a strong governance framework that provides the structures, roles, responsibilities, and accountabilities to enable effective management of benefits. They also note the importance of leadership in project-based teams, or in this case, design teams. To ensure that the project outputs and outcomes are continuously aligned with the benefits envisioned in the project's goals and ambitions.

However, the enhancement of project success through project governance and leadership relies on the accountability of key governance roles, including the project owner and project manager. It is crucial for these roles to adopt a benefits realization mindset and integrate it into their project management practices. This involves advocating for a consistent approach focused on benefits throughout the project lifecycle, rather than prioritizing short-term project delivery within traditional constraints of time, cost, and quality, which can be detrimental (Musawir et al., 2017). Based on these findings, adopting a benefits-oriented approach by project managers becomes crucial in safeguarding sustainability goals and ambitions during the design phase. This approach entails focusing not only on time, cost, and quality but also on the benefits that arise after project delivery. To achieve this, it is important to establish a robust project governance structure within design teams, clarifying roles, responsibilities, and accountabilities in translating sustainability goals and ambitions into the final design. Additionally, measuring,

monitoring, and controlling the benefits throughout the process are essential. Leadership, as highlighted by Musawir et al. (2017), plays a vital role in achieving the intended benefits. The subsequent chapter provides further elaboration on the leadership role of project managers.

3.3.2. Project Manager's Leadership Role and Ability to Influence

The project manager, as highlighted in the preceding section, is the individual pointed accountable for delivering a project safely, on time, within budget, and to the desired quality standards determined by the client (Sommerville et al., 2010). He is also responsible for implementing the necessary processes to attain the desired project outcomes (Rezania et al., 2019). Consequently, the project manager serves as the leader of the team and acts on behalf of the client while striving to maintain an efficient project team to ensure this (Fewings & Henjewele, 2019). The Chartered Institute of Building (CIOB) suggests that a key role of project managers is the leadership function of motivating, coordinating, and maintaining the morale of the whole project team throughout the life cycle of building projects (CIOB, 2010). Thus, projects require not only an efficient project manager but also an effective project leader who can lead the project team spontaneously, focusing on the project and motivating the project team to achieve the goals within the agreed project framework. International Project Management Association (IPMA) (2015) also includes leadership in its definition of project management as:

"the planning, organizing, monitoring, and controlling of all aspects of a project and the management and leadership of all involved to achieve the project objectives within agreed criteria for time, cost, scope, and performance/quality"

In the book *Construction Project Management: An Integrated Approach* by Fewings and Henjewele (2019), the importance of leadership in addition to management is emphasized in the definition of project management, as it involves applying not only a specific set of tools but also the motivation of people and the responsibility to achieve goals within constraints. It necessitates both proactive and reactive behavior from the project manager and the project team (Fewings & Henjewele, 2019), as well as the possession of requisite knowledge, skills, and attributes for effective project leadership. In fact, Hwang and Ng (2013) state that leadership skills may be even more important than planning skills to ensure that the project team executes their work to meet the project's deadlines. Moreover according to Musawir et al. (2017) leadership is required for effective Benefits Management to ensure that the project outputs and outcomes are continuously aligned with the benefits envisioned at the start of the project, as described in Section 3.3.1.

Leadership differs from management and is recognized as one of project managers' essential competencies in effective communication and goal orientation (Moradi et al., 2020). In general, project management concerns making decisions on the traditional "*hard*" skills of planning, organizing, and controlling projects, as described in Section 3.3.1. In comparison, leadership focuses on leading a project team through encouragement and empowerment, employing "*soft*" skills to unlock the team's potential and foster individual development towards achieving ambitious and challenging organizational and project goals (Anantatmula, 2010; Latiffi & Zulkiffli, 2021).

As shown in Table 3.1, leadership is characterized not only by the ability to lead but also by the ability to influence others to achieve goals. Shackleton and Shackleton (1995) describes leadership as the process in which an individual influences other group members toward attaining group or organizational goals. In comparison, Liphadzi et al. (2018) argues that leadership is a process by which one person influences other individual's thoughts, beliefs, and actions. And Nikoloski (2015b) asserts leadership as the ability of an individual to influence, motivate and enable others to contribute toward the effectiveness and success of the organization of which they are members. The statements presented in Table 3.1, including the ones mentioned here, collectively convey the concept of leadership as the capacity to lead and influence individuals or groups toward the attainment of project goals. Nikoloski (2015b) further elaborates that exercising influence over other people is the essence of leadership.

Table 3.1: Definitions of leadership from the literature

Author	Definitions
Anantatmula, 2010	Leadership is about motivating and guiding people to realize their potential and achieving more demanding and more challenging organizational and project goals.
APM Body Of Knowledge, 2012	Leadership is the ability to establish vision and direction, to influence and align others toward a common purpose, and empower and inspire people to achieve success.
Project Management Institute, 2017	Leadership involves the knowledge, skills, and behaviors needed to guide, motivate, and direct a team, to help an organization achieve its goals.
Shackleton and Shackleton, 1995	Leadership as the process in which an individual influences other group members toward the attainment of group or organizational goals.
Tabassi and Bakar, 2010	Leadership is the process whereby a leader, with his intelligence and perseverance, influences a group of subordinates to develop their potential in order to achieve the organizational goals and ambitions within the set time schedule and budget.
Liphadzi et al., 2018	A process by which one person influences other individual thoughts, beliefs, and actions.
Muda, 2013	A combination of capability and actions of leaders that influences other principles aligned with the purpose and goal of the organization
Nikoloski, 2015b	The ability of an individual to influence, motivate and enable others to contribute toward the effectiveness and success of the organization of which they are members.

Furthermore, according to Nikoloski (2015b), there are two types of leadership. Formal leadership refers to managers within an organization who possess the formal authority and power to influence others based on their hierarchical position. In contrast, informal leadership does not rely on official rights and power but instead relies on the inherent qualities of an individual to exert influence within an informal group (Nikoloski, 2015b). For this reason, leaders must be aware that their influence over others will be particular to their personal characteristics and position, as well as the situation at hand, as Kotter (1985) claims that effective leaders will use their influencing power continuously but will be sure to vary the kind of influence they exert according to the situation in hand, i,e., situational leadership. More thoroughly explained in Section 3.3.2.

Good leadership inspires, motivates, directs, and supports project team members, leading to improved performance. According to a study conducted by J. Zhang and Faerman (2007), 80% of construction projects fail due to poor leadership, including a lack of leadership skills, teamwork, poor communication, and inefficiency in problem-solving. Consequently, ineffective leadership can be identified as a fundamental cause of unfavorable project outcomes. Asserting that not all leaders will be good leaders in projects. In addition, Archer et al. (2010) argue that the main weakness in leadership is when the leader cannot make the team focus on the project goals.

Moreover, according to Archer et al. (2010), a critical weakness in leadership arises when leaders fail to make the team focus on the project goals, as unclear or ambiguous goals create uncertainty among team members regarding the leader's competence. Therefore, a key skill lies in striking the right balance between leadership and management in each situation. By employing both management and leadership, project managers can effectively direct, motivate, and guide; in other words, they influence their project team to achieve project success. For example, in projects that consider sustainability,

project managers require strong leadership skills to influence, motivate and empower both the project team and stakeholders toward achieving sustainability goals and ambitions. This is particularly crucial as multidisciplinary teams grow more complex with the increasing number of disciplines involved. Therefore, project managers must enhance their ability to lead multidisciplinary teams and adapt to the resulting complexity (Müller & Turner, 2010; L. Zhang et al., 2018).

Power and Influence

ccording to Nikoloski (2015), there is a close connection between power and leadership. It is argued that while an individual can wield power without being a leader, an individual cannot be a leader without power. As a result, leadership is seen as a means to exert power and influence over others, with the ultimate goal of achieving organizational success (Braynion, 2004).

According to Northouse (2021), the concept of power is related to leadership as it is part of the influence process. Braynion (2004) explains that leadership is a power relationship that exists between leaders and followers, involving the utilization of power to influence others' behaviors to meet the organizational goals. Here, power is a person's capacity or ability to exert their will over a person or a project team to alter their views, actions, and behaviors. Essentially, power represents the capability to bring about desired outcomes (Coates, 1997).

Schwalbe (2015) also acknowledges the connection between power and influence, as she noted the discussion on influence inevitably leads to the topic of power, which she defines as "*the potential ability to influence behavior to get people to do things they would not otherwise.*" In the current context, power signifies the potential to influence others within the organization, especially a design team, to safeguard the sustainability goals and ambitions in the design phase of building projects.

Power is earned through an educational background, by gaining experience in the field, or granted to someone by the management, owners, or shareholders of a company. The latter form is known as legitimate power, which denotes a person's ability to influence others' behavior because of the position that person holds within the organization (Lunenburg, 2012). Legitimate, in other words, position power, is derived from a position of authority inside the organization, often referred to as "*formal authority*". Lunenburg (2012) defines that a position of authority gives an individual occupying a particular position the right to influence and direct specific other individuals (subordinates or the project team) and to make decisions. In comparison, Braynion (2004) provides a definition wherein the leader has the legitimate right and/or authority to influence, while the followers are obliged to comply with the leader's orders. Both definitions emphasize that authority is the power associated with holding a formal position within an organization. However, subordinates play a significant role in the exercise of legitimate power. Compliance will only occur if subordinates perceive the use of power as legitimate. Braynion (2004) highlights that the effectiveness of legitimate power will be dependent upon *"readiness"* of the followers, as "*unable and unwilling (low readiness)*"followers will not care whether the leader is perceived to have legitimate power or not.

Joseph S. Nye of Harvard University identifies legitimate authority as a hard power that stems largely from a person's position of authority (Nikoloski, 2015b). Hard power enables a supervisor to influence subordinates through rewards and punishments. It allows a project manager to make orders and expect them to be obeyed.In addition to legitimate power, hard power encompasses reward and coercive power, primarily established by the organization's guidelines, such as policies and regulations. However, Nikoloski (2015a) states that it is crucial to remember that position power and leadership are distinct concepts. Leaders can not rely solely on the hard power derived from their formal position to make demands and influence others, as they may not always have the authority to do so, as noted by Kotter (1985):

> "*power is the ability to influence others to get things done, while authority is the formal rights that come to a person who occupies a particular position since power does not necessarily accompany a position.*".

On the other hand, soft power includes expert and referent power, primarily based on personal characteristics and interpersonal relationships rather than on a position of authority (Nikoloski, 2015b). Expert power does not rely on a formal position, as it originates from people who possess knowledge, infor-

mation, or specific skills and expertise respected by others (Goncalves, 2013; Lunenburg, 2012). For leaders to be granted this power, their followers must perceive them as credible, trustworthy, and relevant. Furthermore, referent power is a person's ability to influence others' behavior because they like, admire, and respect the individual. It is a power that develops out of admiration of another and a desire to be like that person (Goncalves, 2013; Lunenburg, 2012).

Nikoloski (2015b) identified two essential sources of soft power; inherent personal qualities of the leader and communication. Personal leadership qualities consist mainly of charismatic attraction and emotional inspiration, while communication qualities include persuasion and non-verbal communication. Furthermore, Nikoloski (2015b) highlights three skills that are important in the domain of soft power:

- Vision: A leader's ability to articulate an inspiring picture of the future, in other words, vision. A vision has to be attractive to various circles of stakeholders and also sustainable within the organization. The effectiveness of a vision can be assessed by looking at how well it strikes a balance between realism and risk, as well as between objectives, values, and capabilities.
- Emotional intelligence: A leader's ability to exhibit self-mastery, discipline, and empathetic capacity, which enable them to channel their personal passions and attract others. To be effective, emotional intelligence must be genuine and enduring. Since humans focus on their leaders, they must successfully manage their personal impressions through emotional discipline.
- Communication: A leader's ability to effectively communicate through words, symbols, and personal example. Leaders who lack rhetorical skills can communicate effectively through examples, symbols, actions, and organization, as a good story is an excellent source of soft power.

Individuals within organizations attain power due to their specific job and titles. This means that they are able to influence others because of the formal power associated with their position. However, project managers, despite being held accountable and responsible for project delivery by clients, often possess limited power or authority. Consequently, project managers must find a balance between hard and soft leadership powers in order to influence their teams and maximize the extent of their power. Nikoloski (2015b) asserts that this requires self-awareness, situational awareness, and attention to the needs of others and the organization. By understanding how power operates within organizations, project managers will better understand their position and employ this knowledge to become more effective leaders (Lunenburg, 2012). They can use their power to bring about change in a person or a project team and influence their attitudes, values, beliefs, or actions. In pursuit of project goals and ambitions, project managers can utilize this power to prioritize sustainability during the design phase of building projects and influence both their client and project team to integrate and safeguard sustainability goals and ambitions into their projects.

Researchers have debated the limited authority and power among project managers, often referred to as an "*authority or responsibility gap*" (Sankaran et al., 2020). Pinto (2000) notes that project managers lack the power to secure the resources for their project, as they do not have or have little formal authority or legitimate power to assign their preferred team members unless the project's significance, complexity, or importance allows for some degree of input, or even a free rein, in team assignment. To assign the appropriate members for the team, including experts in sustainability or other areas, project managers must employ alternative means of influence to secure the necessary resources for project success, given the perceived absence of power and authority during the assignment process. They must be able to influence the client or other project sponsors to ensure the selection of suitable team members or leverage their reputation and status within the design team to invoke additional power and authority, utilizing their influencing skills. Consequently, according to Sankaran et al. (2020), in case of lacking authority, project managers must rely on their ability to influence laterally to secure their project's preferred resources and use this strength to ensure the fulfillment of sustainability goals and ambitions.

Leadership Styles

The leadership style adopted by project managers often reflects their approach to management and leadership. Various leadership styles have been developed to address different situational demands, employing different strategies of influence and power to shape the views, actions, and behaviors of

project teams in relation to their goals and ambitions for the project. Among these styles, four particular leadership styles stand out.

Transformational leadership is a well-known leadership style that inspires and motivates project teams, addresses their developmental needs, and encourages innovative approaches and increased effort in problem-solving (Anantatmula, 2010). It emphasizes the leader's role in influencing followers to transcend personal interests for the collective good. Tabassi et al. (2014) describes that transformational leaders aim to transform individuals in their project teams to go beyond the status quo to improve the ability to innovate and adapt in their team environment. It goes beyond the traditional success criteria of timely, cost-effective, and high-quality project delivery, extending to non-traditional criteria such as integrating sustainability goals and addressing inherent complexity and uncertainty.

Transformational leadership, as defined in *APM Body Of Knowledge* (2012), involves influencing the behaviors and actions of the project manager's subordinates. Consequently, project managers can foster higher sustainable performance by transforming their subordinates and guiding them to include sustainability in the quality performance targets of building projects. Essentially, this entails creating or modifying the culture of building projects to embrace sustainable technologies, materials, and strategies. Furthermore, Broman et al. (2013) stress the need for transformative changes and leaders toward sustainable societies in their "c*all-for-papers*" (CfPs) for a Special Volume of the *Journal of Cleaner Production* that focuses on what type of research is needed for us to make the necessary local, regional, national, and global changes regarding environmental sustainability (Broman et al., 2013; Tabassi et al., 2016).

Next, *charismatic leaders,* as described by Nikoloski (2015a), create an atmosphere of change and articulate an idealized vision of a better future. Charismatic leaders communicate complex ideas and goals in straightforward, compelling ways. Their charisma, characterized by emotional expression, self-esteem, confidence, determination, internal stability, intellectual stimulation, passion, and commitment, serves as a means to influence others (Nikoloski, 2015a). In addition, Conger and Kanungo (1994) identifies six behavioral factors exhibited by charismatic leaders, including strategic visioning and communication behavior, sensitivity to the environment, unconventional behavior, personal risk, sensitivity to organizational members' needs, and deviation from the status quo. Charismatic leaders use these behaviors as part of a process to bring about change in their organization (Murphy & Ensher, 2008). Although charismatic leaders may hold formal positions of authority, their influence is based more on their personal characteristics by, for example, showing emotions rather than using their formal positions of authority and thus transcend formal organizational positions (Murphy & Ensher, 2008).

The rising complexities and uncertainties associated with modern building projects have necessitated the emergence of new leadership styles to navigate technological, societal, and ecological challenges effectively. Research by Whyte et al. (2022) stresses the need for leadership styles that can adapt to evolving technology systems, manage multiple stakeholders, and navigate the increased complexity and dynamics of organizations, all within the context of sustainability and resilience challenges. The research emphasizes the importance of implementing innovative forms of project leadership that foster transformative and inclusive social capital, enabling the effective management of complexities and the promotion of sustainability.

Whyte et al. (2022), therefore, introduces *socialized leadership*, which encompasses a commitment to project completion within budget, schedule, and quality, while also prioritizing broader-based values and purposes that extend beyond immediate project outputs to long-term societal considerations. This leadership style is more shared, distributed, and participatory than in the past, emphasizing building consensus and collaboration among team members to achieve a shared vision. This approach is particularly relevant in projects where environmental sustainability is a priority, as it requires the input of various stakeholders to ensure that the project meets sustainability goals.

Authentic leadership, on the other hand, emphasizes the importance of leading with genuine transparency and ethical behavior. In addition to managing projects, authentic leaders also serve as guides for individuals and visionaries for the future. Ofori et al. (2008) describe authentic leaders as influential in enhancing others' ability to perform better by providing support and creating conditions that stimulate the individuals "*to work hard, even extraordinarily hard, to perform at one's very best*". They challenge their followers by setting high-performance standards through their own conduct and examples by ex-

hibiting dedication, loyalty, and commitment; they embody the exemplars of genuine achievement. By fostering an environment of mutual trust, optimism, altruism, transparency, and openness within teams, authentic leaders effectively motivate and gain the support of their project teams and obtain project objectives (Ofori et al., 2008).

The introduction of socialized and authentic leadership styles is crucial in effectively navigating the increasing complexities and uncertainties encountered in building projects, particularly in the context of environmental sustainability. This becomes especially significant given the evolving environments of the building industry and the increasing awareness of "*soft skills*" in project management and leadership (Ofori et al., 2008). However, it is important to note that no leadership style can be considered the best in all circumstances and at all times, as context is a vital factor for the success and effectiveness of any particular leadership style. For this reason, researchers in the field have identified many more styles over the years, such as *transactional leadership*, which is more task-oriented and authoritarian to award or punish project team members, or *self-leadership* and *spiritual leadership* (Ofori et al., 2008).

All leadership styles discussed in this section involve the ability to change the behaviors and actions of the project managers' subordinates. This influence involves inspiring and motivating individuals to go beyond their personal interests and embrace broader-based values while challenging them to enhance their performance. According to the *APM Body Of Knowledge* (2012), this act of impacting others' behaviors and actions is commonly referred to as influence. Additionally, Müller and Turner (2010) define influence as the ability of a leader to persuade others to change a viewpoint based on the understanding of their position and the recognition of the need to listen to this perspective and provide a rationale for change.

Leadership Skills

Research by J. Zhang and Faerman (2007) found that approximately 80% of construction projects fail due to poor leadership and a lack of accompanying skills. Therefore, leadership skills are considered crucial for project managers to ensure successful project outcomes. A significant amount of literature on leadership has identified the necessary skills that project managers need to lead projects effectively. The Project Management Institute (2017) emphasizes that these skills must demonstrate essential capabilities such as negotiation, resilience, communication, problem-solving, critical thinking, and interpersonal skills. Table 3.2 presents a compilation of skills identified by other researchers in the field of project management.

Table 3.2: Leadership skills found in the literature

Author	Skills
Gido and Clements, 2014	Communication, interpersonal, problem-solving and time-management skills, and the ability to develop people and handle stress.
Sankaran et al., 2020	Communication, problem-solving and decision making, team building, conflict resolution, planning and goal setting, sense of responsibility, and time management skills.
Shi and Chen, 2006	Communication, interpersonal, coordination, team-building and delegation, problem finding, analyzing and solving skills.
Project Management Institute, 2017	Communication, negotiation, resilience, problem-solving, critical thinking, and interpersonal skills.
Trivellas and Drimoussis, 2013	Communication, conflict resolution, teamwork, decision-making and delegation skills.
Zulch, 2014	Communication, interpersonal, stress handling, problem-solving, management skills and presentation skills, and the ability to inspire and motivate.

Compared to conventional projects, sustainable building projects pose greater technical and social complexities, as discussed in Section 3.2, due to the increasing number of involved disciplines. Therefore, researchers have emphasized the need for project managers to enhance their skills in order to manage such projects effectively. Table 3.3 outlines the skills needed to manage a sustainable building project according to the literature. In addition, research by Anantatmula (2010) and Lambrechts et al. (2019) note that communication, as well as collaboration and teamwork, are essential skills for project managers in sustainable construction projects, which tend to be more complex than traditional projects due to the presence of multidisciplinary and inter-organizational project teams.

Table 3.3: Leadership skills for sustainable projects found in the literature

Author	Skills
Zulkiffli and Latiffi, 2019	Communication, planning and goal-setting, team building, motivation, decision-making and problem-solving, conflict management, negotiation, and delegation skills.
Hwang and Ng, 2013	Analytical, decision-making, team-working, delegation, and problem-solving skills.

Leadership in the Organizational Transition toward Sustainability

In addition to its significance in establishing and attaining project goals, leadership has also been linked to the transition toward sustainability in wider organizations in the building industry and other technical industries (Tabassi et al., 2016). Because leadership can also be understood as the capacity to bring about change in an organization's management and the individuals involved. As highlighted by Abbas and Asghar (2010), effective leadership is the key determinant of successful transformation and organizational achievement, necessitating the consideration of organizational and personal interests when pursuing specific goals (Zulch, 2014). Therefore, the role of the project manager as a leader is to consider changes in the organization's management in conjunction with the project's goals.

Silvius and Schipper (2014) noted that project managers play a crucial role as *"change agents"* within organizations, and have a significant influence on integrating sustainability in organizations. Accordingly, Jones et al. (2005) state that to ensure the achievement of sustainable development, project managers within construction, manufacturing, and other project-based organization need to inspire team members to integrate sustainability principles within the daily process of satisfying the client needs and project requirements—creating a culture of sustainability in day-to-day practices. However, despite the willingness of many firms in these industries to embrace sustainable principles and transform their business approaches accordingly, others remain resistant to the organizational shift and maintain their status quo. This resistance is often attributed to the uncertainty and complexity associated with transitioning from established socio-technical systems to more sustainable alternatives (Geels, 2011; Markard et al., 2012). In such organizations, projects may face challenges in gaining stakeholder support and realizing the agreed-upon sustainability benefits, posing barriers to project success.

Zheng et al. (2017) also recognize the pivotal role of leadership in the transition toward sustainability in project-based organizations. They highlight that the success of sustainable projects rests upon the effective leadership competencies of project leaders. Furthermore, their research emphasizes that leadership is essential for enacting and implementing an innovative organizational strategy and structure, promoting organizational learning, and motivating teams to pursue sustainability-related innovations. As the construction industry becomes increasingly knowledge-intensive in terms of sustainability, the authors argue that ongoing innovation aligned with sustainability trends is imperative, with leaders playing a crucial role. Zheng et al. (2017) state that leaders can stimulate knowledge creation by facilitating knowledge sharing and fostering strong relationships among team members and stakeholders. Project managers can use their leadership position to promote interaction, coordination, and open communication of ideas and approaches, thereby fostering mutually beneficial relationships within temporary project organizations in which the members and resources may be aggregated. Such relationships provide valuable resources, including information and advice, both among project members and external

stakeholders. In the context of building projects, where expertise in architectural design, installation, structural engineering, and sustainability is essential, project managers must ensure the right resources are available to the organization. Vice versa, based on project managers' need for knowledgeable resources, the organization must embed such essential knowledge in their workforce (Zheng et al., 2017).

As project managers are put in a unique position by the client to lead the project team, they can use their position to boost the sustainability performance in projects by utilizing their skills and influence their project team and organization to foster a culture of sustainability in everyday practices through the adoption of innovative sustainable concepts. Thus, aside from their traditional role of delivering a project based on the success criteria of cost, time, and quality (the Iron Triangle), project managers have a unique role as the sustainability driver to deliver a sustainable building project successfully. This is not only beneficial for the transition to sustainability (i.e., quality and technical level) of the construction projects, but it may also be beneficial for the sustainability (i.e., competitiveness improvement) of the construction industry and firms themselves, as sustainability is becoming an essential part of construction and building processes today (Mingaleva et al., 2022; Zheng et al., 2017).

3.4. Conceptual Framework

Project managers play a vital role in the success of building projects. While existing research has indicated that managers tend to allocate greater attention to the construction phase (Mujumdar & Maheswari, 2018), their role in the design phase is equally vital as they are held accountable and responsible for delivering the building to the client, which encompasses the design phase as well.

To ensure the achievement of defined goals and ambitions in building design, project managers must effectively fulfill both leadership and managerial roles. As managers, they are responsible for planning, organizing, and controlling the design process to ensure the project's successful delivery on time, within budget, and to the desired quality standards determined by the client. In addition, as suggested by Musawir et al. (2017), the incorporation of Benefit Management is crucial for addressing, measuring, and controlling the short- and long-term benefits associated with sustainability principles. In order to accomplish this, project managers must establish a robust governance framework that clearly outlines roles, responsibilities, and accountabilities for effectively managing benefits in addition to time, cost, and quality considerations. Leadership, as highlighted by Musawir et al. (2017), plays a vital role in achieving the intended benefits.

As leaders, project managers play a crucial role in exerting their authority and utilizing their leadership skills to influence, motivate, and empower both the client and the multi-disciplinary design team. The primary objective is to foster a collective vision on sustainability for the project and facilitate the integration of sustainability principles into the design process, drawing upon the definitions provided by Nikoloski (2015b) and Shackleton and Shackleton (1995). In order to contribute to sustainable development, project managers can strive to develop buildings that mitigate negative environmental impacts while maximizing social and economic benefits. They can exert their influence by prioritizing sustainability throughout the project and introducing the client and design team to the sustainability principles and benefits early on during the planning and design phase.

A combination of roles which is in line with the definition provided by Tabassi and Bakar (2010), wherein leadership is described as "*the process whereby a leader, with his intelligence and perseverance, influences a group of subordinates to develop their potential in order to achieve the organizational goals and ambitions within the set schedule and budget*".

Based on the theoretical foundation, three crucial aspects emerge that play a significant role in safeguarding sustainability during the design phase. The following sections provide descriptions of these three aspects.

Authority

Authority refers to the power conferred upon individuals holding formal positions within an organization (Braynion, 2004; Lunenburg, 2012). This power grants them the ability to influence and direct specific members of the design team, as well as make decisions. As leaders of the team and representatives

of the client, project managers assume the responsibility of maintaining an efficient project team to ensure successful project delivery (Fewings & Henjewele, 2019). Consequently, they are often entrusted with the authority by the client to make project-related decisions, including resource allocation and task assignment. However, the extent of the project manager's authority can vary depending on the organizational structures of both the design team and the client. In certain instances, project managers may have limited authority, necessitating approval or decision-making by higher-level managers. While in other cases, project managers may possess broader authority to make decisions and take necessary actions.

Therefore, project managers should use the extent of their authority and accompanying power, such as referent and expert power, to prioritize sustainability during the design phase of building projects. This involves influencing and directing their project team and the client to integrate and safeguard sustainability goals and ambitions.

Accountability

Architects, structural engineers, project managers, and other disciplines involved in the design process, including the project manager, should be held accountable for the sustainability outputs and the short- and long-term benefits of their contributions. This accountability extends beyond meeting the client's expectations regarding the timely delivery, budget, and desired quality standards at delivery (Sommerville et al., 2010). Clear roles and responsibilities are defined to establish accountability, accompanied by regular progress reporting and robust monitoring and evaluation processes (Fewings & Henjewele, 2019; Musawir et al., 2017; Rezania et al., 2019). These mechanisms guide the delivery process.

By holding design team members accountable for their work, direct output, and long-term benefits, as suggested by Musawir et al. (2017), there is an increased likelihood of prioritizing sustainability. Consequently, steps are taken to integrate and safeguard sustainability within the project's design.

Affective Influence

In accordance with Nikoloski (2015b), leadership involves exercising influence over others, wherein one person influences the thoughts, beliefs, and actions of other individuals (Liphadzi et al., 2018). As leaders of project teams, project managers can utilize their influence to motivate the adoption of sustainability principles within the design team. This can be achieved by creating a safe environment characterized by mutual trust, optimism, altruism, transparency, and openness, where sustainability is actively promoted (Ofori et al., 2008).

Based on the research on leadership and influence, a distinct domain of influence has emerged, known as the affective domain. According to Bloom et al. (1956), the affective domain primarily relates to the emotional aspects of learning, including emotions, feelings, values, appreciation, enthusiasm, motivations, and attitudes. In comparison, the cognitive domain deals with recognizing knowledge and developing intellectual abilities and skills (Bloom et al., 1956).

Therefore, in this research, the affective influence is identified as the means of influencing individuals to go beyond the status quo and improve their ability to innovate and adapt in their team environment (Tabassi et al., 2014). It serves to motivate and gain the design teams' support to obtain project objectives, including sustainability (Ofori et al., 2008), by creating a safe environment characterized by mutual trust, optimism, altruism, transparency, and openness where emotions are harnessed to promote sustainability and facilitate open communication and collaboration (Nikoloski, 2015b). This utilization of emotions aligns with the concept of emotional intelligence, which Mayer and Salovey (1993) define as *the ability to monitor the feelings and emotions of yourself and others, to distinguish and use this information to guide your thoughts and actions*.

When sustainability is promoted as a core value of the team through affective influence, it becomes easier to safeguard during the design phase. This is further strengthened by a "*commitment to broader-based values and purpose*," "*building consensus and collaboration*," and "*genuine transparency and ethical behavior*". Emphasizing the significance of values-based leadership directs the focus of the

teams toward the greater good beyond project completion, particularly with regard to the advantages of sustainability in building projects.

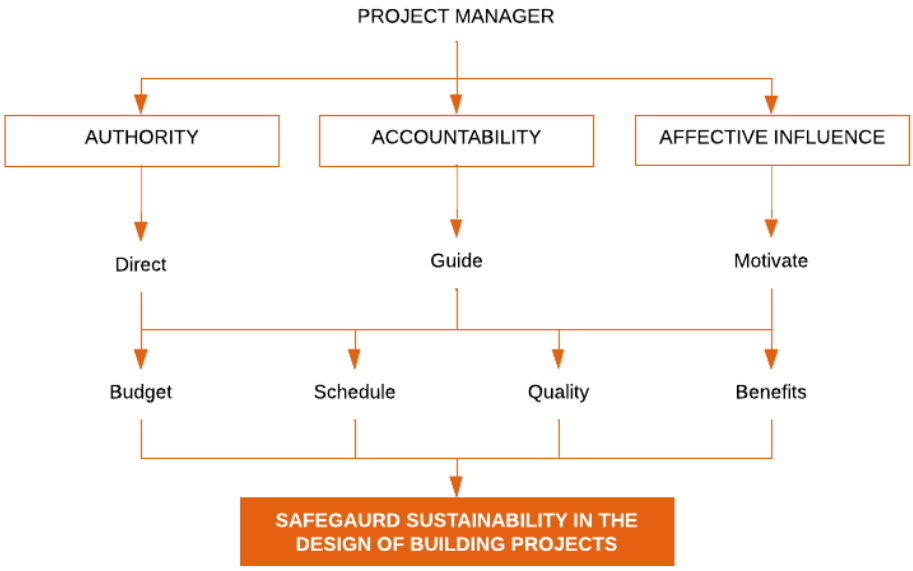

Figure 3.6: Conceptual Framework: Sustainability Safeguarding Framework (own work)

In conclusion, safeguarding sustainability during the design phase of a building project requires attention to three key aspects: authority, accountability, and affective influence. These aspects contribute to:

- Prioritizing sustainability by establishing direction and emphasizing the importance of sustainability from the outset of the design phase.
- Holding individuals in the design team accountable for sustainability principles throughout the design phase.
- Creating a safe environment within the design team wherein sustainability is motivated.

Overall, finding the right balance between the project manager's leadership and management role during the design phase can be crucial for safeguarding sustainability in the design of building projects. Figure 3.6 represents the three aspects in a conceptual framework, called the *Sustainability Safeguarding Framework*, that combines the topics elaborated on in the theoretical background. The model can be explained as follows:

"Project managers, acting as both managers and leaders, are responsible for integrating sustainability into project goals and ambitions, safeguarding them throughout the design process, and ensuring the delivery of a sustainable building within budget, on time, and with desired quality standards, including short- and long term benefits associated with sustainability, utilizing authority, accountability, and affective influence."

It goes without saying that a project manager's ability to succeed is elevated when the corporate organization embraces the same sustainability goals and ambitions within its corporate strategy and objectives, thus providing the project manager with a corporate culture and resources with a sustainability mindset (Mingaleva et al., 2022; Zheng et al., 2017).

4

Empirical Research and Results

This chapter provides the empirical research and results per case. The data is gathered by means of semi-structured qualitative interviews as described in 2.3. The semi-structured qualitative interviews are guided by the theoretical background and conceptual framework introduced in Chapter 3, called the *Sustainability Safeguarding Framework*. The questionnaires are focused on the project managers' involvement during the design phases and can be found in the Appendix in A.2.

The gathered interview data is analyzed using the Gioia method in conjunction with flexible-pattern matching. The analysis is also guided by the theoretical background and conceptual framework, which sheds light on moments of authority, accountability, and affective influence that emerged in relation to safeguarding sustainability in the cases. Appendix B presents graphic visualizations the analysis processes concerning three key aspects, including that of the barriers encountered towards sustainability.

After the cases are introduced based on the organizational structure, the following structure is used to present the results:

- **Interviewees:** For each case, the interviewees are introduced, including their roles and organization.
- **Vision on Sustainability:**For each case, the establishment of the project's sustainability vision and the influencing methods used to promote sustainability are discussed.
- **Authority:** This section identifies and analyses moments of authority during the design phases, in which direction is given by the use of authority and power by design team members toward safeguarding sustainability or other project priorities.
- **Accountability:** This section identifies and analyses moments of accountability during the design phase, in which team members are held accountable or responsible for the aspect of the building project, including safeguarding sustainability.
- **Affective Influence:** This section identifies and analyses moments of affective influence during the design phase, in which an environment is created within the design team by means of emotions, open communication, and collaboration wherein sustainability is safeguarded
- **Summary of Barriers Encountered During the Design Phase:** For each case, the barriers toward sustainability that arose during the design process are identified.

4.1. Case A: Inter-Organizational Building Project

Case A concerns a completed commercial building where people gather to engage in various entertainment and activities. The project was carried out by a multi-disciplinary, inter-organizational design team. The inter-organizational structure is defined by the contractual relationships between the client, (main and sub) contractors and the external project manager hired by the public, cost-driven client. The structure is illustrated in 4.1, and attached in the Appendix C.1.

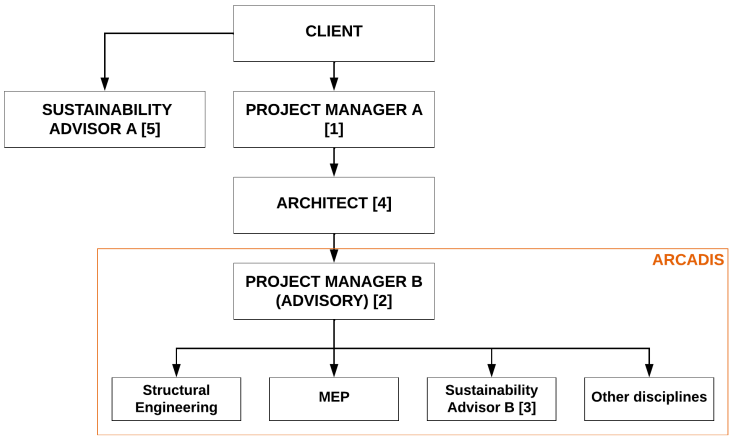

Figure 4.1: Organizational structure design team case A.

From the start of the project, the client chose to work with an external project manager who participated in the tender process for the project, including the selection of the architect and advisory roles. The external project manager hired an additional sustainability advisor role, directly advising the client during the call for tender and project execution while helping transform the client's overall organization toward sustainability. This role was filled by an employee previously working for the project manager's firm.

The architect and Arcadis jointly submitted a bid to the tender. To win winning, Arcadis teamed with the architect and became part of this project. The architect was the main contractor, and Arcadis was subcontracted to advise on mechanical, electrical, and plumbing (MEP), structural engineering, sustainability, and other disciplines throughout the design process and construction of the building. Within Arcadis, a project manager led a team of advisors.

4.1.1. Interviewees Case A

Case A involved two project managers, the external project manager, a senior project manager at a project management firm appointed by the client, i.e., Project Manager A, and the project manager appointed by Arcadis to lead the team of advisors, i.e., Project Manager B. Both project managers were interviewed. However, the focus will be mainly on Project Manager A as he was appointed accountable and responsible by the client for the execution and delivery of the project.

As there are two sustainability advisors involved, the one hired by the client is identified as Advisor A, and the Arcadis advisor is identified as Advisor B.

Both were interviewed, as well as the Architect. The interviewees of case A are listed in 4.1.

Table 4.1: Interviewees case A

Role	Organization
Project Manager A [1]	External
Project Manager B [2]	Arcadis
Sustainability Advisor B [3]	Arcadis
Architect [4]	External
Sustainability Advisor A [5]	External

4.1.2. Vision on Sustainability

At the kickoff, the multi-disciplinary design team was tasked to design an iconic building with maximum sustainability and an optimal user experience. However, the project was not initially conceived with a vision of maximum sustainability. Before the tender request, the client's vision was for it to be an iconic building and did not yet include sustainability, as both project managers state in the following two quotes:

> *"When we started working on the project, I felt that there wasn't really a sustainability vision laid down by the client. Not for the whole company anyway, but not for this project either."* [1]

> *"The client came with the requirement that it be visible and iconic [...], so there were actually two things that came together in the tender competition, but sustainability did not come from the client at all."* [2]

Sustainability Advisor B states that the client required significant guidance and direction toward a vision on sustainability which originated from the municipalities high cradle-to-cradle goals. Cradle-to-cradle is a sustainable concept that focuses on the reuse of materials by means of zero-waste production or recycling, which leads to no negative impacts on the environment. Thus, using materials circulating in a closed loop without losing any natural resources (El Haggar, 2010). This was an eye-opener for the client, and from here, the client, with Project Manager A and Sustainability Advisor A, started looking at how the project and the organization could implement sustainability. However, it had to be cost-effective sustainability, as the client was a cost-driven organization. Since sustainability could be related to costs, rational choices were also made involving sustainability. Weighing the various options logically, focusing on the maximum achievable for the project, as stated by Project Manager A:

> *"Importantly, there should be the talk of cost-effective sustainability. If it makes money or doesn't cost any money, you have no reason not to do it, so to speak. Thus looking over the whole spectrum, not only over the construction period, but also the maintenance period. If in the end, it doesn't cost money or even makes money over long term, then we should do it and let's focus on those items in particular."* [1]

In order to shape this vision, the decision was made to use a sustainability assessment method, the Gemeentelijke Praktijk Richtlijn (GPR). GPR was chosen for the project as it gives clear guidelines for integrating sustainability in building design based on five themes; energy, environment, health, quality of use, and future value, as described in Section 3.1.3. In addition, the building also became eligible for subsidies upon achieving a minimum GPR score of 8. The eligible subsidy totaled 1.8 million euros, forming a significant part of the project's budget to integrate sustainability. As a result, a strong focus was put on achieving a minimum GPR score of 8, both in the tender document and during the project's design and execution.

In the end, the client was very enthusiastic about sustainability and its opportunities. Ultimately sus-sustainability became an essential part of the project's vision based on the cradle-to-cradle vision of the municipality, the possibility of cost-effective sustainability, and eligibility for subsidies. With this vision in mind, the client, with Project Manager A and Sustainability Advisor A, issued a call for tenders for an iconic building including cost-effective sustainability. The tender was eventually won by the Architect,

in collaboration with Arcadis as advisory under a sub-contract, based on a concept design with very high sustainability goals and ambitions.

After winning the call for tenders, the Architect and Arcadis started collaborating on the final design. In the process of developing the winning design concept, Project Manager B states that to ensure a truly sustainable concept and fitting sustainability principles, a sustainability advisor was included in the Arcadis team early in the design process:

> *"Here quality consisted of two things: creating an iconic building and creating a sustainable building. Thus a very clear vision of sustainability had to be laid down in the competition. Therefore we had a sustainability advisor on our team from the beginning. Apart from an insulation advisor, structural engineer, building physics advisor and all those technical advisors."* [2]

Project Manager B argues that Sustainability Advisor B from Arcadis played a very significant role in the design phase to promote and integrate sustainability.

> *"In the initial phase and later on sustainability with Sustainability Advisor B, we just had a really good story, where both the Architect and the client could clearly explain what are the good things to do, what is effective and what is not effective."* [2]

Throughout the design process, several drivers, i.e., key factors, greatly influence the result and motivate people to take action in safeguarding the sustainability goals and ambitions included in the winning concept design. Sustainability Advisor B indicated that his role with Sustainability Advisor A was to define and safeguard the sustainability concept. He defined the concept by looking at what fits the client's organization best which involved detailed knowledge in the field of sustainability to propose sustainable alternatives, such as insulation materials—resulting in an integrated sustainable concept that matched the functionality of the iconic building and did not necessarily increase the costs through optimization of the various involved disciplines. As the design progressed, he had to safeguard the sustainability concept. Five factors were decisive:

1. Cradle-to-cradle vision of the municipality.
2. The long-term economic benefits; cost-effective introduction of sustainability.
3. The GPR score required for the accompanying subsidies.
4. An integral design with all disciplines interconnected.
5. The power of the concept and the team buy-in, through conviction and persuasion of the overall story.

Based on the vision, the design team developed a final design using circular and bio-based materials, including a wooden structure. The building uses natural energy sources through photovoltaic (PV) film on the roof and collects rainwater for the greywater circuit. Additionally, attention was given to the natural ecology of the surrounding environment by creating ecological quality into the landscape of the building through green plant walls that serve as a habitat for insects and other organisms.

The building, as completed, has many sustainability features; however, modifications were made throughout the design process. Even though many attempts were made during the (planning and) design phase to incorporate all the sustainability principles from the tender's concept design into the final design, barriers arose which prevented this, which led to the dilution of several sustainability principles, which was what Sustainability Advisor A predicted:

> *"we really have so many sustainability measures in the tender document from the Architect and Arcadis, and some things I knew in advance: well, that can hardly be true, they're never going to live up to that. Well, that also turned out afterward. because of course you also have to deal with business cases and feasibility and things like that."* [5]

4.1.3. Authority

The interviews indicated that in defining and safeguarding the vision on sustainability during the design phase, several design team members, including the municipality, client, project manager, and architect,

utilized their authority. The sustainability vision of the building originated from the municipality's high cradle-to-cradle goals. Here, the municipality used its position of authority and legitimate power over the clients' organization to comply with their cradle-to-cradle vision; otherwise, they would not be permitted to build on the desired location:

> *"And the incentive to implement sustainability, or the first time that penny dropped with us, and we thought: 'Oh yes, oh yes, we do have to incorporate sustainability into the project as well.' Was actually because of contact with the municipality."* [1]

> *"At the same time as the purchase of the land and the zoning plan changes, we, as project management, brought in Sustainability Advisor A, the sustainability expert, to first discuss with the client and their executive board to determine what the vision for the client's organization will be in terms of sustainability, and what we can take from that for project A."* [1]

Consultation with Project Manager A and Sustainability Advisor A, who was recruited to the project by Project Manager A, led to the transformation of the strategic vision of the client's entire organization toward sustainability, including this project, with the municipality's vision having had the most significant influence on the establishment of the clients' sustainability vision of the project. The benefits of sustainability, including long-term economic advantages for the client, such as energy savings, were also considered. As the design progressed, the municipal cradle-to-cradle vision exerted power over the project and helped promote and safeguard sustainability.

Project Manager A states that he grows richer from experience and intends to directly engage clients to discuss sustainable practices in follow-up projects that display clear sustainability possibilities and ambitions, especially as it is demanded by society. He acknowledges that this requires a significant investment of time besides financial resources and emphasizes the need for intelligent and strategic thinking throughout all project phases.

> *"So if you ask me, I have taken a step in that direction. But that is purely because I have dealt with the subject through projects. I'm not really looking for the "we must, we must, we must" mentality. But we do have to because it's demanded by society."* [1]

Moreover, he stresses the importance of involving the appropriate individuals in this process. He states that he is a project manager is concerned with managing the project, and he is not a sustainability expert. Therefore, if he wants to incorporate sustainability into a project, he does not have the passion for convincing a client. He states that in his position, he should seek out those individuals, those parties, who possess the passion and are specialists in the field of sustainability. Also, giving them a position in the design team, which, as indicated in the interviews, can sometimes be challenging. Project Manager A claims that he finds this learning process challenging, to step outside the boundaries with the client to come up with concrete plans based on enthusiasm, innovative ideas, and out-of-the-box thinking. Therefore, he would always have to rely on a specialist in this area, and it is up to him to involve such specialists:

> *"But it is up to me, as the project manager, to sense whether that is necessary and to keep them involved in the process. And that's where I see my role, so on the one hand, creating awareness about asking questions at the beginning, in the initiation phase with the client."* [1]

Project Manager A's advice for project managers seeking to promote sustainability is to include passionate individuals in the design team who specialize in sustainability. These specialists approach sustainability with a sense of societal and intrinsic commitment, sharing their stories while exploring the potential benefits that can be achieved with little or no cost and possibly generating revenue, further elaborated on in Section 4.1.5.

Later on in the design phase, as the design progressed and became more detailed, Sustainability Advisors A and B indicated that Project Manager A decided that both Sustainability Advisors A and B were no longer necessary, as the GPR calculations became the only focus for the design teams, and no further sustainability additions were deemed necessary. Here, Project Manager A again used his authoritative power to ascertain the team's composition.

The interviews also indicated that a hierarchical order emerged in the inter-organizational design team. Project Manager A and the Architect stood above Project Manager B and his team of advisors from Arcadis, as they were under subcontract by the Architect. Project Manager B and Sustainability Advisors A and B acknowledge that this led to a power and position imbalance between the team members during meetings and moments of decision-making. Usually, in projects that assert an integrated design approach, all disciplines are involved in the decision-making process to ensure the client makes substantiated choices. However, due to the hierarchical order created by the inter-organizational structure, specific disciplines, including sustainability, were only sometimes involved in the decision-making process; Project Manager B explains this led to the dilution of several sustainability principles. The experts could not safeguard them as they were not involved in delivering their story and argumentation on the proposed alternatives:

> "*And hierarchy is that the project manager is the one who often talks in the steering committee with the Architect, the client, and the board. Yeah, you, as an advisor, will never get there. So the fact is they always have to deliver the message of your story. And they're obviously much less able to do that than you yourself*" [5]

> *"I was sitting at the table with the client, but the Architect was the main contractor; he had the final decision. So I had a lot of direct contact with the client, but when we had to make decisions or make cuts, I would sit at the table, or sometimes not. But often, we sat at the table as advisors, but then the Architect was our boss, our client."* [2]

Similarly, the interviewees spoke of not having the position or power to speak out due to not being involved in decision-making as well as the hierarchical position and power which the architect had over the team, as Sustainability Advisor B states:

> *"The moment the Architect is in control of the project, then that means you have less position in the design team if you are not careful."* [3]

Consequently, this led to discussion and conflict in the design team involving the dilution of sustainability principles which led to powerlessness, as the Architect had priorities other than sustainability. When asked*"So there was a certain kind of hierarchy in that regard?"*, Project Manager B replied accordingly:

> *"We had a lot of trouble with that too. It also caused some conflicts. I can tell you that it is not easy to work on behalf of an architect. We started out very equally, but ultimately, if someone wants to get their way, they will use their power position."* [2]

Stating that, in a project of this nature, a hierarchy is always present, with the Architect typically assuming the role of leader, to which the team must adapt. An example of such a discussion that occurred during the design process was in regard to the facade of the building:

> *"The thing that did come into play [...] is that we fell under the Architect as Arcadis. The Architect was the main contractor. [...] Glass is not sustainable, and LED lighting is a sustainable way of lighting, but there are much more sustainable options for a facade.[...] I wasn't in the position to go to the client and say: 'wouldn't you encourage that architect to make that facade a little simpler because then you can spend a little more money on sustainability'. [...] but ultimately, the Architect was the one who sat down at the table with the client and pulled the strings. That's one thing I couldn't do anything about as a project manager."* [2]

Even though the advisors faced challenges in establishing their position, Sustainability Advisor B contends that monitoring the GPR score ultimately provided him with a sufficient foothold. In this, Project Manager A played a supportive role:

> *"Project manager B played an important part in giving me a position. On the one hand, I had a position because I simply knew a lot of things that people needed to know, and conversely, I had to know things from various people. So, Project Manager B was an important link there, to make that clear. We had quite a bit of discussion with the Architect and the client about the time needed to achieve sustainability. Because it was above average, but then again, project manager B was very important."* [3]

> *"A circularity or sustainability advisor really needs to have a strong position at the table, knowing what he or she is talking about. So having expertise, stand firm on the basis of arguments, just stating that it is as it is. And yes, that is quite a challenge for many people. Especially with project managers, who tend to act fairly hoity-toity nowadays."* [5]

The latter quote by Sustainability Advisor A also highlights the significance of sustainability experts holding a prominent position within design teams. This requires expertise, maintaining a resolute stance on arguments, and confidently expressing their knowledge. However, a challenge arises when project managers exhibit an arrogant attitude. In this case, when hierarchical structures hinder the experts from obtaining influential positions while others gain more power and authority on occasion.

However, the client has the highest authority in the design team, as the client's organization will be the future user and finances the project. As such, they have a significant financial investment in the project and therefore have the highest authority. They have the final say on all major decisions related to the project, including selecting the design team and approving the design concepts, including those focusing on sustainability. Thus, as stated by Sustainability Advisor B, the client steered the design team in two ways:

> "*The client steered in two ways. A, they had used an external sustainability advisor* [Sustainability Advisor A] *as a guard, who was my counterpart. And B, of course, they had the GPR and a number of other criteria that they now had to meet. Particularly the GPR for the subsidy, which was about 1.8 million euros. Those were two important drivers from the client, and the municipality was long happy that everything was going to plan. So that was quickly covered.*" [3]

As described in Section 4.1.2, GPR was chosen by the client for the project as it gives clear guidelines for integrating sustainability in a building design and the project's eligibility for subsidies upon achieving a minimum GPR score of 8. As the client was cost-driven, this played a significant role in the client's decision-making during the design process, which, at one point, was vital for the project's financial feasibility. Likewise, this also played an important role in the project manager's decision-making during the design process, as he states that "*we actually unburden the client from the beginning to the final question.*" Indicating that the project manager needs to address and safeguard all client priorities, including those beyond sustainability when making decisions and directing the design team, as they are burdened by the client to complete the project successfully. Sometimes considering budget over sustainability, as Project Manager B asserts:

> *"But finance was ultimately the key issue. It just had to be within the budget point. So, from that side, they took the decisions regarding that. "* [2]

4.1.4. Accountability

Similar to Project Manager's A statement on unburdening the client in the previous section, Project Manager B asserts that project managers are hired by the client to organize the project for them so they do not have to do it themselves:

> "*For a lot of people, a project manager is someone who organizes the project for the client, so to speak. [...] The client hires a project manager to make sure something gets built.*" [2]

To ensure the successful completion of a project, Sustainability Advisor B emphasizes the need for the project manager to promote collaboration and communication among team members, particularly due to the integral nature of the design. The advisor further highlights that as design integrality gains significance, the project manager must ensure that team members possess and exchange accurate information. Failing to do so may result in a return to old routines and a fragmented approach to work multi-sectorally.

> "*That's really your role* [as project manager]*that you must make sure that everyone does their thing and that everyone is considerate of each other because that doesn't always happen.*" [4]

Furthermore, the Architect argues that the project also required good coordination by the project manager to ensure a strong and aligned design team. The project manager needs to ensure that everyone

is aligned and coordinated in the execution of their tasks, avoiding divergence. Moreover, the Architect states that the project manager must ensure everyone knows each other's roles and responsibilities, and drawing this up in contracts, clearly define the demarcations at the beginning. Without this, Sustainability Advisor B states that design team members tend to work multi-sectoral, focusing only on their own disciplines and not integrally. Thus a balance needs to be maintained. The Architect reinforces this by stating:

> *"You're a spider in the web, and you have to inform everyone in a structured way about what is happening, which is quite a job. So you have to know very well what's going on with everybody. Moreover, you also have to make sure that everyone takes account of each other and that this is coordinated. Furthermore, the project manager also has to be able to signal when you think: 'Hey, something is not going well here, this is going to fly off track with costs, and this is going to fly off track with this and your advisors often don't take that into account.'"* [4]

The interviewees also point out that it is essential that the members of the design team play their proper part within the team. By this, they mean that everyone operates in their assigned role of expertise and strength. For example, do not let the architect solve a structural engineering task. The project manager must ensure that the right people are allocated to his project for the specific work packages in hand, which according to the Architect was managed well by the project manager, and reinforced by Sustainability Advisor B:

> *"Hold the positions sharp; 'Best architect, you are not the only and best, and installation, you are not the only and best, and I am not the only and best.' Moreover, we do this together, and then we make the best plan together. And that relationship is still sometimes skewed."* [3]

> *"I think we were working with a strong and well-coordinated team."* [4]

In this respect, the interviewees do indicate that it is essential that the goals and objectives are concrete and well-documented in the project plans so that everyone understands them and takes their and other roles and responsibilities into account. This is also in line with the GPR assessment method. Sustainability Advisor B states:

> *"I am not necessarily the most prominent advocate of these kinds of systems, but you need to have some kind of indicators set with elaborations of relevant things to them so that very practical people also know what to do and what not to do."* [3]

Besides the eligibility of subsidies with a minimum GPR score of 8, the GPR assessment method also helped to make sustainability more tangible and measurable for the design team and easy to measure and control during the design process as sustainability became linked to costs, i.e., whether all the sustainability disciplines were integrated and safeguarded in the design, contributing to the score. Project Manager A states the following on the use of GPR:

> *"But again, that was cost driven. In the knowledge, if we scored on all those five components of the GPR and at least an 8 and we could also prove it at the end, then you are entitled to a subsidy. So then afterward, you get a large sum of money back because you incorporated sustainability into the project. So we were very much looking for how can we make money and sustainability go hand in hand."* [1]

> *"Sometimes it goes too far, emotionally too far, because then it's really only about thinking outside the box, and elements don't become concrete. That's where I often draw the line of, okay, but that's really not going to fit in the project."* [1]

The latter quotation by Project Manager A reflects his concern about the balance between creativity and feasibility in a project. He acknowledges the value of thinking outside the box but emphasizes the need for concrete and practical solutions that are tangible and measurable. Here, the phrase "*drawing the line*" suggests a decisive action taken to ensure the project remains on track and consistent with the client's priorities. For this reason, routine checks were done throughout the design phase to check whether the sustainability requirements were being met on the basis of documented proof submitted

by the different disciplines of the design team. In monitoring the GPR score, the sustainability advisors played significant roles in collaboration with the two project managers.

> *"Not so much adding more, but guarding, that the right thing stays in there. And keeping the right thing in there was actually very easy for me too, because everything was expressed to GPS score"* [1]

> *"Then, as architects, we worked out several variants, two or three, and then we sat down with their cost experts from the Project Manager A, and we looked at which variant was the best within the costs."* [4]

However, the interviews did reveal that during the design process, Project Manager A occasionally failed to fulfill the expected role of encouraging communication and collaboration. Project Manager B and Sustainability Advisors A and B recognize the need for more structured and formal collaboration with the design team members, especially during meetings and pivotal decision-making moments related to sustainability. As a result, the distortion of information led to unsubstantiated decision-making as the various disciplines were not present to substantiate their proposed alternatives. Project Manager A also acknowledges the insufficient collaboration during the design phase, and closer collaboration could have fostered stronger relationships, enhanced mutual comprehension among design team members, and built trust, further elaborated in 4.1.5.

> *"I have to say honestly, that maybe that was not done enough in the design phase [...] we could maybe have done that a little bit more to then get a better understanding with one another. The Architect had another internal project manager from the design team as well. I had quite a lot of contact with him, so I didn't really have a handle on the entire team; someone from the Architect was supervising them. But that could perhaps have yielded a little more at that phase, at least a better collaboration and understanding at that time."* [1]

The interviews indicate that Project Manager A steered toward integrating and safeguarding sustainability, however, only to a certain extent. From the perspective of Project Manager A and Sustainability Advisors A and B, this was caused by his traditional way of managing projects based on time, cost, and quality. Here, sustainability was subordinate as part of quality but to a certain extent; when sustainability did not cost money or its return on investment was positive in the long term.

> *"The project manager steered mostly on time and money, and also some sustainability aspects, but sustainability as far as it doesn't cost money."* [3]

Project Manager A mentioned during the interview that he indeed is a traditional project manager and may not have held sustainability in a high priority:

> "*Look, I am not a sustainability guru. I represent the customer's interests on money. On the prominent elements. I do not know if you are familiar with these from your studies; money, organization, time, information, quality and risks are often mentioned?*" [1]

Focus on traditional management criteria and practices may have led to the dilution of sustainability principles in the design phase, as decisions were made based on cost rather than the benefits of sustainability. Significantly when certain sustainability principles did not contribute to the GPR scores and related subsidies. A reason for this may be that the project manager's firm does not have its own intrinsic goals and ambitions toward sustainability; sustainability is not yet embedded in their organizational strategy and culture, as Project Manager A states:

> "*When we started working on the project, I felt there wasn't a sustainability vision from the client. Not for the whole company anyway, but also not for this project. And not really from us either. So, not from project management either.*" [1]

The fact that both the client's and Project Manager A's organization lacked sustainability vision and culture may have amplified the focus on traditional qualities. This will also be discussed in the Section 4.1.6, which focuses on the barriers to sustainability encountered in the design phase.

Nonetheless, Project Manager A continues to explain that the S of sustainability, cradle to cradle or circular, has become an essential aspect of projects and can be added to the traditional success criteria of time, cost, and quality and that he is now also tasked with monitoring, creating, and steering

toward sustainability. However, the project manager needs to keep all aspects of the project in balance, sometimes at the expense of sustainability, as Project Manager A states:

> *"I am simply a dedicated project manager who ensures my client is satisfied with all those components. I try to keep them all in balance, you know?"* [1]

> *"To steer very tightly at the front end, right away on costs, and also to design more intelligently. For example, that's something I thought Project Manager A did very well."* [4]

Project Manager A also stated that at the beginning of each project, he determines with the client what is most important: *"Are factors such as time or money crucial? Or is it sustainability that matters?"* Having this discussion at the start of the project makes it clear on what basis decisions must be made. He asserts that this approach was also followed for this project, resulting in the successful completion of the project within budget, which was deemed critical by the client as they were cost driven, explained in 4.1.2. While the project was not completed entirely within the specified time frame, it was still delivered with a certain level of iconic and sustainable quality.

Project Manager A further explains that architects often want to take on this role, which may be their disadvantage, as one could argue that there could have been much more sustainability incorporated into the design, which is undoubtedly true. He acknowledges that if he had not been involved and the Architect had taken on the project manager role, then the quality would have been too heavily focused on aesthetics and sustainability, as creative people often want to do more and more, even if it results in going over budget. This can lead to conflicts with the client when they do not want to invest further. Therefore, it is the project manager's responsibility to maintain balance while using the advice from the Architect and the advisory team of Arcadis, and considering the time and cost factors when making decisions, ultimately leaving the choice up to the client. Project Manager A explains that linking sustainability to money with GPR makes this much more straightforward and keeps the client committed to sustainability in his decision-making.

4.1.5. Affective Influence

As described in the previous section, the project manager's firm did not have its own intrinsic goals and ambitions toward sustainability. However, in order to promote and safeguard sustainability, the project manager argues that he did find that his role was to create awareness about sustainability and seek those who are passionate and specialized in sustainability. Specialists who approach sustainability with a sense of societal and intrinsic commitment, share their stories while exploring the potential benefits that can be achieved with little or no cost and possibly generating revenue, as outlined in the following quotes.

> "*Honestly, for me it is not an intrinsic thought: 'Oh, that has to be sustainable, sustainability, sustainability!*" [1]

> *"That is where I see my role, on the one hand, creating awareness of the importance of asking questions in the beginning, in the initiative phase. Now, you can push a little bit because sustainability cannot be ignored today. [...] And when I see clients and speak to them about it, or do not speak to them about it, that could also be the case, right? That is when you say, " Okay, maybe it is a good idea to bring in that sustainability guru and let them tell their story." And see what you can achieve with sustainability without it having to cost money and actually saving money instead."* [1]

> *"The people who are involved in sustainability, those specialists, they do it from a societal commitment and from their intrinsic involvement."* [1]

In the early stages of the design process, Sustainability Advisor A, as the specialist, collaborated with the client and Project Manager A to incorporate sustainability into the strategic vision of the entire organization, including the building project.

> *"That is the strength of Sustainability Advisor A, he made the client's organization think more of sustainably and integrally, which is what I tried to do in our organization with the project and the Architect, among other things. He used this project as part of the client's transition, so he has the same mindset as me in that regard."* [3]

The municipality's vision had the most significant influence on the establishment of the clients' sustainability vision of the project, as they were only permitted to build on the desired location with a sustainability vision that was considered cradle-to-cradle. Educating the client on the benefits of sustainability, including long-term economic advantages for the client, such as energy savings and subsidies accompanying the minimum GPR score of 8, also contributed to the establishment of the vision.

Sustainability Advisor A stated that the client required significant guidance and direction toward sustainability. They achieved this by jointly visiting reference projects. As no circular buildings with this type of function existed at the time; sustainable buildings with different functions were visited. These buildings were exemplary of what is possible regarding sustainability and explored the theoretical potential of the building to be realized under the contract.

As described in Section 4.1.2, in developing the vision on the sustainability of the winning design concept and safeguarding it, Sustainability Advisor B also played a very significant role. Project manager B states that to ensure a truly sustainable concept and fitting sustainability principles for the client's organization and the building's function, Sustainability Advisor B was included in the Arcadis advisory team early in the design process:

> *"It's about figuring out what your client needs and how you can assist them. If you can achieve that role, you have a lot of influence."* [2]

Sustainability Advisor B underscores the importance of collaboration in this process and jointly developing the concept, in other words, vision, of which everyone is enthusiastic. After which, the process is organized in more detail to realize that concept, or as Sustainability Advisor B calls it, "*dream.*"

> *"Because if you start with the details, you'll never end up with such a special throne."* [3]

The first step, therefore, was to jointly develop a concept that everyone is excited about and thinks: "*cool!*". Furthermore, Sustainability Advisor B notes that when design team members do not collaborate, they will revert to their old routines, developing solutions and solving problems multi-sectorally. By working multi-sectoral, the design team will lose the dream they initially found appealing. Furthermore, he emphasizes that it is about influencing, transitioning, and bringing people along and "*that motivation is much less when people have to do something than when they want to do it.*"

In Case A, Sustainability Advisor B harnessed "*the power of concept*" to motivate the design team members by emphasizing their involvement in something new, unique, and iconic, particularly in terms of sustainability, thereby safeguarding it. For instance, when faced with budget constraints and trade-offs, Sustainability Advisor B utilized the concept's influence to persuade team members to adhere to sustainability principles. This is supported by the assertion of Sustainability Advisor B that decisions often revolve solely around budget considerations without conscious awareness. Nonetheless, by adhering to the initial vision or concept, the team can better uphold the integrated and sustainable intentions, as recommended by Sustainability Advisor A: "*stick to the power of the concept.*"

> *"Also with regard to budgets when budgets got more expensive:'Yes, but the story!'"* [3]

Furthermore, Project Manager B significantly emphasizes the relationship between early involvement in a project and the extent of influence one can exert over it, including sustainability concerns. He highlights the importance of proactive engagement during the initial design stages of a project, as such efforts can have a substantial impact on the progression of the design and the sustainability outcomes by changing the client's mindset on sustainability as well as others in the design team:

> *"In the beginning, it's about getting people enthusiastic and excited so that they sometimes choose a sustainable option instead of a luxury option or something like that. So, it's about changing the mindset in the beginning."* [2]

The latter quotation suggests that promoting sustainability in a project requires changing the way people think and feel about the choices they make. Project Manager B was also explicitly requested to address the following question: *"How do you envision the role of the project manager evolving in light of the increasing emphasis on sustainability in building projects?"* Based on experiences with this project and previous comparable projects, Project Manager B believes that the project manager should ensure two things from the beginning of the project. First, the project manager should establish a trusting relationship with the client, as this is the foundation for the second goal: to inspire the client's enthusiasm

for sustainability. Project Manager B further explains that this can be achieved by organizing additional sessions and workshops to ensure the client shares the same ideas about sustainability as the project manager. This approach benefits the entire project team, as it helps to get everyone on the same page.

> "*Invest some energy into it, organize a workshop, or invite an inspiring speaker. Make sure to find a way to get the client excited about that sustainability aspect. Bring Sustainability Advisor B along; people always get very enthusiastic about it.*" [2]

According to Project Manager B, by establishing a positive mindset beforehand, conversations become easier, rather than approaching the client later with the option of choosing between sustainable and non-sustainable alternatives. Thus, it is better first to cultivate the client's interest in sustainability and change their mindset.

Project Manager B also emphasizes establishing a trusting relationship with the client, as it is essential for effective communication and decision-making. And highlighting the importance of expertise and credibility in influencing the client to make informed choices, especially when it comes to sustainable decision-making.

> "*Because at the moment that you are in that role and the client trusts you and sees that you can deliver what he wants, he will also listen better to you when you say that you would make a sustainable choice there and not a short-sighted choice or the luxury choice.*" [2]

The latter quote of Project Manager B, emphasizes the importance of safeguarding sustainability by building relationships based on trust and mutual value creation, not only with the client but also with other design team members. The project manager acknowledges that during the design process, difficulties were encountered in establishing these relationships due to indirect communication and insufficient collaboration, which negatively impacted the ability to safeguard sustainability.

> "*We had an architect who could actually hold us back when we wanted to do things. So it was challenging if we wanted something with the client; it always had to go through him. That made communication difficult and indirect, which made especially building trust difficult. You work best together when you work as a team that has trust in each other. And that was difficult in various places, but also between the architect and project manager. There were occasional breaches of trust in those chains, so to speak, and if there is no trust in just one chain, communication doesn't flow smoothly.*" [2]

Project Manager A acknowledges the lack of collaboration during the design phase and recognizes that closer collaboration could have led to stronger relationships, improved mutual understanding among design team members, and built trust (Section 4.1.4). Encouraging communication and collaboration within the team is crucial for fostering a positive atmosphere and trust, but the approach may vary depending on the preferences and style of the project manager, as argued by the Architect.

> "*Working together and simply calling, good atmosphere and tuning in with each other. And yes, commitment, that's also a bit in your character, I think, how you do that.*" [4]

Furthermore, the Architect asserts that to achieve a successful project today, including sustainability, project managers need to acknowledge the significance of sustainability across all project layers and effectively communicate this notion to the advisors, followed by ensuring a collaborative and synchronized approach among the advisors:

> "*If you want to establish a successful project in this day and age, sustainability is simply a fact that cannot be ignored. Sustainability encompasses all aspects of a project. As the project manager, you must effectively communicate this ambition to your advisors. Then, you must ensure that all advisors work together and run in the same direction, and collaborate with one another. This can be quite a challenge.*" [4]

Thus, the Architect argues that besides the project manager needing to have "*alles goed in de smiezen heeft*", which translates to "*has a good handle on things*" in English. He needs to be able to control all the aspects of the project in a way that inspires enthusiasm in everyone on the design team, including the client. Also, he needs to ensure that everyone is in their correct position so that they feel they can make a real contribution to the project. This way, the project manager can ensure a great project. The Architect continues that "*the project manager should only assign tasks to design team members they*

are comfortable with and create a good atmosphere within the team". If all these conditions are met, the project can be completed within the allotted time and budget. This coincides with Sustainability Advisor A's notions that a positive ground attitude is needed in design teams to ensure the project remains enjoyable:

> "*It should not be seen as a burden for the people who have to work it out and get started with it. And you do that on the one hand by telling it enthusiastically, and I think communication is very important.*" [5]

Sustainability Advisor A continues by saying that two aspects are significant: effective communication and expertise. The project manager must generate a positive team spirit to prevent sustainability from becoming an obstacle for those responsible for implementing it. A positive team spirit can be achieved by enthusiastic communication. Sustainability Advisor A emphasizes the importance of verbal and substantive content, supported by substantiation tools, when making sustainable choices.

As the interviews reflected on the increasing emphasis on sustainability in building projects, Project Manager A states that he grows richer from experience and intends to directly engage clients to discuss sustainable practices in follow-up projects that display clear sustainability possibilities and ambitions, especially as it is demanded by society. He acknowledges that this requires a significant investment of time besides financial resources and emphasizes the need for intelligent and strategic thinking throughout all project phases.

> *"This is how I am; through experience, you become richer and through more projects. And what is also just the case, sustainability is increasingly being prioritized. For myself, it has become more of a given, an awareness that you can't do without sustainability."* [1]

4.1.6. Summary of Barriers Encountered Toward Sustainability

In the previous section, a number of barriers were mentioned that may have caused the dilution of a number of sustainability principles from the design. However, throughout the design phase several other barriers arose. The encountered barriers are summarised and visualised in Appendix B.1, and can be divided into four themes, i.e., categories of barriers related: economic, technology, awareness, and organizational barriers.

Economic barriers

Even though the winning design had very high sustainability goals and ambitions, sustainability principles were intentionally diluted during the design development due to financial considerations.

> *"We started with very high sustainably, but it dropped a bit under the influence of finances."* [2]

After winning the tender, Project Manager A estimated the design cost, which was too high. Due to the high cost of the design, savings led to the dilution of several sustainability principles to ensure the costs stay within the budget. Especially as the client was cost-driven and did not want to increase his budget for sustainability as not all sustainability principles were cost-effective. Project Manager B states that "*there was a trade-off between budget constraints and sustainability concerns*".

> *"Although life-cycle costs were discussed, the client was not receptive to this approach. While many sustainable measures may lead to financial benefits in the long term, this client was not willing to increase the construction budget."* [2]

Even though achieving a minimum GPR score of 8 was a driver in achieving high sustainability in the project and becoming eligible for subsidies, it also became a barrier as only contributing sustainability aspects of the design were safeguarded. The interviewees highlighted that non-contributing ones were not included due to costs. In order to win the tender, the Architect, together with the advisors of Arcadis, included many sustainability principles. Also, those that the GPR assessment method does not take into account in their score. For this reason, principles that did not score within GPR and thus did not contribute to the prospects of subsidy eligibility were diluted from the design as they, for this reason, had no added value in receiving the subsidy and would only cost extra money. This creates resistance to doing more and exceeds the GPR minimum.

> *"What happened next was that there was a subsidy of about 1.8 million in return for the GPR. So everything that scored in the GPR score, all sustainability measures that earned points in the GPR, remained. But all the measures that did not score points in the GPR score disappeared. [...] For example, we had a helophyte filter outside [...] that didn't score any points in the GPR, and well, off with it. Similarly, for various other principles that were in the idea of the design."* [2]

Example being the original exterior facade that is made up of hemp fibers, grey and black water systems that generate energy and other elements in the building's surroundings, for example, parking lot:

> *"That just doesn't have the greatest added value, so then we just really started digging around to see which things are most relevant and provide the most benefit. So some things were discarded, but these are mainly the things that are cool, but not the things that are important."* [3]

Thus, for financial reasons, various sustainability principles in the conceptual design of the Architect which contributed in winning the tender, were diluted during the design development.

Technology barriers

Several sustainability principles that faced economic barriers also faced technology barriers, not only due to technical difficulties but also because the client made clear at the start of the project to only use proven technologies and did not want to be a pioneer:

> *"They didn't want to go pioneering, they were not waiting for that. The water-less urinals perished as a result. So there are a number of things where indeed the user was too reluctant to take an innovative step."* [2]

The client did not want to use such technologies as they still face significant challenges and risks when used, Project Manager A states. In combination with high investment and unclear ROI, they are taken out of the design very easily:

> *"there were a lot of technical features that were still experimental for that time [...] so then I'm talking about gray and black water systems [...] everything that comes out of the toilet is made into fuels again, so generating energy, and of course that had no chance. The water pumping system, had been cut out of the design I think, or at least, in the form in which they offered at the time, purely because of cost."* [5]

Also, they can create a burden for the client in the future as they, for example, can bring along uncertainty in maintenance cost and/or maintainability:

> *"It's a nice idea but it feels like pioneering, we don't want that. And then it gets crossed out regardless and as I said, everything can be converted into money. And so, I do fully support that, because I'm also that project manager who recognizes that we need to build more sustainably but it also shouldn't become a burden on a client."* [1]

Awareness Barriers

Also, awareness barriers manifested themselves during the project. Sustainability Advisor B notes members of the design team were unfamiliar with the various sustainability alternatives and solutions available, particularly in the use of sustainable materials.

> *"a lot of the colleagues just had far too little material knowledge, sustainable material knowledge."* [3]

A lack of knowledge and experience in sustainability projects leads to tunnel vision toward traditional solutions. For this reason, Project Manager B states that it was essential to include sustainability advisors as soon as the design development; this refers to advisors' influence on team members in introducing sustainable alternatives.

Organizational Barriers

Throughout the design development, a number of organizational barriers arose that also led to the dilution of sustainability principles. An overlapping cause for this is the inter-organizational structure of the design team. Even though an inter-organizational structure has its benefits, it can also create challenges, such as indirect communication or lack of communication caused by the many layers that arise in an inter-organizational design team:

> *"The communication at times was pretty poor during this project [...] because there was such a distance here between us and ultimately the client, where normally we sit one-on-one with them at the table, but thus here there were two layers in between. That made it difficult."* [2]

Sustainability Advisor A argues that even though advisors are part of the team, they rarely meet with the client in meetings due to the multiple layers in the organizational structure of the design team. This makes communication difficult and often indirect, as messages must pass through different organizations to get to the client and vice versa.

> *"Initially, we had a lot of trouble reaching the client due to project manager A, who was sort of a huge buffer between us."* [3]

Indirect or lack of communication can also lead to poor decision-making. Sustainability Advisor A continues that this may have led to the client making general or sustainability-related design choices, of which it was unclear whether the client was aware and understood the rationale and supporting data that led to the initial design proposal. And whether the client fully understood the intentions of options or alternatives as they had not been in direct contact with the advisors. Such moments can be described as decision gates. These are a series of moments in a project that requires a decision to either proceed with the next phase of the project or which can modify the project's scope, schedule, or budget (Sutherland & Feltey, 2017).

However, the interviewees indicated that not all disciplines were involved during such decision gates. Moreover, as there were four intermediaries between Sustainability Advisor B and the client, there were instances of miscommunication or a lack of communication altogether, leading to information being inadequately conveyed or distorted. To avoid the distortion of information and ensure that the client bases their decisions on the correct information, Project Manager A and Sustainability Advisor A argue that it must be ensured that information reaches the client via the shortest possible route; direct communication or through the participation of advisors in meetings with the client. Sustainability Advisor A enforces by arguing that "you really do have to have contact with that end-user or client to really make the right decision." [5]

> "*Even though communication is separate from sustainability, sustainability does not benefit from this.*" [2]

As described in Section 4.1.3 , the interviews highlight that in the inter-organizational design team, a hierarchy quickly emerged, resulting in power imbalances between design team members. In the case described, the architect and project manager A had a higher position than Project Manager B and the team of advisors from Arcadis. This led to specific disciplines, including sustainability, being only occasionally involved in decision-making processes. This lack of involvement resulted in the dilution of several sustainability principles, causing discussion and conflict within the team. The Architect was ultimately in charge and at a higher position in the design process, causing his vision to lead, hindering sustainability principles in the design. Therefore, Project Manager B states:

> *"An architect is also not a project manager. You shouldn't let them manage such a big project."* [2]

The lack of involvement of expert disciplines during decision-making also indicates the lack of collaboration and teamwork between the disciplines and organizations. Due to limited interaction between the team members, communication suffered. Sustainability Advisor B also argues that team members tend to communicate only within their own organization rather than a team as a whole.

Thus, the main organizational barriers are lack of communication, lack of collaboration and teamwork,

the overreaching vision of the Architect in charge, and lack of position of advisors due to multiple layers in the team, with the overreaching barriers of an inter-organizational structure. Another organizational barrier has been identified, which is the lack of steering by the project manager toward sustainability. This barrier has been highlighted by Sustainability Advisor B stating *"The project manager steered mostly on time and money, and also some sustainability aspects, but sustainability as far as it doesn't cost money"*, described in Section 4.1.4.

4.2. Case B: Turn-Key Building Project

Case B relates to a completed logistics building where processes converge around receiving and shipping goods, including food products such as fresh vegetables, bread, and meat. The client is private and a family-owned cooperation, and thus considering long-term investments. Through the early involvement of Arcadis in the client's strategy process, the client requested Arcadis to accept and execute the building project in all its facets based on a turn-key contract. This responsibility included construction and installations and advisory in BREEAM, engineering, architecture, cost management, project management, permits, ecology, environment, and other disciplines. In this case, Arcadis was also made responsible for the selection and sub-contracting of the construction of the building. The organizational structure of the design team is illustrated in figure C.2, and attached in the Appendix C.2.

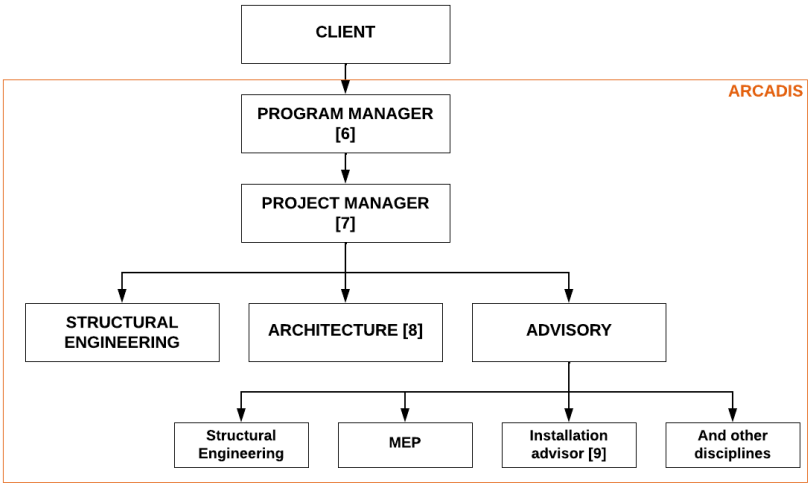

Figure 4.2: Organizational structure design team case B.

4.2.1. Interviewees Case B

The organization for the design phase is led by a project manager. Above the project manager and his design team stood the program manager, who managed the organization's strategy. The role of sustainability advisor in the advisory team was fulfilled by the Installation Advisor, who also was the BREEAM expert during this project. In short, the Installation Advisor had the role and responsibility for the sustainability principles.

The Project and Program Manager were interviewed for this research as well as the Installation Advisor and the Architect. The interviewees are listed in 4.2.

Table 4.2: Interviewees case B

Role	Organization
Program Manager [6]	Arcadis
Project Manager [7]	Arcadis
Architect [8]	Arcadis
Installation Advisor and BREEAM Expert [9]	Arcadis

4.2.2. Vision on Sustainability

When Arcadis started the project, the client only had a sustainability vision focused on energy efficiency. This was the client's explicit starting point, as logistics buildings use a lot of energy. The Program

Manager and the Installation Advisor then provided the client with the insight that there is more to sustainability than only energy efficiency. It is also about materialization, emissions, water consumption, waste reduction, and managing a construction site, and there is much to be gained in these aspects too:

> *"But the interest was relatively small in terms of size. And we offered them insight to broaden that."* [9]

The Program Manager explained that this resulted in the client stating that all sustainability measures with a positive return on investment (ROI) within a reasonable period should be included in the design scope. Thus, the starting point for Arcadis was:

> *"That we would at least commit to anything that contributed to energy efficiency, and if that paid off within a reasonable time, we would include that in the project."* [6]

The Program Manager further explains that the return period was not precisely defined. However, he further explains because the client is private and family-owned cooperation, their return period is somewhat more extended than is generally encountered with publicly listed organizations. Thus, the client considered long-term investments.

When the design process started, the discussion arose on how sustainability could be measurable and whether the client wanted to go beyond energy efficiency. The design team deliberated about the use of the sustainability assessment method BREEAM and how this could be applied. Since BREEAM has a much broader scope than energy efficiency and includes management, welfare, water, and ecology, this could be a good proposition for the client. Based on these discussions, an assessment was carried out for the additional measures and investments needed to achieve BREEAM's excellent certification. Also, because building with BREEAM certifications are eligible for governmental subsidies, such as the Milieu-InvesteringsAftrek (MIA), a business case was drawn based on this, including the additional required investments and what subsidies might be available However, it was made clear that the subsidy would cover a part of the additional investment required for sustainability, and a financial gap would still remain, which the client was prepared to fill from the overall interest in sustainability. Shortly thereafter, the subsidy measures changed, which led to buildings that complied with BREEAM excellent would no longer qualify for a subsidy. Following this change, it was considered what it would mean for the project and its investments if a step further was taken toward BREEAM outstanding that did comply with the subsidy. Although this meant greater investments in additional measures regarding sustainability. The business case of BREEAM outstanding became the basis for the conviction toward sustainability in which the starting point was:

> *"Within the scope of the project, we do whatever we can that has to do with the energy efficiency of the equipment, insulation, and things like that. That is the baseline. And then, in the business case, we looked at what could be done more on top of that to get from that point to BREEAM excellent or BREEAM outstanding."* [6]

The business case focused on the additional measures that had to be taken to comply with BREEAM outstanding, as the scope of the project already included all measures that made the building energy efficient, as the program manager stated:

> *"The need and must have was everything in terms of energy efficiency, and the should have was to achieve BREEAM."* [6]

By giving the client insight that sustainability does not have to be expensive with the help of subsidies, decreased operational cost, and increased total cost of ownership, the client ultimately chose to go along with the increased investment and meet BREEAM outstanding. Besides the economic benefits, the contribution to the client's image also played a role in their decision because utilizing a sustainable building makes a good impression and benefits the neighborhood and the surroundings. Moreover, the client can promote the organization as sustainable.

Based on the BREEAM outstanding business case, the design team of Arcadis further developed the design from the business case to the final design. The goal of achieving BREEAM outstanding was an essential driver in safeguarding the sustainability goals and ambitions set out in the business case. All interviewees of Case B stated that achieving BREEAM outstanding was *"een goede stok achter de*

deur", which in Dutch means *"a threat to get something done"*, but is used here in a positive sense, namely in the sense of *"an extra motivation to achieve something"* (Genootschap Onze Taal, 2023). A similar term for this in English is "*carrot and stick*".

Including giving the client the freedom and flexibility to choose options of sustainability and the adoption of BREEAM, other methods of influence also provided significant guidance through the design phase. The methods are listed below and further elaborated on in the following sections based on authority, accountability, and affective influence:

1. The contractual incorporation of BREEAM outstanding between the client and Arcadis and associated subsidies
2. Collaboration and communication; to ensure the client makes informed decisions and to establish a formal and informal environment of committed and motivated design team members.
3. A shared drive toward sustainability among the whole team, including the client.

However, modifications were made throughout the design process, from conceptual design to final design, i.e., design development, which led to the dilution or replacement of several sustainability principles; in the case of BREEAM, credits:

> *"I think we dropped one or two credits."* [6]

However, the dropped BREEAM credits were compensated with other credits. To achieve the desired BREEAM score of 85%, the design team established a target list that included all the required credits that had to be attained. In the target list, they included a margin in the event of credit loss due to either the unattainability of the credits or problems in providing the necessary evidence to obtain certain credits. Thus, the target list encompassed 94%. During the process, various credits were lost or replaced by others. Nevertheless, the overall loss of credits during the design development was trivial, as the final design yielded well above 90%, and the BREEAM outstanding certificate was obtained.

4.2.3. Authority

The interviews indicate that in defining and safeguarding the vision on sustainability during the design phase, several design team members, including the client, Project Manager, and Installation Advisor, utilized authority.

As seen, the initial sustainability vision of the building originated from the client's vision for energy efficiency. Furthermore, they are the consumer financing the project and have the final authority in the decision-making toward the level of sustainability to be included in the project, visible in the choice between the business cases of BREEAM excellent and outstanding. Furthermore, the Program Manager notes that during the conceptual design phase, the client clearly expressed the requirements for the project to be completed on time and within a specified budget limit. However, the Program Manager continues saying that the client expressed openness to exploring additional sustainability measures if they could better safeguard their family capital, even if it required a slightly higher investment than initially planned. This way, the Program Manager indicates that the client remained receptive to new ideas and suggestions in such scenarios. Scenarios proposed to them by the advisors of Arcadis, as the Installation Advisor argues:

> *"My position is that of an advisor, where I enable the client to make well-informed decisions and carefully considered investments when developing their building. I believe that this is a beautiful starting point, which clearly indicates that the role of the Installation Advisor is not to choose a specific option, such as option C. Rather, the Installation Advisor is merely an advisor and not an authority with the power to make decisions. The ultimate decision rests with the client, as it is their money. As an advisor, I make it possible for the client to make a choice."* [9]

The Architect believes that the client holds the most authority. Whether the client is well-informed or not, they make decisions and are sometimes quite strict in their requests, which applies to all clients who say: "*No, we want this period*". The Architect suggests that the team can ask for clarification, but this is not always necessary or appropriate.

> *"Sometimes, an utterly unreasonable choice is made by the client. of which I or the team or I often question it. Of course, the client is king. If they really insist and are persistent, then we'll do it. And then it must be done; it is their building and money. So they have absolute and high authority. "* [8]

The Architect goes on to say that the project manager is the one who engages in such conversations and takes those decisions to heart, and takes the responsibility of effectively implementing and distributing the client's decisions across the team. As the Architect called the project manager the "*highest-ranking individual in the project hierarchy*", excluding the client, the project manager thus serves as the central source of information for the entire team, "*the information hub.*"

In conjunction with this, the Project Manager characterizes his role as a *"duvelstoejager"* - a term used in Dutch for someone who chases after everything. He stresses the importance of being hands-on in the role, emphasizing that project managers must not only chase after everything in a project but also engage in actively creating deliverables. The Project Manager also emphasizes the need for project managers to consider their added value beyond task coordination, recognizing that the role entails much more than simply chasing after team members, which he did during the project—also concerning sustainability and the team's compensation. This way, the Project Manager utilized his position and authority to determine who will be on the design team and ensure that those included were committed and motivated, even after the initial offer of the client, to ensure all goals and ambitions were met, which can be identified from the following two quotes. This observation also relates to affective influence, further elaborated in Section 4.1.5:

> *"when you feel like one person on the team isn't fully committed or doesn't understand it all, well, I have to scoop them out. I am tough on that, purely to prevent wasting energy. If someone does not really want to or cannot do it, we will have an exit conversation with them."* [7]

> *"The atmosphere within the team was really great and enjoyable. I must say that the Project Manager was instrumental in steering this, and at moments when there were a few bad apples among us, he had the ability, power, strength, and seniority to remove them and say to the management at Arcadis, 'I want someone else who fits better within the team.'"* [9]

The Architect also suggests that if project managers are tasked with this duty, they must ensure that sustainability advisors are included in the project's offers if projects include high sustainability ambitions or where opportunities are plentiful. Sustainability advisors then aim to act as a mediator, continuously monitoring whether the sustainability goals and ambitions are met and actively engaging in conversations with the design team members and the client regarding sustainable practices.

Furthermore, the Architect suggests that although there may not have been a strict hierarchy or authority in place, there is always a clear dependence on one individual. An individual who possesses the necessary knowledge and expertise to guide the design team, which in this case is the Project Manager. The Architect also cites himself as an example, as he was this individual for his internal design team.

> *"That sounds like there was a hierarchy, but it didn't feel that way. It's more like one person just knows how everything works, and the rest depends on that person. That person has to know everything. For architecture, I also had to make certain decisions."* [8]

In the following quotes, the Architect emphasizes that when team members disagree on specific design decisions and those disagreements persist without a consensus, the project manager is responsible for making timely and informed decisions to resolve such disagreements.

> *"You need to make decisions in order to move forward, and that's what the Project Manager did. When it comes to the management of the Arcadis team, however, it was based on information, so there was little real authority. "* [8]

> *"That has also been the role of the project manager, to search for solutions and finish something within the given time frame, make a decision, or put something on paper. And sometimes that time is too short; then you have to switch to other options, involve other people, lower certain quality a bit to meet the deadline or something like that. You have to play around with the good materials you have."* [8]

In the latter quote, the Architect asserts that at certain moments during the design phase, the Project Manager also had to step in and make critical decisions to meet deadlines at the expense of quality, in some cases sustainability, or involve the right people. In such moments, the interviewees indicate that theProject Manager, during the process, steered the design team toward safeguarding sustainability and other priorities of the client. Nevertheless, BREEAM played a significant role in the Project Managers' determination. The Architect further explains that this applied to all disciplines, including theProject Manager. Thus, it seems that BREEAM was an essential driver in the sustainability efforts, further elaborated in the next section, which discusses accountability.

4.2.4. Accountability

As the client ultimately opted for the BREEAM outstanding certification and the design progressed, BREEAM served, as highlighted in Section 4.2.2, as a reference, target list, and "*stok achter de deur*" to steer the design team toward embedding and safeguarding sustainability in the project's design. Decisions were made based on BREEAM outstanding, as it provided guidance for the team in incorporating sustainable features into the design.

> *"Then it is simply the end of the discussion: 'We have to achieve the credit. Otherwise, we will not achieve BREEAM, and we will not get subsidies.' Well, that was the business case that the Installation Advisor had counted on. We had to live up to that, and all signed off on it together."* [8]

The Architect also states that if BREEAM had not been a part of the project's goals, or to a lesser extent, much more persuasion and guidance would have been necessary to integrate and safeguard sustainability, as the Architect comments on other projects in general in response to the question,*"so, you did not have to push the team toward the integration of sustainability yourself?"*:

> *"Not for this specific project, but for other projects, yes. So, if BREEAM is not there or at a lower level, you must do it yourself. You have to be the driving force for sustainability and convince and push the team to maintain sustainability in the design. That is what it comes down to, yes. And fortunately, that is also being done."* [8]

Therefore, the upfront contractual inclusion of sustainability goals and ambitions, including BREEAM, was essential for safeguarding sustainability during the design process. The Architect states that sustainability is often overlooked without such inclusion and stringent rules or financial benefits that prioritize it for the client. For this reason, BREEAM credits were contractually established and organized into a target list. In the target list, responsibilities were divided among the design team members to meet specific credits, as outlined by the Program Manager in the following quote. Otherwise, the Project Manager asserts that various challenges or obstacles could arise, potentially leading to negative outcomes or the failure to achieve intended BREEAM credits.

> *"We created a target list. We documented which credits we had to achieve. Subsequently, we assigned all those credits to design leads. So some credits had to be achieved in the construction phase. [...] Certain credits, such as ecology, had to be handled by the landscape designer or civil designer for the outdoor area. In this way, we split the entire credit list into individual goals or tasks. These were then assigned to the different design leads within our team, who incorporated them into the design."* [6]

> *"If responsibilities are not given to specific tasks, everything will go wrong. Everything will fall between the cracks, and information will go in the wrong direction and things like that."* [7]

The target list also acted as a to-do list as credits and tasks were assigned among the design team members, which they were held responsible for achieving. The Project Manager states that the target list prevented the members from forgetting something or two members performing the same tasks without knowing about each other. The target list was discussed and reviewed during the weekly meetings. If not done correctly, tasks were at risk of not being fulfilled. However, the Installation Advisor emphasizes that sustainability should not be regarded as an administrative checklist to be completed and ticked off after the fact. The advisor argues that sustainability must be integrated into the process

as it does not happen automatically and requires effective management and steering. This was accomplished in this case by increasingly prioritizing sustainability during team meetings because, as the Installation Advisor states, "*before you know it, it slips completely out of your hands.*"

Although BREEAM played an essential role in decision-making, the interviewees indicated that it required persuasion to reach certain decisions. For this reason, the Program Manager states that it was important that the decision-making process was well-structured, with the pros and cons, including financial considerations, clearly presented and that it was brought to the table at the appropriate time. The Program Manager also argues that the process was more about structure than influence. The Installation Advisor supports this view by stating:

> *"The advisors enable the client to make well-considered choices and well-consulted investments when they develop the built environment."* [9]

In other words, advisors enable the client to make the right decisions by presenting substantiated proposals supported by different alternatives and calculations where the investments, operating costs, energy costs, and total cost of ownership lie. This way, the client can make well-considered decisions toward sustainability. The Installation Advisor states that if the project managers and involved disciplines do this well in an academic way, then it should also be reliable, transparent, verifiable, and achievable.

Furthermore, according to the accounts provided by the interviewees, the project manager plays a crucial role in facilitating communication between the design team members and the client, ensuring that decisions were effectively distributed among the team and implemented, further elaborated on in Section 4.2.5. As the team's central "*information hub*", the interviewees also note that the Project Manager played a critical role in maintaining the coherence and fluidity of the design process, as argued by the Architect:

> *"But of course, the Project Manager did not only manage the client and ensure that Arcadis delivered something that met all the requirements, both BREEAM and all the other wishes of the client and the municipality. As a team, it was our task to bring together all the principles, including permits, etc., and then communicate that to the client. The Project Manager was mainly responsible for this."* [8]

Therefore, as mentioned in Section 4.2.3, the Project Manager referred to himself as a "*duvelstoejager*", including organizing, coordinating, and monitoring whether everyone in the team fulfilled their responsibilities.

The Installation Advisor also asserts that by nature, the project manager should steer on six project management aspects, TGKIOR (Tijd, Geld, Kwaliteit, Informatie, Organisatie, Risicos), which stands for time, money, quality, information, organization, and risks—referring to the project manager's accountability. With the exception of Case B, where the Project Manager faced sleepless nights completing one of the most sustainable projects in Europe, the Installation Advisor explains that project managers often prioritize time, money, and quality. Furthermore, he argues that in most cases *"quality"* is the responsibility of the technical experts in the team. When managed effectively, the project can be completed within budget and on time; however, the Installation Advisor argues that many project managers in general, continue to prioritize time and money over quality, outlined by in the following quotes.

> *"Not with this project, but in a general sense with other projects, I sometimes find that the project managers steer too much on time and money."* [9]

> *"I have also seen other construction management firms where there is too much focus on time and money. As soon as you want to start explaining the possibilities regarding BREEAM and how it works, you get cut off with, 'No, that is content, I don't want to deal with that.' As a result, their focus on time and money makes them make the wrong decisions, which can cause a project to go haywire."* [9]

The Installation Advisor says it is not about having substantive expertise but rather how the project manager needs to integrate that substantive expertise into the project management process. Otherwise, the project manager may focus on the wrong aspect, such as time, money, or quality, excluding

sustainability. For this reason, project managers need to take responsibility for occasionally seeking external information and consulting with people with knowledge and expertise about sustainability, which was the case for this project. Case B also showed that managing a project in combination with sustainability requires positioning a sustainability expert as an assistant to the project manager, working alongside each other. The Installation Advisor notes that the project is otherwise bound to fail if the sustainability expert is positioned too far down in the organizational structure. This, however, can also be considered as the use of authority to safeguard sustainability, giving experts to position and power to effectively promote and safeguard sustainability in the design process. The interviewees state that this also requires an optimal balance, which is reasonably well-established within their organization, Arcadis.

The interviewees were also explicitly requested to address the following question: *"How do you envision the role of the project manager evolving in light of the increasing emphasis on sustainability in building projects?"* Based on experiences with this project and previous comparable projects, the Program Manager argues that someone is needed in the design process to drive and pursue sustainability in the project and thus suggests a BREEAM coordinator for this role. A person who coordinates BREEAM alongside the project manager, like the Installation Advisor in this project. He further argues that in large projects like this one, a separate BREEAM coordinator should be added to the design team, but in small projects, it should be the project manager's responsibility. However, the Program Manager also states that sustainability should ultimately be an integral part of the design process. It cannot be said that *"someone else is responsible for sustainability."* Therefore, the sustainability responsibility must be conveyed to all design members. They all must implement sustainability in the parts of the design they are responsible for—however, the interviewees note that someone is needed to coordinate the process to drive and pursue sustainability, in other words, safeguard.

> *"If sustainability is your departure point, 'I want to be very sustainable', then you could say, you have to take it up a level, you have to put it into the program organization and the project organization"* [6]

The interviewees also suggest that the project manager should introduce sustainability to the client as early as possible in the course of the project. This will also ensure that attention is paid to it in decision-making.

4.2.5. Affective Influence

Throughout the design phase, different influencing methods were used by the various design team members, as listed in 4.2.2. For each method, the interviews indicated that a well-structured process is essential to influence. As described in 4.2.4 and stated by the Program Manager, the responsibility of Arcadis is to properly structure the problems and questions, prepare decisions thoroughly, clarify the advantages and disadvantages of specific choices, and ensure effective coordination. This way, Arcadis can ensure the client can make the right choices for sustainability that best suit their needs by clearly structuring the project. Thus the focus is not on influencing, as the Program Manager states:

> *"I don't know if you can really say influence because, in our role/function, we shouldn't necessarily influence clients but rather help and advise them to make the sensible choice."* [6]

The Installation Advisor also assert that this was the strength of Arcadis, providing insight to the client that sustainability does not necessarily entail high costs. Instead, including sustainability principles and the better allocation of scarce resources can result in a favorable total cost of ownership over a period of 20 years, making it attractive for the client to consider sustainable measures. Based on well-structured business cases, Arcadis tried to convince the client early on in the project more could be done about sustainability than just energy efficiency. By offering two business cases, BREEAM excellent and BREEAM outstanding, Arcadis gave the client the flexibility and freedom to make their own sustainability-related decisions with a reasonable justification of the benefits that come with it. On this, the Program Manager states:

> *"The business case was the basis in the conviction toward sustainability."* [6]

The interviewees conveyed that the Project Manager provided motivation to the design team to pursue the sustainability goals and ambitions throughout the design process. However, it was again noted that the Project Manager's commitment to sustainability was largely influenced by the importance placed on BREEAM outstanding. The Architect clarifies that this held true for all disciplines, including the Project Manager, as BREEAM was a critical driver for sustainability initiatives in the design phase.

> *"Those credits just had to be met. End of the discussion, and yes, then you have to make certain design decisions for it. The project manager obviously had that between his ears as well, so he uses that, I assume, as a guideline."* [8]

According to the interviewees, the Project manager was instrumental in leading the process and assuming responsibility for integrating and safeguarding sustainability in the project. Besides being guided by BREEAM and well-structured decision-making, the Project manager effectively communicated proposed alternatives and disseminated information among team members and the client. Furthermore, the four interviewees argue that collaboration and communication were crucial in creating a positive working environment and fostering personal relationships among team members, which played a significant role in the successful translation of sustainability goals and ambitions. Moreover, collaboration and communication with the client's senior management and others within the client's organization assisted in this process. With this, the Installation Advisor also emphasizes the soft side of projects and the psychological influence of people. All interviewees emphasized that team composition is also essential in the design process for building trust, affecting decision-making.

> *"The composition is important for collaboration but also to cope with such kind of tension curves with each other."* [7]

The interviewees report that the Project Manager's decision to bring the entire design team together in the office in Maastricht for a few months also positively contributed to finalizing the preliminary and detailed designs. The Project Manager states that although this option was already included in the initial offer of the project, it had not yet been undertaken when he joined the team. Recognizing the benefits of this requirement, he decided to take the initiative to set this up. Collaborating within a shared workspace and residing together in a common lodging establishment close by, facilitated collaboration and communication, formal and informal, which helped prevent information distortion, and ensured that all information was disseminated efficiently by stimulating face-to-face communication instead of over email, phone, or screen. This improved the formal relationships among the team members and the informal relationships by interacting with each other after working hours. Contributing to the Project Manager's role in maintaining the coherence and fluidity of the design process, as discussed in Section 4.1.4.

> *"Humans are better off sitting in a room with each other after all, and then we have much better communication"* [7]

> *"To achieve all the credits. It took an incredible amount of effort to keep that up with all of us and not leave it at that. That was an issue, though. That is more about encouraging and motivating them to ensure they have the hands to do that, right? Because we also went out for drinks and snacks together quite a lot. Because that helps so much."* [7]

> *"By doing so, you simply get to know each other personally much better. So naturally, you also have an occasional non-work related chat on the work floor, which makes it very pleasant. It's a very nice dynamic for the team."* [8]

In addition, the Project Manager emphasizes the importance of having the right people on the design team. He asserts that one bad apple could spoil the entire basket, and as such, he believes that it was part of his role to ensure that competent individuals were part of the team. He asserted that the same applied to the client; it would have also been discussed if someone did not match the team at the client's end. The Project Manager states that if someone does not fit within the team, it has consequences for the process, also concerning sustainability:

> *"It is people's work, so you must ensure everyone wants and does it. And when you feel like one person on the team isn't fully committed or doesn't understand it all, well, I have to scoop them out. I am tough on that, purely to prevent wasting energy. If someone does not really want to or cannot do it, we will have an exit conversation with them."* [7]

> *"If someone does not have the right attention span or attitude, that person can throw the whole team off balance."* [7]

The installation advisor enforced this sentiment, further highlighting the crucial role played by competent team members in the success of any project:

> *"The atmosphere within the team was really great and enjoyable. I must say that the Project Manager was instrumental in steering this, and at moments when there were a few bad apples among us, he had the ability, power, strength, and seniority to remove them and say to the management at Arcadis," I want someone else who fits better within the team." I learned from him that he was very strict about this and that it is important because if you have a few bad apples who either cut corners or do not fit well with the group or do not match well with the type of client, [...], you will get other disruptions in the process of your team."* [9]

The Project Manager goes on to say that everyone in the team must also have the same ambitions toward sustainability. It is people-based, it is all about the people, and the project manager has to make sure everyone wants to be part of it and does it, committed and motivated, which also applies to the client.

> *"Who is willing is able, right?"* [7]

The interviews also indicate that establishing an informal relationship with the client significantly impacted achieving the sustainability goals and ambitions. Despite the client being known as "*tough business*", the Project Manager reports that the client surprised them in a positive way, and they worked together in a pleasant and friendly manner. There was a "*heart-to-heart*" relationship between both parties, according to the Project Manager. For instance, they were aware of each other's birthdays within the team, and the client would have a bouquet of flowers delivered on behalf of the team member. The Installation Advisor also states that the client was "*soft on the relationship but tough on the content*".

> *"They were one of the few clients who called me and said, 'Hey, why are you calling?' ' I know it's your wife's birthday. Congratulations to your wife.' Even leaders at Arcadis don't do that, for example."* [9]

> *"So they really pampered us on site. So everyone was also willing to go for it. Not a single bad word, nobody. And we really worked day and night for them."* [7]

The Installation Advisor indicates that the team received a lot of sympathy from the client and vice versa. However, when it came to finances, the client was very strict. Building a friendly relationship during the process did help in this regard.

> *"During the CEO meetings, you create a little bit of sympathy, and if the client exhibits a certain behavior, you get that in return"* [9]

The Installation Advisor indicates that due to the informal relationship they had built, they never encountered major issues in the project. Although there were significant differences of opinion, these could always be resolved based on substantive arguments rather than escalating into a fight. This kept team members highly motivated to continue their work.

Moreover, the Installation Advisor notes that the difficulty lies in the fact that investing in such informal relationships and utilizing these soft skills is sometimes challenging to link to hard output in terms of money. While it does exist, the advisor asserts that scientifically proving it can be difficult. He implies the same to what is often seen in healthy buildings nowadays, with more ventilation, better thermal comfort, and more attention to acoustics, in which people are much less distracted from their substantive work resulting in much higher labor productivity

The interviews show that the Project Manager effectively fulfilled his role by leveraging his position to create an environment of committed and motivated design team members that came together to integrate and safeguard the sustainability goals and ambitions. While BREEAM played a significant role in this effort, the Project Manager further acknowledges that the Installation Advisor played a pivotal role in ensuring sustainability was effectively integrated and safeguarded in the design. The Project Manager argues that the Installation Advisor, including his helping hands, remained vigilant and, on

occasions where the client proposed changes to the design, would promptly intervene with comments such as, *"Wait a minute, that has implications for sustainability and long-term viability - that won't work."*

4.2.6. Summary of Barriers Encountered Toward Sustainability

Throughout the design phase, a number of barriers arose that caused the dilution of sustainability principles, i.e., BREEAM credits, from the design. The encountered barriers are summarised and visualized in Appendix B.2, and divided into two themes, i.e., categories of barriers: economic and technology barriers.

Economic Barriers

The design development of certain sustainability principles were constrained due to finance, as the incorporation of certain sustainable materials was not feasible for the function of the building or had unrealistic pay-back periods. This resulted in an increase in cost, thereby acting as a barrier in the design phase:

> *"You just can't use certain materials in a building that size. Here, the finances immediately take over."* [8]

Furthermore, alterations in the design had a pronounced impact on the cost of the project, as one small change in the design can lead to significant changes in the budget. For this reason, certain principles were left out of the design or replaced by others. Here, the Architect used *"the law of large numbers"*: a slight change in the roofing directly affects a large number of square meters, which very quickly increases the budget of the project.

Technology Barriers

Moreover, the design of the building necessitated the prioritization of functional aspects, such as safety measures that required the installation of particular doors with locking mechanisms that did not necessarily align with the overall function of the building and therefore did not contribute to its added value. Additionally, the size of the parcel often resulted in the exclusion of certain sustainability principles:

> *"But it's either functional things [...] for the security regime there had to be certain doors in the building with a locking mechanism but that didn't meet the function of the building itself. Or that something becomes so extremely expensive or just didn't fit the size or the parcel, for example. Well, then you have to let that slip because otherwise, it's just either impossible or just becomes way too expensive."* [8]

Here, credits that were left out in the beginning due to difficulty but turned out to be easier after all replaced these impossible or expensive credits. Thus, trades were made to ensure BREEAM outstanding was reached.

Next, multi-disciplinary BREEAM credits also brought difficulties at times when it came to the assignment of these credits. Most credits are unambiguously assigned to one design discipline and are quite straightforward. However, some credits can be assigned to multiple disciplines that take part of the project, where disagreements and discussions are more often to arise in regard to responsibility and require a lot of collaboration between them. However, this can also be seen as an organizational barrier.

> *"There are also credits that affect multiple disciplines, and then it is always a bit of a question, who does what to what extent? [...] Especially in such multidisciplinary credits is where you often see most, well, problems or discussions arise."* [6]

Additionally, certain credits proved to be overly complex or unattainable during the design process, primarily due to challenges in providing the required supporting documents or evidence for the BREEAM credits. As a result, intentional dilution of credits occurred, and compensatory measures were taken by pursuing alternative credits.

5

Discussion

This research has uncovered similarities and distinctions between the theory identified in the theoretical background and practice through experiences retrieved from the interviews conducted with practitioners in the building industry in the multiple case analysis. This chapter discusses the similarities and distinctions by comparing theory and practices utilizing the same structure adopted in Chapter 4, based on the conceptual framework, known as the *Sustainability Safeguarding Framework*, presented in Section 3.4.

Section 5.1 discusses moments of authority and influential power. Section 5.2 discusses moments of accountability and new patterns that have come forward in the cases. Section 5.3 discusses moments of affective influence that contributed to safeguarding sustainability in the cases, as well as leadership skills and styles that facilitate this. Section 5.4 summarizes the encountered barriers identified in the cases, which includes two new barriers not previously identified in the literature. Finally, Section 5.5 discusses an additional differentiation observed in this research concerning the concept of safeguarding sustainability versus actively promoting it.

5.1. Authority

The empirical research analyzed moments of authority in the two case studies, as authority exerted in projects has in literature, been closely linked to leadership and the power of influence and emerged as a critical aspect in safeguarding sustainability during the design phase. As discussed in 2.1, authority is the power associated with a formal position in an organization (Braynion, 2004), giving people with authority the position to influence and direct specific individuals and to make decisions (Lunenburg, 2012). Braynion (2004) explains that leadership is a power relationship between leaders and followers and involves utilizing power to influence others' behaviors to meet the organizational goals. Here, power is a person's capacity or ability to exert their will over a person or a project team to alter their views, actions, and behaviors toward a building project. In other words, it is the ability to make something happen (Coates, 1997). Schwalbe (2015) also noticed the correlation between power and influence, as she found that discussion of influence inevitably leads to the topic of power, which she defined as "*the potential ability to influence behavior to get people to do things they would not otherwise.*" This section, discusses moments of authority by the various members of the design team in the cases.

Moments of Authority by the Client

In both cases, the highest authority, and accompanying power, lies with the *client*. As the future user and financier, the client's organization wields the highest level of influence over project decisions. This authority extends to significant determinations during the planning phase concerning the project, such as the selection of the design team and the development of the project's vision and requirements, including those on sustainability, which best fit their needs, function, and budget. Throughout the design progression, from concept to finalization, the clients maintain the final say in design choices, including the approval of material selection and proposed business cases or sustainability alternatives. Conse-

quently, the clients significantly impact the overall design processes, thereby playing also a crucial role in safeguarding sustainability.

However, in case A, the vision was influenced by another source of authority, the *municipality*. Here, the municipality used its position of authority to promote sustainability initiatives in their municipality and influence the client and its organization to comply with its cradle-to-cradle vision; otherwise, they were not permitted to build on the desired location.

Furthermore, both cases show that the clients use their authority over financial decisions affecting sustainability, positively or negatively. The financial trigger here involved the eligibility for subsidies.

In Case A, the sustainability assessment tool GPR was selected and utilized as it gave clear guidelines for integrating sustainability in the building design and the project's eligibility for subsidies upon achieving a minimum GPR score of 8; the decision positively contributed to the integration of sustainability in the project. As the client was cost-driven, obtaining the required GPR score significantly impacted the client's decision-making during the design process. The targeted subsidy was at one point vital for the project's financial feasibility as it was included in the project's budget. The client put a strong focus on achieving a minimum GPR score of 8 by the client, both in the tender documentation and in decision-making during the project's design and execution. To a certain extent utilizing GPR also negatively affected the integration of sustainability into the design as sustainability principles not contributing to the GPR score and requiring extra investment were intentionally diluted from the design. This observation also shows a relation to accountability, further elaborated in Section 5.2.

In case B, a similar observation was made regarding the BREEAM methodology. The client deliberately opted to pursue BREEAM outstanding certification in order to secure subsidies. It is noteworthy that in this case, the client also prioritized cost-effectiveness and explicitly expressed their intention to adhere only to cost-effective sustainability principles.

In cases A and B, the clients exert legitimate power, specifically position power. This power arises from their authority within their respective organizations, commonly known as "*formal authority*" as described by Lunenburg (2012), which enables them to influence the behavior of others due to their organizational position. The clients' decisions to incorporate sustainability into their project visions, including the requirements of achieving GPR and BREEAM certifications, serve as directions that the design teams must adhere to.

Furthermore, Nikoloski (2015b) identified legitimate power as a form of hard power, which enables supervisors to influence subordinates through rewards and punishments. In both cases, punishments were not used; however, rewards were identified. In case A, the municipality used its authoritative position to exert legitimate power to influence the client and its organization to comply with their cradle-to-cradle vision; otherwise, they were not permitted to build on the desired location. Complying became an award. Moreover, the governmental authority influenced both cases to include and safeguard sustainability by utilizing sustainability assessment methods and certifications, such as GPR and BREEAM, by granting and rewarding subsidies.

Moments of Authority by the Project Manager

Fewings and Henjewele (2019) observed that project managers are the leaders of the teams and act on behalf of the clients and try to maintain an efficient project team to deliver projects successfully. Often given the authority by the client to make project decisions, such as resource allocation and task assignment, as they lead the design team. However, the extent of the project manager's authority can vary depending on the design team's and client's organizational structures (Nikoloski, 2015b). In some cases, project managers may have limited authority, and decisions may need to be approved by higher-level managers. In other cases, project managers may have broader authority to make decisions and take action as needed. For this reason, Nikoloski (2015b) described that leaders must be aware that their influence over others will be particular to their personal characteristics and formal or informal position, as well as the situation at hand (Kotter, 1985).

Given the clients' explicit goal of obtaining a maximum GPR score of 8 and BREEAM outstanding and the related subsidies, the project managers, in both cases, used their authority to direct their design teams to align with this objective and make choices accordingly. Notably, the GPR score and

BREEAM outstanding certifications serve as significant constraints for decision-making based on the Iron Triangle factors, such as budget, schedule, and quality. Safeguarding sustainability for example, when deadlines had to be met.

In regard to resource allocation, Project Manager A, in case A, states he is a project manager and is concerned with mainly managing the project. He is not a sustainability expert, nor is he able to passionately convince a client toward sustainability, and finds the learning process with respect to sustainability in building projects challenging. Addressing project boundaries with the client and coming up with concrete plans based on enthusiasm, innovative ideas, and out-of-the-box thinking in regard to sustainability is not his forte. Therefore, in such situations, he would rely on a specialist in this area, likewise in case A. With his position of authority in the design team, he seeks out those specialists in the field of sustainability who possess the passion and can assert expert power. Here, expert power does not rely on a formal position but originates from people who possess knowledge, information, or specific skills and expertise and, thus, are respected by others (Goncalves, 2013; Lunenburg, 2012). In short, authorities in their field of expertise. Project Manager A describes that these specialists also approach sustainability with a sense of societal and intrinsic commitment, sharing their stories while exploring the potential benefits that can be achieved with little or no cost and possibly generating revenue. This refers to referent power that experts can obtain. Referent power, as described in Section 3.3.2, is a person's ability to influence others' behavior because they like, admire, and respect the individual (Goncalves, 2013; Lunenburg, 2012). It is a power that develops out of admiration for another and a desire to be like that person. Thus, Project Manager A's advice for project managers seeking to promote sustainability is to include passionate individuals in the design team who are specialized in sustainability and can project expert and/or referent power.

Case A demonstrated that Project Manager A, for the above-mentioned reason, recruited Sustainability Advisor A into the project, utilizing his authority to benefit the client's transition toward sustainability for the project and its overall organization. During the conceptual design process for the winning tender, Project Manager B also recruited an expert in sustainability, Sustainability Advisor B, to ensure a truly sustainable concept and fitting sustainability principles for the building's function and enthuse the design team members on sustainability, as he also did not have expert power to promote sustainability.

Case A also demonstrated that even though specialists with expert power and referent power in sustainability were included in the design process, these specialists had difficulties gaining a position in the design team to exert these powers over the design team members. Due to the inter-organizational structure of case A's design team, a hierarchical order emerged with a power and position imbalance between the team members during decision-making and meetings.

To ensure that the client makes substantiated choices, Sustainability Advisor A asserted that all disciplines should be involved, especially when an integrated design approach is utilized. Sustainability Advisor A's statement on an integrated design approach is similar to that of Keeler and Vaidya (2016) and Ikudayisi et al. (2022), who describe an integrated design approach as a process of bringing interdisciplinary members of the design team together for inclusive collaboration and communication, together creating an intense balance between the different disciplines and a path of priorities, roles, and responsibilities to deliver a sustainable building successfully. Allowing design team members to think holistically about the project rather than focus solely on their own discipline, as every new design decision will also affect other disciplines (Ikudayisi et al., 2022; Keeler & Vaidya, 2016; Trumpf et al., 2007). Case A demonstrates that this balance is hard to establish, and literature on this aspect shows an "*ideal world*".

As disciplines were not involved during decision-making or meetings, the architect obtained a higher position and power over the design team, which at certain moments led to discussion and conflict. At such moment Project Manager B, representing the advisory team of Arcadis, including sustainability, felt powerless as the Architect had other priorities, such as aesthetics rather than sustainability. Although the advisors faced challenges in establishing their position, Sustainability Advisor B contends that monitoring the GPR score ultimately provided them with the help of Project Manager B with a sufficient foothold to help safeguard sustainability in the projects.

Concluding that even though members expect to be treated equally in an integrated design process, position and power imbalance still remain in design teams as observed in case A, which was probably

caused by the advisory team being subcontracted by the architect, giving the architect the position to make decisions and use his authority, as Project Manager B stated: "*I can tell you that it is not easy to work on behalf of an architect. We started out very equally, but ultimately, if someone wants to get their way, they will use their power position.*"

Similarly, in case B, individuals with expert power in sustainability were also brought into the design team. The interviews of case B do not indicate if the Project Manager was involved during the process of recruiting the expert in sustainability. However, a critical recommendation was made by the Program Manager and Installation Advisor in relation to recruiting individuals with expert power: managing a project with sustainability goals and ambitions requires positioning a sustainability expert as an assistant to the project manager, working alongside each other. The Installation Advisor notes that the project is bound to fail when the sustainability expert is positioned too far down in the organizational structure to beneficially help integrate substantive sustainability expertise into the project management process. The interviewees state that this also requires an optimal balance, which is reasonably well-established within their organization, Arcadis. However, even though specialists can utilize their expert power, the final decision lies with the client, as stated by the Installation Advisor of Case B about himself: "*I am an advisor. I am not an authority who can make a choice; that is up to the client. It's their money*".

Furthermore, it was observed that the project manager utilized his position and authority to ensure that the design team included committed and motivated individuals and removed those from the team who were not. Besides involving the correct individuals in the design team, the interviews of case B showed that at certain moments during the design phase, the project manager also stepped in to make critical decisions in order to meet deadlines at the expense of quality or resolve conflict. In such moments, the interviewees indicated that the project manager steered the design team toward sustainability during the design process.

In both cases, moments of authority occurred in which governing parties, such as the municipality, the client, project managers, and others in the design, influenced and directed specific members of the design team and made crucial decisions regarding the design and safeguarding sustainability to achieve the GPR and BREEAM certifications and subsidies. Furthermore, there were moments wherein authority was not or was inadequately used within the projects. In both situations, this led to the intentional or unintentional dilution of sustainability.

In case A, this was also caused by the absence of an integrated design process at decision-making or during occasional meetings. In the definition by Keeler and Vaidya (2016) of an integrated design process, they say it requires an intense balance between the different disciplines - and a path of priorities, roles, and responsibilities - to deliver a sustainable building successfully. This balance was observed to be hard to attain in case A as specific disciplines, particularly the architect, take on more power and position, in other words, authority than others in the design team, while they should be equals in the process. For this reason, project managers should use their extent of authority, formal or informal, and accompanying power to promote an integrated design process by steering toward collaboration and communication and take authority in maintaining a balance between all disciplines to ensure everyone has an equal say during the design process if such situations are observed. Furthermore, prioritize sustainability during the design phase of building projects and influence their project team and the client to integrate and safeguard sustainability goals and ambitions into their projects by, for example, attaining specialists with referent and expert power if they do not acquire this themselves. Both cases confirm the statement made by Nikoloski (2015b), that the extent of the project manager's authority varies depending on the design team's and client's organizational structures. and thus must be aware that their influence over others will be particular to their personal characteristics and formal or informal position, as well as the situation at hand.

5.2. Accountability

Accountability is crucial for safeguarding sustainability in building projects, particularly with regard to the role of project managers. According to Sommerville et al. (2010), project managers are held accountable by clients for delivering projects safely, on time, within budget, and meeting the desired

quality standards. To establish accountability, project managers should define clear roles, delegate responsibilities, provide regular progress reports, and implement monitoring and evaluation processes (Fewings & Henjewele, 2019; Rezania et al., 2019).

However, literature found that traditional project management practices, as described by Atkinson (1999), primarily focus on measuring success based on budget, schedule, and quality at the delivery stage, neglecting the long-term benefits that projects can bring. For this reason, Musawir et al. (2017) proposes integrating Benefit Management into project management practices to account for these long-term benefits. Benefit Management facilitates the active management and alignment of project outputs, outcomes, benefits, and organizational strategy. It requires a robust governance framework that establishes the necessary structure, roles, responsibilities, and accountabilities. Effective management of benefits also necessitates leadership that advocates for a consistent, benefits-oriented approach from project conception to the realization of benefits instead of solely prioritizing project delivery within the constraints of time, cost, and quality (Musawir et al., 2017). The empirical research studied moments of accountability in the two cases that contributed to safeguarding sustainability and meeting the other desired quality standards, besides being held accountable for the delivery of the project on time, within budget,

Case A establishes that the responsibility of Project Manager A is to require good coordination to ensure a strong and aligned design team in the execution of their tasks to avoid divergence. Furthermore, Project Manager A must ensure everyone knows each other's roles and responsibilities and that people with the right expertise and strength are allocated for the specific task. Drawing this up in contracts clearly defines the demarcations at the beginning. In this respect, the interviewees indicated that it is essential that the goals and objectives are concrete and documented in the project plans so that everybody knows and understands them and takes their and the other's roles and responsibilities into account. The use of the sustainability assessment tool GPR played an instrumental role in this.

Reflecting on Project Manager A's responsibility, the results show that Project Manager A, at times, does not succeed in fulfilling the expected role of encouraging communication and collaboration. Project Manager A acknowledges the insufficient collaboration during the design phase and that closer collaboration could have fostered stronger relationships and enhanced mutual comprehension and trust among design team members. Furthermore, the interviews indicate that Project Manager A steered toward promoting and safeguarding sustainability, however, only to a certain extent. From the perspective of Project Manager A and Sustainability Advisors A and B, this was caused by his traditional way of managing projects based on time, cost, and traditional quality. Project Manager A mentioned that he, indeed, is a traditional project manager and may not have held sustainability as a high priority as he needs all aspects of the project in balance, sometimes at the expense of sustainability.

In case B, the Project Manager referred to himself as a "*duvelstoejager*", someone who chases after everything and organizes, coordinates, and monitors whether everyone in the team fulfilled their responsibilities. To ensure this, a target list was established, which also functioned as a to-do list, to clarify the project requirements, including those focused on sustainability such as BREEAM credits, and everyone's various roles and responsibilities to prevent team members from forgetting something or two people performing the same task without knowing. This way, different components and topics were assigned to specific team members, and project leads were appointed to manage everything effectively. The target list was discussed and reviewed during the weekly meetings. If not done correctly, tasks were at risk of not being fulfilled, as stated by the project manager. Thus, safeguarding the sustainability by the continued measuring and controlling of the BREEAM credits, with the help of the installation advisor who, according to the program manager, also acted as a so-called BREEAM coordinator. Furthermore, the Project Manager also acted as a central "*information hub*" and played a critical role in maintaining the coherence and fluidity of the design process and facilitating communication and collaboration.

The project managers, upon their initial observation of accountability, are also regarded as being responsible for promoting communication and collaboration. This connection between the project's processes and leadership, as demonstrated in the research conducted by Anantatmula (2010) and Lambrechts et al. (2019), and other scholars referenced in Table 3.2 in Section 3.2, emphasizes the significance of these responsibilities. Furthermore, it is essential to note that these responsibilities are not explicitly defined within the term descriptions of project managers' accountability factors as outlined by

Stellingwerf and Zandhuis (2013) and Sommerville et al. (2010).

Therefore, the issue of accountability for project managers and the specific factors for which they are currently held accountable is thus debatable, introducing a shift in the conversation about accountability. Furthermore, the existing descriptions of accountability do not include the long-term benefits project managers should be accountable for, particularly concerning sustainability goals and their corresponding requirements. Furthermore, the delegation of these responsibilities among various members of the design team, as proposed by Musawir et al. (2017), remains unaddressed. Project Manager A, in case A, does claim that he is now more frequently held accountable for sustainability besides cost, time, and quality. Nevertheless, it remains uncertain whether this aligns with the suggestions made by Musawir et al. (2017) on Benefit Management based on observations by Atkinson (1999). This topic will be further explored in Section 5.2.1. Finally, both cases do point out the importance of establishing clear project requirements, defining team roles and responsibilities, and maintaining continuous coordination, which is in accordance with research by Rezania et al. (2019), Fewings and Henjewele (2019) and Musawir et al. (2017).

5.2.1. Advantages and Disadvantages of Sustainability Assessment Methods

The previous section emphasizes the significance of establishing accountability and coordinating roles, responsibilities, goals, and objectives in project plans. Clear documentation of these aspects ensures that team members are informed and can incorporate them into their work. Both cases employed sustainability assessment methods, namely Gemeentelijke Praktijk Richtlijn (GPR) and the Building Research Establishment Environmental Assessment Method (BREEAM-nl), to aid project managers and sustainability advisors in managing and monitoring sustainability.

GPR was selected for case A to contribute to the sustainability vision and provide specific guidelines for integrating sustainability into building design while focusing on specific themes. Achieving a minimum GPR score of 8 not only made the project eligible for subsidies but also enhanced the measurability and tangibility of sustainability for the design team. By linking sustainability to costs, GPR facilitated accountability among team members for the relevant GPR categories.

Case B utilized the BREEAM, with the client explicitly opting for the BREEAM outstanding certification. BREEAM served as a valuable point of reference, target list, and incentive throughout the design process, guiding the design team in incorporating and prioritizing sustainability. The Architect noted that without or with less emphasis BREEAM as a project goal, more significant effort and guidance would have been necessary to integrate sustainability effectively. The upfront inclusion of sustainability goals, including BREEAM, in the contractual agreement, along with a clear delineation of responsibilities and accountability for each BREEAM credit, proved essential in driving the design process.

GPR and BREEAM have a significant impact on promoting sustainability in the building industry and ensuring its integration throughout the life cycle of building projects, as observed in cases A and B, where design team members were made responsible for meeting the requirements. This influence is evident in both case A and B, where the design team members were assigned responsibility for meeting the prescribed requirements. However, these methods can also be limiting, as projects tend to focus solely on fulfilling the minimum set of sustainability principles necessary to attain a GPR score of 8 or BREEAM outstanding certification. Consequently, preventing the implementation of additional sustainability initiatives that surpass these predefined thresholds. This constraint was also observed in both cases, particularly in Case A.

In both cases, the clients' focus on cost considerations made subsidies a critical factor in design decision-making. The acquisition of subsidies was vital for the project's financial feasibility and was included in the project's budget. Consequently, sustainability principles that did not contribute to the required GPR or BREEAM certifications and/or required additional investment were intentionally excluded from the design. These principles were considered to have no added value in securing the subsidies. Therefore, while tools like GPR and BREEAM are utilized to incorporate sustainability in building projects, the primary emphasis in cases A and B remained on the financial benefits and subsidies associated with such efforts. The accountability for non-contributing sustainability principles became less evident.

Cases A and B highlight an additional drawback associated with the use of tools like GPR and BREEAM: the perception of these tools as administrative checklists. This perception leads team members assigned specific GPR categories or BREEAM credits to prioritize achieving those credits without considering the long-term benefits resulting from the integration of sustainability principles. Musawir et al. (2017) recommends incorporating Benefit Management into management practices to ensure alignment between project outputs, outcomes, benefits, and organizational strategy. In the planning and conceptual phase of the design process, cases A and B considered long-term economic benefits, such as energy savings, to establish the project vision. However, once GPR and BREEAM were established and responsibilities were assigned, team members often focused on immediate outputs measured at delivery, neglecting or giving less priority to the long-term benefits. The requirements were treated as checklist items monitored and controlled by project managers and sustainability advisors, indicating the lack of integration of Benefit Management in the studied cases. In line with Musawir et al. (2017), the Installation Advisor in case B underscores the importance of integrating sustainability principles throughout the entire process and the need for effective management and guidance, as sustainability cannot be achieved automatically.

5.2.2. Objectifiable Sustainability

Objectifiable sustainability entails the quantifiable measurement and evaluation of sustainability using tangible and objective criteria. Assessment methods like GPR and BREEAM, as discussed earlier, enable the achievement of objectifiable sustainability.

In case A, Project Manager A emphasizes the importance of making sustainability measurable and striking a balance between creativity and feasibility in a project. While recognizing the value of thinking innovatively, there is a focus on practical and tangible solutions. After all, to obtain a GPR score, the submission of supporting documents was necessary. If not feasible, Project Manager A would "*draw the line*" and take decisive action to ensure the project remained on track. Furthermore, Project Manager A highlights the inclination of architects to assume the role of project manager. However, this could result in an excessive emphasis on aesthetics and sustainability, as creative individuals often aspire to do more.

The Program Manager in case B echoes this sentiment, emphasizing the necessity for a well-structured decision-making process. Proposed alternatives should be clearly presented and supported with their respective advantages and disadvantages, including financial considerations. The Program Manager concludes by suggesting a focus on clear structuring rather than exerting influence. In addition, interviewees from case B highlighted that BREEAM credits, which posed challenges in presenting necessary evidence, such as calculations to substantiate their contributions to BREEAM outstanding, were deliberately diluted or compensated for by other credits. This indicates that the quantification of sustainability principles can occasionally hinder the integration of various sustainability principles into design practices.

The analyzed cases demonstrate that the utilization of GPR and BREEAM leads to the safeguarding of measurable and verifiable sustainability principles. However, it is important to acknowledge that sustainability is not always easily quantifiable, particularly regarding long-term benefits, such as social benefits that arise from the project's outcomes, and consider the lasting impact of a building. Scholars like Samset and Volden (2016) and Too and Weaver (2014) emphasize measuring the performance of construction projects beyond immediate outputs, including factors like cost, schedule, and quality. Similarly, Morris (2009) highlights the significance of effective project management that goes beyond execution and focuses on value creation and benefit delivery.

However, specific long-term social benefits derived from sustainability principles can be less tangible and difficult to measure regarding costs or through GPR and BREEAM assessments, as discussed in Section 5.4. Consequently, these benefits are often intentionally diluted during the design phase, as observed in cases A and B. In light of this, Kibert (2016) emphasizes the necessity for further research on the impact of indoor air quality in green buildings on productivity and health.

The cases demonstrate that objectifiable sustainability remains a crucial aspect of project management and the integration of sustainability. It enables a quantifiable assessment of the project's impact and ensures that sustainability is not merely an abstract concept. Furthermore, it facilitates informed

decision-making. However, this emphasis on objectifiable sustainability comes with a trade-off, as it may overlook sustainability principles that are unproven or have less measurable and tangible benefits. This highlights the importance of adopting Benefits Management, as suggested by Musawir et al. (2017), to address these limitations and effectively manage sustainability benefits which are harder to objectify in sustainability assessment methods.

5.2.3. Incomprehension of Project Managers Priorities

Case A revealed another issue - the lack of understanding between the sustainability advisors and project managers. While the advisors are responsible for advising the design team on sustainability, the project managers are responsible for the successful delivery of all aspects of the projects, on time, within budget, and to the desired quality standards, including the sustainability targets of GPR. The incomprehension between the two roles occasionally posed challenges highlighting the distinct domains of generalist and specialist expertise.

A specialist possesses extensive expertise and knowledge in a specific field, such as sustainability (Press, 2023b). They offer specialized advice or services based on their in-depth understanding of the subject. On the other hand, a generalist possesses broad knowledge and skills across various disciplines without necessarily having deep expertise in a specific field (Press, 2023a). Generalists, due to their diverse knowledge and skills, can adapt to different roles and situations, providing a holistic perspective on complex issues (Ferraro, 2006). Although project managers primarily fall under the "*specialist*" domain of project management, they can also be considered generalists as they apply a wide range of management skills to ensure the safe, timely, and budget-compliant delivery of projects, meeting the client's desired quality standards (Stretton, 2013).

Project Manager A managed toward promoting and safeguarding sustainability, however, within constraints. From the perspective of Project Manager B and Sustainability Advisors A and B, Project Manager A´s traditional project management approach prioritized time, cost, and quality, with sustainability being secondary unless it had no financial implications or yielded positive returns on investment, aligning with GPR requirements. Nonetheless, Project Manager A defended his focus on traditional success criteria, as the successful completion of the project within budget was deemed critical by the client. The discrepancy in perspectives arose from the project manager's adherence to traditional management criteria, reflecting the client's priorities. Consequently, Project Manager A acts as a generalist, striving to balance all project aspects, sometimes at the expense of sustainability and against the insights of specialists.

Effective communication, collaboration, and clear documentation of requirements, roles, and responsibilities are crucial to address the incomprehension of specialists toward generalists identified in case A. Pointing out the importance of the intense balance between the different disciplines - and a path of priorities, roles, and responsibilities - to deliver a sustainable building successfully, as advocated by Keeler and Vaidya (2016) for integrated design processes can enhance accountability and understanding among design team members. By working together and recognizing each other's perspectives, specialists and generalists can ensure the fulfillment of sustainability goals without compromising the overall project objectives., understanding the broader project objectives and the constraints project managers base their decisions on.

5.3. Affective Influence

Affective influence emerged as a critical aspect in safeguarding sustainability, considering the project managers' leadership role in building projects. Nikoloski (2015b) describes exercising influence on other people as the essence of leadership, the process by which one person influences other individual thoughts, beliefs, and actions (Liphadzi et al., 2018).

Throughout the design processes of the cases, a range of methods were utilized to effectively persuade and convince the clients and team members to promote and safeguard sustainability in the design. These methods have been previously identified in the literature and the most commonly utilized ones are as follows:

- Considering the long-term benefits such as cost-effective sustainability.
- Utilizing sustainability assessment methodology and tools such as GPR and BREEAM and the associated subsidies.
- Promoting an integral design approach that encourages communication and collaboration.
- Involving intrinsically motivated sustainability experts to introduce and enthuse the client and design team members about sustainability.

The latter two influencing methods can be perceived as affective influence. This type of influence is generated by fostering an environment where sustainability is driven by emotions, motivation, open communication, and collaboration that establish mutual trust, optimism, altruism, transparency, and openness, as noted in 3.4. The empirical research studied moments of affective influence that contributed to safeguarding sustainability or in which affective influence was insufficient.

In case A, Project Manager B emphasized the importance of fostering relationships with the client and other design team members based on mutual trust and value creation. However, this objective encountered challenges. Despite implementing an integrated design approach, instances of indirect communication and inadequate collaboration arose due to the hierarchical organizational structure of the team, making it difficult to establish trust among team members.

Project Manager A acknowledged a lack of collaboration during the design phase and recognized the potential for closer collaboration to strengthen relationships, improve mutual understanding among design team members, and foster trust. Project Manager A admitted to not having a strong personal commitment to sustainability. As a result, he advised project managers aiming to promote sustainability to include passionate individuals in the design team who possess specialized knowledge in sustainability, similar to his own actions in case A. He argued that these specialists approach sustainability with a deep sense of societal and intrinsic commitment, sharing their experiences while exploring the potential benefits that can be achieved. One concrete example of such commitment can be observed in the actions of Sustainability Advisor B. Ultimately, the integrated design approach, combined with the strong sustainability vision established by Sustainability Advisors A and B, resulted in the successful incorporation of numerous sustainability features in the building.

Sustainability Advisor B emphasizes the importance of influencing, transitioning, and actively engaging individuals, stating that "*motivation is much less when people have to do something than when they want to do it*" a sentiment agreed upon by Sustainability Advisor A. Accordingly, the initial step involved collectively developing a concept that evokes excitement and enthusiasm, eliciting a response of "*cool!*" from everyone involved. As the design progressed, Sustainability Advisor B harnessed "*the power of concept*" to motivate the design team members. This was achieved by consistently highlighting their involvement in something new, unique, and iconic, particularly within the realm of sustainability. In doing so, Sustainability Advisor B employed affective influence, compelling the design team members to surpass the status quo, and enhancing their ability to innovate and adapt within the team environment through motivation.

To acquire support and facilitate the attainment of sustainability goals, Sustainability Advisor B collaborated with the design teams to establish the concept, continuously reinforcing its potency through narrative, enthusiasm, optimism, and collaboration. This approach relied on not only expert power but also referent power, as evidenced by Project Manager B's assertion to "*include Sustainability Advisor B in the process, people always become highly enthusiastic about him*".

In case B, the interviewees emphasized the significance of team composition in establishing a positive work environment that promotes personal relationships among team members and the client, thereby influencing decision-making. Effective collaboration and communication were deemed crucial for the successful realization of the project's sustainability goals and ambitions. The interviewees also highlighted the instrumental role played by the project manager in cultivating such an environment, demonstrating the project manager's use of affective influence. The Project Manager's strong dedication to sustainability and emphasis on achieving BREEAM outstanding certification served as a significant driver for sustainability initiatives during the design phase.

The assembly of the design team in Maastricht for a specified period to finalize the preliminary and detailed designs serves as a positive example of affective influence implemented. The Project Manager

recognized the advantages of this approach, as initially outlined in the project's offer, and proactively undertook the responsibility of establishing it. Collaborative efforts and formal and informal communication were facilitated by working together in a shared workspace and residing in close proximity at a joint lodging facility. This arrangement provided several advantages beyond streamlining the design process, including reducing information distortion and promoting efficient information dissemination through face-to-face interaction, as opposed to remote methods like email, phone, or screens. Moreover, this approach fostered informal relationships among team members, positively contributing to the design process. These relationships were further strengthened through activities outside of working hours. Additionally, it was observed that the project manager utilized his position and authority to ensure the inclusion of committed and motivated individuals in the design team while taking the necessary steps to remove those who did not contribute positively to the team atmosphere. This proactive approach aimed to maintain a conducive and positive environment within the team.

Additionally, fostering an informal relationship with the client positively impacted the design process, demonstrating another instance of affective influence. As highlighted by the project manager, the client pleasantly surprised them, and both parties maintained a pleasant and friendly working dynamic, fostering a sense of heartfelt connection. For example, birthday gestures fostered a sense of sympathy between the client and the design team. This informal relationship positively contributed to achieving the sustainability goals and ambitions of the project, as it prevented obstacles from arising. When challenges did arise, they were resolved based on substantive arguments rather than escalating into a conflict. This approach motivated team members to sustain their motivation and commitment to the project and safeguard the sustainability goals and ambitions. Exhibiting sympathy, a form of empathetic capacity identified by Nikoloski (2015b), as a channel for enabling their passions and attracting others through emotional intelligence, in this case, attracting motivation and commitment to the project by the team members.

In case B, the installation advisor also highlighted the psychological impact of fostering empathy among individuals, often referred to as the "soft side" of project management. The advisor shares an additional example from their experience, wherein the client organized informal social events, effectively enhancing affective influence.

> "*Sometimes your management was invited, other times you were allowed to bring your draftsman and engineers with you, but thanks to the social gatherings during those openings, a sense of sympathy and reciprocity arose at their expense, which resulted in resolving many issues on the construction site*."

5.4. Barriers Encountered Toward Sustainability

In addition to moments of authority, accountability, and affective influence, this section explores encountered barriers toward sustainability in the cases. The literature identifies four main barriers that impede, restrict, or weaken the integration of sustainability principles in building projects: economic, technological, awareness, and management barriers. Through a comparison of case studies and literature, this section analyzes the barriers.

In addition to the barriers identified in the literature, this study has revealed new potential barriers. The first newly identified barrier concerns the unintended effect of using sustainability assessment methods currently perceived as drivers for sustainability in the building industry. The second newly identified barrier relates to organizational structure and authority.

The discussion begins by addressing the newly identified barriers, followed by discussing the previously identified barriers in the literature.

5.4.1. Sustainability Assessment Methods and related subsidies

Although sustainability assessment methods have promoted and enabled project managers and stakeholders to more effectively evaluate the environmental, social, and economic impact of building projects (Akadiri et al., 2012; Kibert, 2016), and help them make informed decisions regarding the integration of sustainable practices, cases A and B show that the tools also may limit the integration of further

sustainability principles beyond their scope. This can be seen as an unintentional side effect of using assessment tools and related subsidy schemes.

Sustainability assessment methods give clear guidelines for integrating sustainability into building design. For GPR the guidelines are based on five themes; energy, environment, health, quality of use, and future value, as described in Section 3.1.3. However, in case A in particular, the GPR also created a barrier as only sustainability aspects contributing to the GPR score were included in the design. The interviewees highlighted that sustainability principles initially included in the tender's concept design were deliberately omitted from the final design as they did not contribute to the required GPR score and were deemed unnecessary further investment providing no added value in securing the subsidy. Similar observations were made in case B regarding BREEAM outstanding.

While tools such as GPR and BREEAM are utilized to incorporate sustainability into building projects, cases A and B demonstrate the primary emphasis continues to be placed on the financial advantages associated with such efforts rather than sustainability itself. Targets, acting as thresholds as well, are formulated for sustainability based on a maximum GPR score of 8 or BREEAM outstanding, and resistance is introduced to implement additional sustainability initiatives beyond those required to achieve GPR and BREEAM targets/thresholds.

In case B, the assignment of multi-disciplinary BREEAM credits presented difficulties. While many BREEAM credits are straightforward and can be unambiguously assigned to a single design discipline, certain credits may involve the participation of multiple disciplines in the project. As a result, disagreement and discussion regarding responsibility arose, requiring significant collaboration between these disciplines. This can also cause the dilution of sustainability.

Despite the fact that aligning project requirements with GPR scores and BREEAM credits had, in both cases, a significant impact on achieving a high sustainability score by making the design team accountable for their achievements, this research reveals that several sustainability principles were intentionally excluded from the design. This exclusion often is attributed to a perception of the associated financial burden and/or perceived lack of added value, creating resistance to do more and exceed the required GPR and BREEAM scores.

5.4.2. Organizational Barriers

In this research, another type of barrier was identified, namely organizational barriers. The organizational barrier can be categorized into two types: the organizational structure of the design team and the sustainability background of the organization(s) involved.

Organizational Structure of Design Team

Case A showed that inter-organizational structure could benefit as multiple disciplines share their knowledge and expertise. However, when the structure becomes too complex or multilayered, it also presents challenges, such as long or indirect communication lines or the absence of communication due to the numerous layers that emerge in an inter-organizational design team.

The case highlighted how the multiple layers between the client and the advisors with expertise in sustainability led to miscommunication or a complete lack of communication, resulting in incomplete or distorted information about the proposed design alternatives not reaching the client accurately. These layers have led to the absence of sustainability advisors in meetings and their inability to present sustainability-related topics properly. According to the interviewees, this may have led to the client making general or sustainability-related design choices whereby it was unclear whether the client was aware and/or understood the rationale and supporting data that led to the initial design proposals or its proposed alternatives.

This highlights the importance of effective and direct communication within inter-organizational design teams, particularly regarding complex issues such as (integration of) sustainability. Re-emphasizing the importance of communication, collaboration, and teamwork skills, asserted in Section 5.5.2. Project Manager A and Sustainability Advisor A argue that information must reach the client via the shortest possible route, through direct communication, or through the participation of advisors in meetings with the client. This proved to be challenging.

Furthermore, case A illustrates that in inter-organizational structures, unintended hierarchical orders can emerge with power and position imbalance during the design process. Even though the client has the highest authority in the design team, the architect assumed a strong position of power as well. During meetings or decision-making, the architect diminished expert power on sustainability, making the advisory team, on occasion, feel powerless, leading to conflict and distrust, as the architect's priorities were viewed as most important. This highlights that position and power imbalance can persist in design teams, even in integrated design processes, and can be attenuated by a multi-layered structure, as observed in case A. The imbalance may have been caused by the architect subcontracting the advisory team of Arcadis, giving them the position to make decisions and use their authority and consequently creating an expectation of deference from Arcadis.

On the other hand, case B showed that a turn-key project, in which the design is developed by a single organization, has a lot of advantages, significantly facilitating communication, collaboration, and teamwork. In this project, the importance of the involvement of sustainability advisors was recognized and ensured, leading to influence on decision-making and strong motivation through recognition and participation.

Sustainability Background Organizations

The cases indicate that a project manager's ability to succeed in the integration of sustainability is elevated when the corporate organization to which they belong embraces the same sustainability goals and ambitions within its corporate strategy, objectives, and culture. This provides the project manager with a corporate culture and resources with a sustainability mindset, as supported by the research conducted by Zheng et al. (2017) andMingaleva et al. (2022). Case B provides a positive example.

In case B, Arcadis executed the building project in all its facets based on a turn-key contract. The corporate sustainable strategy and culture of the organization contributed strongly to a shared motivation toward achieving the sustainability goals and ambitions set out for the project. The project manager argues that "*you automatically consider sustainability because it is also the label of Arcadis. So then you just have to take that into account.*"

In case A, the fact that the client and Project Manager A's organization initially lacked a sustainability vision and culture may have amplified the focus on the traditional budget, schedule, and quality constraints. The interviews indicate that the project manager mainly steered toward budget rather than sustainability. Project Manager A asserted that the project manager's firm did not have its own intrinsic goals and ambitions toward sustainability; sustainability is not yet embedded in its organizational strategy and culture. Nonetheless, explains Project Manager A that sustainability has become an essential aspect of managing projects as they are now tasked with monitoring, creating, and steering toward sustainability. He adds that this is now more embedded into the firm's vision.

Organizations with a priori strong strategy and culture toward sustainability embrace related goals and ambitions readily. A barrier emerges when organizational background with regard to sustainability is not, or to a lesser degree, present.

5.4.3. Economic Barriers

In literature, the high initial cost associated with implementing sustainability principles is recognized as a significant barrier to incorporating sustainability into building projects (Bon-Gang, 2018; Hwang & Ng, 2013; Shi et al., 2013), as sustainable technologies such as water and energy-saving equipment and high-performance insulation are often costly. Research asserted that sustainable materials could cost up to 3-4% more than conventional materials due to design complexity and modeling costs (Zhang et al., 2011). Also, in this research, barriers were identified caused by financial considerations.

The initial winning concept design of case A had ambitious sustainability goals; however, due to financial constraints caused by high design cost estimates exceeding the available budget, several sustainability principles were diluted intentionally during the design phase. Furthermore, sustainability principles that did not contribute to subsidy eligibility related to GPR were excluded from the final design, as discussed in Section 5.4.1. Consequently, while the final design achieved a minimum GPR score of 8, some of its initial sustainability goals and ambitions were compromised due to economic barriers.

Case B encountered financial constraints during the design process, making it impractical to include certain sustainable materials that did not align with the building's function or had unrealistic pay-back periods. These constraints increased costs and acted as a barrier during the design phase. Additionally, minor alterations in the design had significant budgetary implications due to the building functions; for example, the architect of case B asserted the "*law of large numbers*". Similar to case A, sustainability principles that did not contribute to the eligibility for BREEAM outstanding certification were also excluded, as discussed in Section 5.4.1.

Despite the increasing awareness and implementation of sustainable practices, cases A and B reveal a prevailing focus on cost rather than long-term sustainability benefits. Both project managers and clients prioritize budget constraints over the long-term environmental impact of the building, resulting in suboptimal sustainable practices. For instance, decisions made by clients and project managers are often driven by budget considerations and the eligibility for subsidies through certifications like GPR and BREEAM. Consequently, cost becomes the primary driver in building projects, as expressed by Project Manager B in case A who stated that "*there was a trade-off between budget constraints and sustainability concerns.*" The emphasis on project cost takes precedence over long-term benefits.

For this reason, educating clients and design team members, particularly project managers, about the long-term economic advantages of sustainability principles is essential. A life cycle approach to cost assessment, as proposed by Bon-Gang (2018), can effectively address economic barriers. When project managers have a clear understanding of the economic benefits, they can exert influence during the early planning stages of the design phase to promote sustainability among clients and the project team. This approach helps to alleviate the perception that sustainable buildings cost more than conventional ones, particularly when considering the trade-off between short-term costs and long-term economic benefits.

5.4.4. Technology Barriers

Literature highlights the lack of technological understanding as a significant barrier to adopting sustainable practices (Akadiri, 2015; Bon-Gang, 2018; Shari & Soebarto, 2012; Shi et al., 2013). Insufficient information on the integration of technologies and materials, as well as the long-term performance and benefits associated with them, contributes to this barrier. Sustainable technologies often involve complex techniques and construction processes, impacting the design and construction phases of building projects. Both cases examined in this study demonstrated the presence of technology-related barriers.

According to Shari and Soebarto (2012), industry stakeholders often lack the necessary technical knowledge for implementing sustainable practices, leading to uncertainties in their implementation. This phenomenon was evident in case A. Despite the involvement of sustainability experts, the client exhibited resistance toward adopting experimental or unproven technologies due to concerns about potential risks and challenges, such as maintenance costs and maintainability. The client explicitly expressed a preference for proven technologies in the tender request and hesitated to pioneer in the area of sustainability.

In case B, a technology barrier was identified concerning the building's function. Safety measures did not align with the overall function of the building, thereby failing to contribute to its added value. Additionally, due to parcel size constraints, certain sustainability principles were excluded, requiring the substitution of specific credits to achieve the BREEAM outstanding certification.

5.4.5. Awareness Barriers

According to literature, the incorporation of sustainability principles in building projects also faces barriers due to the lack of awareness, knowledge, and resistance to change (Akadiri, 2015; Bon-Gang, 2018; Ershadi & Goodarzi, 2021; Kibert, 2016; Shi et al., 2013). Traditional perceptions of construction practices and a lack of environmental awareness among stakeholders result in using materials and building technologies without much consideration for sustainability and the surrounding environment. Additionally, practitioners in the building industry are often unaware of the environmental credentials of sustainable measures or alternatives Akadiri (2015).

In both cases, awareness barriers manifested themselves during the project. Especially at the start of

the project, as the clients were unaware of the possibilities of sustainable design and construction. However, this barrier was resolved by involving sustainability experts to introduce the client to sustainability principles and the benefits, including long-term economic advantages, such as energy savings. Promoting sustainability and creating a vision on sustainability with the client and, thereafter, safeguarding this by continuously controlling and monitoring the progress in collaboration with the project manager.

In case A, in addition to the client's unawareness, various team members also lacked knowledge of the alternative and solutions available. Sustainability Advisor B took the initiative to organize workshops and guide various team members to address this knowledge gap. Continuously emphasizing the importance of sustainability, the advisor strived to establish a solid foundation for sustainable practices within the project. Recognizing the significance of sustainability advisors, Project Manager B highlights the need to involve them early in the design development stage. This emphasizes their role in influencing team members and introducing and promoting sustainable alternatives.

5.4.6. Managerial Barriers

Literature shows that project managers experience difficulties incorporating sustainability into their management capabilities due to the complexity that comes with managing a multidisciplinary team. Hwang and Ng (2013) identified ten critical challenges faced by project managers in sustainable building projects, three of which were addressed in this research and are outlined below:

1. Uncertainty with sustainable materials and equipment.
2. High costs of sustainable materials and equipment.
3. Increased meetings and coordination required with green consultants and engineers.

The first two challenges, related to economic and technological barriers, are discussed in Sections 5.4.3 and 5.4.4. The final challenge pertains to organizational barriers identified in case A, which include communication gaps, lack of collaboration, and teamwork due to inter-organizational structure barriers. This confirms the difficulty of managing a multidisciplinary team in building projects, where coordination across different disciplines and organizations is crucial for making informed decisions supported by substantiated documentation. It also aligns with the findings of Robichaud and Anantatmula (2011), who identified ineffective communication among team members as a barrier that hinders collaboration and decision-making, "*silo effect*", often resulting in diluted sustainability goals

In case B, steps were taken to mitigate this challenge by fostering collaboration through shared workspaces, thereby shortening communication lines and facilitating direct interactions among team members.

5.5. Safeguarding versus Promoting Sustainability

In the discussion, it was observed that sustainability goals and ambitions were safeguarded during the design process through authority, accountability, and affective influence to a certain extent. Case A attained a minimum GPR score of 8, while Case B achieved the outstanding BREEAM certification with accompanying subsidies. Nevertheless, deliberate exclusions or substitutions of sustainability principles were made throughout the process due to various barriers encountered, as noted in 5.4. Nevertheless, the overall loss of credits during the design process of case B was trivial, as the final design yielded well above 90%, while BREEAM outstanding score needed to yield 85%. The high score was achieved by incorporating a margin in the sustainability target list to accommodate potential credit loss due to unattainability or challenges in providing the necessary evidence. In addition to fostering effective communication and collaboration, the margin also served as a continuous encouragement for the design team to integrate sustainability, even if initial ideas did not materialize as originally planned.

Hence, in the course of this research, an additional differentiation can be observed concerning the concept of safeguarding sustainability versus actively promoting it.

Sustainability is typically promoted during the planning phase, which includes the sharing of the project views, interests, values, and the goals and ambitions of the owner/client and the various members of a design team. This is the phase after contract kick-off to make shared decisions and co-create the

project goals and ambitions, translate these to project requirements and objectives, address the risks, commit resources, and influence changes. The aim is to maximize the favorable performance of the building project (Kolltveit & Grønhaug, 2004; Williams et al., 2019). In this phase, the project's scope is defined, including the project's vision on sustainability.

In case A, sustainability was initially promoted by Sustainability Advisor A, who was recruited by Project Manager A to introduce the client to sustainability and integrate it into the project scope and tender request. The municipal authority also influenced this recruitment. In case A's design team, Sustainability Advisor B was recruited to promote sustainability and incorporate it into the winning tender design. In case B, the client appointed a design team, which included advisory on sustainability, through the early involvement of Arcadis in the client's strategy process. The installation advisor promoted sustainability by providing the client with the insight that there is more to sustainability than just energy efficiency and helped shape the sustainability vision for the project.

In both cases, sustainability was promoted by introducing sustainability assessment methods, namely GPR and BREEAM, and eligibility for subsidy was contingent upon achieving specific minimum scores. During the planning phase of the cases, the methods used to promote sustainability can also be associated with authority, accountability, and affective influence. In addition to promotion identified in the use of affective influence identified in safeguarding. The Gioia method, in conjunction with flexible-pattern matching, was utilized to visually portray the methods derived from the qualitative semi-structured interviews conducted for each case. The visual representation of these methods can be found in Appendix B of this research report. This approach was also employed when analyzing and composing Sections 4.1.2 and 4.2.2, which focuses on the *Vision on Sustainability* for each case.

While the design progresses from conceptual to final design, the project's goals and ambitions, in other words, objectives set out in the scope definition phase, are translated into the final design. During this phase, 80% of the design choices are made, and is decisive for the project outcome (Kooter et al., 2021), also in relation to sustainability. For this reason, the goals and ambitions need to be well formulated in the objectives of the project; otherwise, they do not become an explicit returning topic of conversation, and they tend to lose value (Kooter et al., 2021). To make sustainability a returning topic and safeguard it, the authoritative decision was made by the clients to employ sustainability assessment methods, namely GPR and BREEAM. This decision served to organize the sustainability goals and ambitions contractually. As a result, the design team, including project managers, were held accountable for attaining the targeted scores. Detailed descriptions of these methods and their implementation can be found in Sections 5.1 and 5.2.

The introduction of GPR and BREEAM, therefore, served two purposes:

- To promote sustainability through the categorization of sustainability requirements and linking their accomplishment with subsidies.
- To offer methodology and tools to monitor, objectively quantify and thus safeguard those required sustainability goals and ambitions.

However, the findings indicate that the focus on safeguarding sustainability is limited to achieving the minimum sustainability thresholds outlined by GPR and BREEAM, driven by authority and accountability. Section 5.4.1 explained that while GPR and BREEAM promote sustainability, the primary emphasis continues to be placed on the financial advantages associated with such efforts rather than sustainability itself. Targets, serving as thresholds, are formulated for sustainability based on a maximum GPR score of 8 or BREEAM outstanding, which are achieved. However, resistance arises when attempting to implement additional sustainability initiatives beyond those necessary to meet the GPR and BREEAM targets/thresholds. This pattern is particularly evident in case A, where certain principles initially included in the conceptual design were deliberately excluded from the final design due to perceived financial burdens or a perceived lack of added value in terms of subsidy eligibility.

In case B, similar observations were made as credits were excluded and compensated; however, in the end, the final design surpassed the minimum score requirement of 80% to attain BREEAM outstanding certification. Case B demonstrates that through continuous promotion, more opportunities to address more sustainability in the building do present themselves. A willingness to go beyond merely safeguarding the thresholds of GPR or BREEAM, indicating that both the client and the design team

are significantly more intrinsically motivated and committed to incorporating sustainability. This accomplishment is mainly attributed to the affective influence that fosters a positive work culture among the client and design team members through the cultivation of formal and informal relationships within a shared workspace, wherein a collective vision pertaining to sustainability is promoted, aiming to ensure sustained motivation and dedication. Facilitated by the project manager and the installation advisor. It is plausible that this collaborative effort contributed to the attainment of a BREEAM score of 90%, surpassing the established threshold.

In case A, sustainability advisors A and B were appointed to promote sustainability in the project, as they approach sustainability with a sense of societal and intrinsic commitment to continuously reinforce the potency of sustainability principles through narrative, enthusiasm, optimism, and collaboration. This approach relied on not only expert power but also referent power. However, as the design progressed and became more detailed, Sustainability Advisors A and B indicated that project manager A decided that both Sustainability Advisors A and B were no longer necessary, as the GPR calculations became the only focus for the design teams, and no further sustainability additions were deemed necessary. Limiting their influence on the design team to promote the integration of sustainability to go beyond the threshold of GPR. In addition, insufficient communication and collaboration caused by the inter-organizational structure may have also limited the occurrence of affective influence to promote sustainability, as breaches of trust were identified.

Based on these findings, it can be deduced that sustainability was effectively safeguarded in the cases. Nevertheless, the finding also highlights the importance of consistently promoting sustainability throughout the design process, to go beyond the predefined thresholds and integrate sustainability principles that may not be fully accounted for or measurable by sustainability assessment tools like GPR and BREEAM. The findings related to safeguarding and promoting sustainability are consolidated and presented in Table 5.1.

To overcome the identified barriers in this study, it is suggested to leverage affective influence to promote sustainability and encourage surpassing predefined thresholds. This can be achieved by fostering a positive work culture characterized by mutual trust, optimism, altruism, transparency, and openness, where sustainability is continuously collectively promoted through emotional engagement and open communication. An example of this was observed in case B, wherein design team members were encouraged to explore alternative sustainability principles when initial ideas did not materialize as originally planned.

Furthermore, the contractual establishment of sustainability principles in advance provides the option to promote the integration of additional sustainability principles in the design. Case B exemplifies this by incorporating a margin. While BREEAM credits are included in the margin in this case, the same approach can be applied to other sustainability principles that are not considered in sustainability assessment tools or are less objectively measurable.

Thus, besides safeguarding the thresholds of GPR and BREEAM, the contractual establishment of supplementary sustainability principles can encourage design teams to surpass the thresholds defined by sustainability assessment tools. Affective influence, which can be effectively facilitated by the project manager's authority, plays a significant role in this process, as demonstrated in Case B. Musawir et al. (2017) also described the necessity of a strong governance framework that provides the structures, roles, responsibilities, and accountabilities to enable effective management of benefits. While Musawir et al. (2017) emphasizes the need for leadership to ensure continuous alignment of the benefits envisioned in the project's goals and ambitions when Benefit Management is incorporated, the research does not yet suggest the associated leadership style or affective influence.

Revisiting the discussion on the accountability of project managers and the existing factors for which they are held accountable, as presented in Section 5.2, it is proposed to incorporate process-related concerns, in connection to affective influence, and long-term benefits in addition to the traditional criteria of cost, time, and quality.

The following sections elaborates on the suggested leadership styles and process-related leadership skills for effective leadership for safeguarding and promoting sustainability in building projects while emphasizing affective influence in addition to authority and accountability.

Table 5.1: The 3 A's in safeguarding and promoting sustainability

	Authority	Accountability	Affective Influence
Safeguarding	The client and project manager exercised their authority during the design process to direct the team toward achieving the desired GPR and BREEAM scores. This was done while ensuring that the project fit within the budget and addressed the client's other priorities, all the while maintaining a focus on sustainability. To enhance these efforts, the client and project managers recruited individuals with expertise in sustainability.	Accountability was implemented in the projects to safeguard sustainability by contractually organizing the sustainability goals and ambitions and holding design team members responsible for meeting the GPR and BREEAM thresholds. This ensured that the project was delivered in accordance with the client's priorities, on time, and within budget while taking advantage of granted subsidies.	Affective influences were utilized to a certain extent in the projects to safeguard sustainability, particularly in Case B. This involved fostering a positive work culture among the client and design team members through formal and informal relationships within a shared workspace. Such influences positively contributed to the design process and safeguarded sustainability through motivation and commitment.
Promoting	The client and project manager utilized their authority in the planning phase to integrate sustainability into decision-making. In case A, influenced by the municipal authority. This involved employing sustainability assessment tools and recruiting experts to promote sustainable practices. However, as the design process advanced, their authority was primarily focused on meeting the sustainability thresholds established by GPR and BREEAM.	Accountability was not utilized during the planning and design phases to promote sustainability among the design team members and clients, except for the sustainability advisors who were responsible for promoting and advising on sustainability. The decision to adopt GPR and BREEAM guided the projects by establishing requirements for achieving target scores.	The promotion of sustainability was facilitated through the involvement of experts who showcased affective influence through their narrative, enthusiasm, optimism, and collaboration. In Case B, the positive work culture among the client and design team members further enhanced the impact of affective influence. This culture nurtured formal and informal relationships within a shared workspace, motivating and dedicating the team to exceed sustainability thresholds.

5.5.1. Leadership Styles for Safeguarding and Promoting Sustainability

The four progressive leadership styles identified in this research toward the integration of sustainability are *transformational*, *socialized*, *authentic,* and *charismatic leadership*. All four leadership styles show to be influential and change the behaviors and actions of those who project managers lead by inspiring and motivating them to transcend their personal interests for broader-based values and challenging them to perform better (Anantatmula, 2010; Ofori et al., 2008; Tabassi et al., 2014; Whyte et al., 2022).

Based on the interviews, the project managers in both cases do not precisely match the leadership styles identified as valuable in promoting and safeguarding sustainability. In case A, the project managers exhibited transactional leadership characteristics. Transactional leadership, also referred to as

managerial leadership, relies on rewards and punishments to motivate subordinates and attain predetermined objectives (L. Zhang et al., 2018). This was observed as the project managers directed the project toward achieving the client's goals through the implementation of structure, organization, supervision, performance monitoring, and outcome evaluation. This was observed as sustainability was safeguarded; however, this was aimed at achieving the minimum sustainability thresholds outlined by GPR, driven by authority and accountability. Determining that, unlike transformational leadership, which emphasizes motivation and inspiration, transactional leadership focuses on exerting influence and maintaining the existing state of affairs rather than pursuing a forward-looking approach (Tabassi et al., 2014).

While the project manager also exhibited transactional leadership characteristics, he also employed authentic leadership on occasion. According to Ofori et al. (2008), authentic leaders are influential in enhancing others' ability to perform better by providing support and creating conditions that stimulate the individuals "*to work hard, even extraordinarily hard, to perform at one's very best*". The project manager in case B employed an authentic leadership style by recognizing and seizing an opportunity to enhance collaboration and communication among team members by taking the initiative to assemble the design team in a shared workspace and creating an environment that facilitated both formal and informal interactions and relationships. By reinforcing these relationships through interactions outside of working hours, the project manager was able to create a cohesive and collaborative team that contributed positively to the design process. Overall, the project manager's authentic leadership style was characterized by a willingness to take risks, recognize opportunities, and create a supportive environment that facilitated effective communication and collaboration among team members.

The project manager's authentic leadership style in case B is consistent with the view of leadership as a process that involves creating a supportive environment that stimulates individuals to "*to work hard, even extraordinarily hard, to perform at one's very best*", as described by Ofori et al. (2008). By providing support and creating conditions that encouraged collaboration and communication, the project manager was able to foster a team culture of mutual trust, optimism, altruism, and especially transparency and openness that emphasized working hard to achieve excellence. The approach employed in case B served as an example of how authentic leadership can create a high-performing team committed to achieving a common goal, fostering affective influence to promote and safeguard sustainability.

While the project managers did not demonstrate transformational leadership, it is recommended that they adopt this style to effectively promote sustainability in addition to authentic leadership. Unlike the transactional approach, which relies on rewards and punishments, transformational leadership emphasizes motivation and inspiration to embrace sustainability goals and surpass the status quo, aiming to enhance innovation and adaptability within the team (Tabassi et al., 2016). By emphasizing a shared vision of sustainable design and empowering individuals to take ownership of their roles, transformational leadership can drive positive change and contribute to long-term sustainability goals during the design phase of building projects. This approach focuses on influencing rather than directing others, and according to Tabassi et al. (2014), project managers have recognized and assessed transformational leadership as a humanistic approach for managing subordinates in sustainable building projects, particularly in terms of employing affective influence.

5.5.2. Leadership Skills for Safeguarding and Promoting Sustainability

Extensive literature on leadership has identified the essential skills that project managers need to lead projects effectively. These leadership skills play a crucial role in directing, guiding, and motivating the design team throughout the process of completing a sustainable building project. They encompass setting goals and ambitions, ensuring effective communication, fostering collaboration, resolving challenges, and making informed sustainability-related decisions.

The empirical research findings indicate that project managers require effective communication skills, collaboration and teamwork skills, and emotional intelligence to exert affective influence over the design team, driving them toward promoting and safeguarding shared sustainable goals and ambitions. This aligns with the definition of an integrated design process proposed by Ikudayisi et al. (2022), which emphasizes the importance of interdisciplinary collaboration and communication for achieving sustainability goals. Adopting an integrated design process is recommended for attaining innovative sustainable

design outcomes, as conventional design processes characterized by linearity and fragmentation may hinder the success of such initiatives in this area (Ikudayisi et al., 2022). Nevertheless, the challenges highlighted in Case A indicate that realizing this "*ideal world*" can be challenging in practice.

Moreover, according to Nikoloski (2015a), projecting vision is another soft power skill of leaders, alongside communication and emotional intelligence. However, in the present study, the project manager did not demonstrate the ability to articulate an inspiring sustainability vision for the project. Instead, the sustainability experts within the design team employed their expert power and referent power to communicate a compelling vision for sustainability, persuading both the client and other members of the design team to work toward its realization actively and safeguarding sustainability.

Recognizing own limitations in the realm of sustainability and purposely and effectively providing sustainability advisors the proper platform and position to play this role represents strength in leadership. In case A, this was burdened by the organizational structure, while in Case B, due to structure and the project manager's affective influence, this became effective and successful.

Communication Skills

Both cases reveal that effective *communication skills* are essential for project managers to safeguard and promote sustainability in building projects by means of lessons learned in case A derived from the interviews, while case B demonstrated a positive example. Project managers serve as the "information hubs" of the team, facilitating communication among team members and ensuring the effective distribution and implementation of decisions. and information. This is in line with Archer et al. (2010), Tabassi and Bakar (2010), and Zulkiffli and Latiffi (2019), who note the importance of leaders' ability to articulate and communicate problems and solutions effectively among the members of the design team, and that barriers arise when processes and communication are poorly defined. To safeguard the sustainability goals and ambitions and promote them during the planning and design phase, project managers must continuously communicate the project's sustainable vision to all team members, including the client, architect, engineers, and sustainability advisors, as explained by Archer et al. (2010) and Tabassi et al. (2016).

Clear communication also enables project managers to monitor the project's progress and identify issues or challenges that arise, allowing them to take proactive measures to address them. Project documentation, reports, feedback, proposals for design alternatives, and change requests should then be distributed.

In case A, the organizational structure posed communication challenges. Advisors had limited interaction with the client due to the multi-layered design team structure, leading to indirect and challenging communication. Messages had to pass through various organizations, including the architect and the project manager, to reach the client and vice versa. This issue is further explored in Section 5.4.2. Project Manager A acknowledged insufficient collaboration during the design phase and that closer collaboration could have strengthened relationships, improved mutual understanding among design team members, and built trust (Section 4.1.4). The architect also emphasizes the importance of communication and collaboration within the team to foster a positive atmosphere, establish trust, and effectively convey the concept of sustainability within the project. This being said, the architect played a dubious role in establishing proper communication lines by creating an imbalance in authority and power in the team. However, the approach may vary depending on the project manager's preferences and leadership style. Additionally, Project Manager B highlights the significance of establishing a trusting relationship with the client as a foundation for inspiring the client's enthusiasm for sustainability. This can be achieved through additional sessions and workshops to encourage communication and align the client's sustainability ideas with those of the design team, benefiting the entire project team and ensuring alignment. Sustainability Advisor A also emphasizes the importance of effective communication and expertise, stressing the need for the project manager to foster a positive team spirit and prevent sustainability from becoming a hindrance through enthusiastic communication.

In case B, the project manager played a pivotal role in ensuring coherence and fluidity throughout the design process by facilitating both formal and informal communication among the members of the design team. A key factor that contributed to this success was providing the team with a shared workspace in Maastricht, which proved advantageous in minimizing information distortion and fostering face-to-face

interactions. It is important to note, however, that the ease of implementing this arrangement was partly attributed to the turn-key nature of the project.

Collaboration and Teamwork Skills

Leadership involves creating a cohesive and collaborative team to achieve the project's goals and ambitions (Hwang & Ng, 2013; Nikoloski, 2015b; Trivellas & Drimoussis, 2013; Zulkiffli & Latiffi, 2019). Anantatmula (2010) explains that leaders prioritizing teamwork can establish clear roles and responsibilities, encourage communication, and foster a positive team culture that promotes trust and respect among project team members. Moreover, collaboration and teamwork facilitate innovation, problem-solving, and improved project outcomes (Anantatmula, 2010). Thus, project managers should obtain *collaboration and teamwork skills* to create a cohesive and collaborative team. Case A and B have multidisciplinary design teams and include diverse areas of expertise; it is essential for the project manager to stimulate collaboration and teamwork for the project to be conducted (Ikudayisi et al., 2022).

Case A presented collaboration challenges due to the inter-organizational structure and hierarchical order which emerged, limiting the involvement of specific team members during decision-making and meetings. Sustainability Advisor B notes that when design team members do not collaborate, they revert to their old routines, developing solutions and solving multi-sectoral problems. Withal, the Project Manager, learned from this experience, as he argues that "*in the execution phase, we approached it differently right away in that matter.*" Project Manager A recommended the organization of additional sessions and workshops during the design process to foster a shared vision and ensure its protection.

In case B, the project manager utilized his authority to promote collaboration within a shared workspace and lodging, fostering a positive work culture based on formal and informal relationships among team members and positively contributing to the design process. This attitude was sustained throughout the design phase while team members were appropriately involved in processes and communication with the client. Illustrating a positive example of affective influence which safeguarded and promoted a shared vision on sustainability.

Emotional Intelligence

Nikoloski (2015b) identified two essential soft power resources, one of which is personal leadership qualities consistent with charismatic attraction and emotional inspiration. Emotional intelligence, as described by Nikoloski (2015b), is the leader's ability to exhibit self-mastery, discipline, and empathetic capacity, enabling them to channel their passions and attract others. While Mayer and Salovey (1993) describes emotional intelligence as the ability to monitor the feelings and emotions of yourself and others, to distinguish and use this information to guide your thoughts and actions. As described using emotion can help create a safe environment of mutual trust, optimism, altruism, transparency, and openness, which can help achieve the project's goals and ambitions.

Case B, positively demonstrated the use of emotional intelligence. Working within a shared workspace and close lodging fostered communication, collaboration, and informal relationships among team members, positively impacting the project by promoting trust and openness. Furthermore, by fostering an informal relationship with the client, they never encountered obstacles in the project, as the team received a lot of sympathy from the client and vice versa. The appropriate involvement in decision-making meetings allowed team members the opportunity to influence and own accountability. This kept team members highly motivated and committed to the project, safeguarding sustainability and surpassing sustainability thresholds. The positive impact of an informal relationship with the client, characterized by enthusiasm, trust, and sympathy, highlights the potential benefits of such a connection between project managers and their subordinate design team members. This relationship can help mitigate barriers and foster effective collaboration.

On the other hand, case A faced difficulties building personal relationships and trust due to a hierarchical organizational structure, hindering communication and collaboration. This caused team members to lose motivation and a sense of involvement. From previous experience, Project Manager B emphasizes the importance of establishing a trusting relationship with the client and inspiring their enthusiasm for sustainability from the project's outset, which is beneficial for the further progress of the project. Project Manager B expressed he will carry forward these valuable lessons learned into future endeavors.

6

Conclusion

This research was conducted to address the following research question:

How can project managers use their position to influence project teams toward safeguarding sustainability goals and ambitions during the design phase of building projects?

To answer the research question, this research explored sustainability in building projects and the project manager's role during the design phase to understand how projects manager can use their position to safeguard sustainability goals and ambitions. Sub-questions were formulated to help answer the main research question.

Before elaborating on the research question, the sub-questions are addressed.

The first sub-question follows "***Why do sustainability goals and ambitions dilute during the design phase of building projects?***"

Literature reveals that the building industry has made significant strides toward sustainability, driven by a growing awareness of the sector's significant energy and natural resource consumption and its harmful emissions and waste generation. To reduce the building industry's environmental impact and meet the goals of the Paris Agreement, the Global Alliance for Buildings and Construction (2021) emphasizes the need for the sector almost entirely to decarbonize by 2050.

To achieve this goal, the introduction of Nationally Determined Contributions (NDCs), environmental assessment, and innovative sustainability principles (e.g. technologies and measures) have been critical in guiding the building industry to set ambitious sustainability goals in project requirements. These goals aim to minimize energy consumption while preserving non-renewable natural resources and creating comfortable and satisfying environments for building owners and users. The ultimate objective is establishing a built environment that meets current needs without compromising ecological sustainability or jeopardizing future generations' ability to meet theirs, as Munyasya and Chileshe (2018) and I. Y. Chan and Liu (2012) discussed.

In projects, sustainability goals and ambitions have become part of the overall project requirements. Clients, architects, building companies, their project management, and project teams ideally should all strive toward maximum sustainability within constraints of money, time, and quality (Iron Triangle). In the various stages, from concept to final design, sustainability requirements based on goals and ambitions are defined, implemented, changed, and often diluted. Methodologies and tools such as GPR and BREEAM have become focal in this process of setting sustainability objectives, as subsidies can be obtained when criteria are met. Long-term benefits of building projects give attention to life-cycle thinking in terms of economic, societal, and environmental benefits of integrated sustainability principles. Presently, these long-term benefits are not sufficiently represented in the GPR and BREEAM.

In answering this sub-question, barriers that hinder and dilute the integration of sustainability principles in building projects are addressed. Through a review of the literature, the research identified four main barriers:

- Economics barriers

- Technology barriers
- Awareness barriers
- Managerial barriers

Firstly, the high cost of implementing sustainability principles is identified as a significant barrier (Bon-Gang, 2018; Hwang & Ng, 2013; Shi et al., 2013). Secondly, the lack of technological understanding of sustainability principles is a significant barrier to adopting sustainable practices (Akadiri, 2015; Bon-Gang, 2018; Shari & Soebarto, 2012; Shi et al., 2013). There is inadequate information on the integration and performance of sustainable materials and technologies, which affects the building projects' design and construction process. Thirdly, lack of awareness and knowledge of sustainability principles and their benefits and resistance to change also hinders the incorporation of sustainability principles in building projects (Akadiri, 2015; Bon-Gang, 2018; Ershadi & Goodarzi, 2021; Kibert, 2016; Shi et al., 2013). Traditional perceptions of construction practices and a lack of environmental awareness among stakeholders result in using materials and building technologies without much consideration for sustainability and the surrounding environment. Due to this, the traditional perception of how buildings are constructed still prevails. Lastly, managerial barriers, such as the complexity of managing a multidisciplinary team, hinder the incorporation of sustainability into management capabilities (Hwang & Ng, 2013). Ineffective communication and collaboration among team members could lead to inefficient decision-making in regard to sustainability. Hwang and Ng (2013) highlighted ten critical challenges project managers face when managing sustainable building projects, including economic, technology, and awareness barriers.

As seen in Chapter 5, empirical research through the use of cases confirmed the occurrence of these barriers. However, the analyses also led to the identification of two additional barriers that can become a factor:

- Sustainability Assessment Tools and related subsidies
- Organizational barriers

Although sustainability assessment tools have guided and enabled project managers and stakeholders to more effectively evaluate the environmental, social, and economic impact of building projects (Akadiri et al., 2012; J Kibert & International Council for Building Research, Studies and Documentation., 1994), and help make informed decisions regarding the integration of sustainable practices, the tools also may limit the integration of further sustainability principles outside those accounted by those tools. This barrier can be seen as an unintentional side effect of the use of assessment tools or, maybe more specifically, the associated subsidies. Subsidy becomes a driver benefiting implementation of those sustainability principles that contribute to the grant of these subsidies. Additional opportunities and possibilities to implement available, innovative, beneficial, and attainable sustainability measures may be diluted when not contributing to the scores required to achieve the subsidy accompanying certification of sustainability assessment tools. Long-term benefits, which are not yet part of GPR and BREEM, may thus not be achieved. Continuous amending GPR and BREEAM to the latest standards, innovations, and technological possibilities, as well as to aspects related to long-term, life-cycle benefits, can remedy this.

The organization barrier observed can be categorized into two types. First, the organizational structure of design teams, whereby complex structures can lead to long or non-function communication lines and exclusion of sustainability experts and advisors in decision taking meetings. This may lead to the client making general or sustainability-related design choices whereby it was unclear whether the client was aware and/or understood the rationale and supporting data that led to the initial design and sustainability proposals or its proposed alternatives. Valuable information about the proposed design alternatives may not reach the client accurately, incomplete, or distorted without experts having the opportunity to make his case.

Secondly, organizations with an a priori strong strategy and culture toward sustainability embrace related goals and ambitions readily and will be more successful in implementing and safeguarding sustainability goals and objectives in projects. Sustainability is already embedded in project approach and thinking. A barrier emerges when organizational background with regard to sustainability is not, or

to a lesser degree, present, or for which the project becomes an organizational learning trajectory to adopting sustainability strategy and culture within its resources.

Next, "***What is the project manager's role in sustainable building projects?***"

As project managers are appointed accountable by the client for delivering the project safely, on time, within budget, and to the desired quality standards determined by the client (Sommerville et al., 2010), they have a 34-47% direct influence on the project's outcome, according to Frank (2002). Thus, managers play an essential role in delivering sustainable projects. Especially as the transition toward sustainability requires reconsidering how projects are planned, organized, executed, and managed. The emergence of sustainable design and construction adds minimization of resource depletion and environmental degradation and the creation of a healthy built environment to the traditional management criteria of cost, time, and quality (Barendsen et al., 2021). For this reason, Musawir et al. (2017) suggest incorporating Benefit Management to address, measure and control sustainability principles' short- and long-term benefits, as they are harder to objectify. To ensure this, project managers must create a robust governance structure and leadership that provides the roles, responsibilities, and accountabilities to manage benefits besides time, cost, and quality effectively (Musawir et al., 2017).

The theoretical background, therefore, reveals that project managers must, as both leader and manager, ensure that the design of a building meets the defined goals and ambitions, including those related to sustainability.

As the leader of the team and acting on behalf of the client as well as trying to maintain an efficient project team to ensure the successful delivery (Fewings & Henjewele, 2019), the project manager plays a key role in motivating, coordinating, and maintaining the morale of the whole project team throughout the life cycle of building projects (CIOB, 2010). For this reason, project managers should use their position as leaders and skills to influence, motivate and enable the client and multi-disciplinary design team to create a shared vision of sustainability for the project and encourage the integration of sustainability principles into the design based on the definitions by Nikoloski (2015b) and Shackleton and Shackleton (1995). The project manager must plan, organize, and control the design process to ensure the successful delivery of the project on time, within budget, and to the desired quality standards determined by the client (Sommerville et al., 2010), including the long-term benefits as suggested by Musawir et al. (2017).

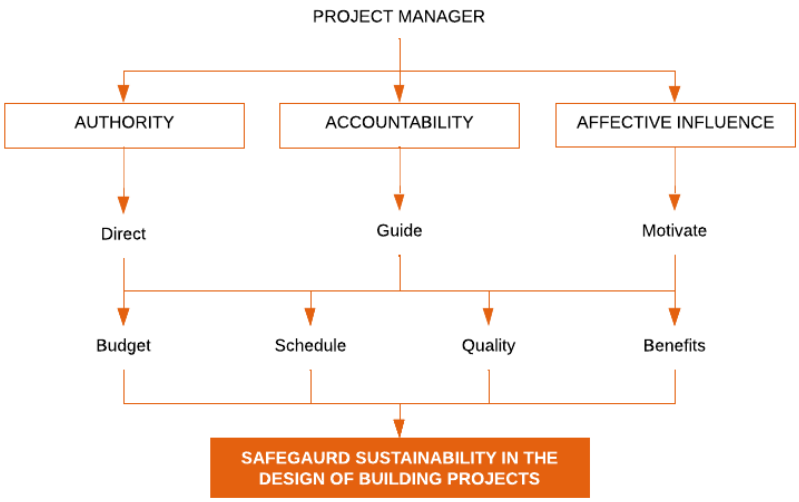

Figure 6.1: Conceptual framework: Sustainability Safeguarding Framework (own work)

The suggested project manager's role in sustainable building projects is represented in the conceptual framework, named the *Sustainability Safeguarding Framework*, illustrated in figure 6.1. It contains three aspects deemed essential for project managers to utilize in safeguarding sustainability in building projects. First, use their *authority* to prioritize sustainability by establishing direction and emphasizing

the importance of sustainability from the outset of the design phase. Second, project managers can achieve *accountability* through clear roles and responsibilities, regular progress reporting, monitoring and evaluation processes, and guiding the delivery process. Holding individuals in the design team accountable for sustainability principles throughout the design phase. And last, *affective influence*, which project managers could utilize to influence and motivate the design team to go beyond the status quo, to improve their ability to innovate and adapt their team environment. Gaining the design teams' support in obtaining project objectives, including sustainability, by creating a safe environment of mutual trust, optimism, altruism, transparency, and openness where emotions are harnessed to promote sustainability and facilitate open communication and collaboration.

Followed by "***What similarities and distinctions can be observed between the theory and practice of diluting sustainability goals and ambitions during the design phase of building projects, and how do the project managers play a role in preventing this?***"

To answer this sub-question, the qualitative aspect of this research involved conducting a multiple case study in which two cases were analyzed to gain insight into the practical role of project managers and the obstacles they face during the design process. The analysis of the cases was structured using a conceptual framework that incorporated three key aspects that emerged from the theoretical background related to project managers' managerial and leadership roles. These aspects included *authority*, *accountability*, and *affective influence*.

In both cases, the highest *authority*, and accompanying power, lie with the client, exerting power over the level of sustainability to be incorporated and the decision to utilize GPR and BREEAM. In case A, this was also influenced by a higher level of authority, the municipality, exerting legitimate powers to comply with their cradle-to-cradle vision.

Both project managers were also found to have had an extent of authority during the project, as they used their power to manage toward the successful delivery of the project and by involving experts on sustainability in the team to introduce and enthuse the client and design team members about sustainability. Experts who possess knowledge, information, and expertise are respected by others through expert and referent power. Also, with specific skills such as conviction and narrative, they can influence design teams. However, even with the involvement of such expert power, the final decision lies always with the client and his priorities, which for both cases included cost-effective sustainability.

By opting for GPR and BREEAM, roles and responsibilities were divided within the design to achieve the minimum GPR score and BREEAM outstanding, making not only the project managers but also the members of the design team *accountable* for the achievement. Through the design processes, routine checks and meetings were conducted by the project managers to check whether the sustainability requirements for the various categories were being met on basis of documented proof provided by the various disciplines of the design team

In monitoring the progress in GPR and BREEAM, the sustainability advisors in cases A and B played significant roles besides the project managers. In the case of A, it was exhibited that Project Manager A managed primarily in the traditional way based on time, cost, and quality while integrating and safeguarding sustainability were secondary. In previous conversation with the client, it was made clear that the successful completion of the project within budget was deemed critical, as the client was cost-driven. Project Manager A is a generalist and needs to balance all aspects of the project, sometimes at the expense of sustainability. Although he introduced sustainability advisors to the team, understanding between the specialists, the sustainability advisors, and the generalist, the project managers, remained sub-optimal.

Projection of *affective influence* was found in both cases in promoting an integral design approach encouraging communication and collaboration, and teamwork and involving intrinsically motivated sustainability experts to introduce and enthuse the client and design team members about sustainability. In case A, affective influence was employed by the sustainability advisors, whereas the project manager enabled this but was not able to expand the reach of this influence to include the client and architect. Despite the utilization of an integrated design approach, insurgencies in communication and collaboration were observed.

Case B illustrated a positive example of affective influence by fostering informal relationships with and

between the client and design team members. The project manager facilitated this by assembling the design team in a shared working space for a defined period to finalize the preliminary and detailed designs, which encouraged communication and collaboration, formal and informal, positively contributing to the design process as it prevented obstacles from arising and kept team members highly motivated to continue their work through friendship and sympathy. To achieve this, the project manager also utilized his position and authority to ensure that the design team included committed and motivated individuals and removed those from the team who were not to protect the atmosphere within the team.

Although the projects applied GPR and BREEAM and achieved the desired certifications, the project managers still encountered various barriers during the design process. These barriers were similar to those identified in the literature, such as economic, technological, and awareness barriers. This study also revealed two new barriers, of which the first is currently perceived as a driver in the building industry: sustainability assessment methods and organizational barriers. These have been addressed in the first sub-question.

Organizational structure and the sustainability background barriers were encountered. This affected case A mostly with its inter-organizational structure. The structure presented challenges for the team, which the project manager had difficulty remedying, such as indirect communication or the absence of communication due to the numerous layers in the organization. This may have led to poor decision-making in regard to sustainability due to incomplete or distorted information.

This was enhanced as hierarchical orders quickly emerged in inter-organizational structures creating power and position imbalance, in which the architect gained a strong position and power, despite the integrated design processes employed. This led to conflict and distrust in the design team, as the architect's priorities were viewed as most important, and the experts' influence was diminished.

Finally, the cases display that a project manager's ability to succeed in the integration of sustainability is elevated when the corporate organization to which they belong embraces the same sustainability goals and ambitions within its corporate strategy and objectives, thus providing the project manager with a corporate culture and resources with a sustainability mindset (ref. case B). However, in case A, the fact that the client's and Project Manager A's organization initially lacked a sustainability strategy and culture may have amplified the focus on the traditional Iron Triangle while the project manager had to cope with the challenges of incorporating a mindset on sustainability at the client and in his team. For this, he sought help by appointing sustainability advisors to the team.

Aligning project requirements with GPR and BREEAM credits had a significant impact on achieving a high sustainability score in both cases. Both project managers used the tools to monitor sustainability in their projects. Still, the primary emphasis continues to be placed on the financial advantages and subsidies associated with such efforts and caused emphasis on decision-making processes, sometimes to the disadvantage of sustainability. The unintentional effects of the tools have been discussed and were manifest in the project.

Regardless of the identified barriers, sustainability was in the end safeguarded during the design processes of cases A and B. However, the findings indicate that the focus on safeguarding sustainability is limited to achieving the minimum sustainability thresholds outlined by GPR and BREEAM, driven by authority and accountability. Resistance emerged when attempting to implement additional sustainability initiatives beyond what was necessary to fulfill the GPR and BREEAM targets. This pattern is particularly evident in case A, where certain principles initially included in the conceptual design were deliberately excluded from the final design due to perceived financial burdens or a perceived lack of added value in terms of subsidy eligibility.

Furthermore, during the course of this research, an additional differentiation can be observed concerning the concept of safeguarding sustainability versus actively promoting it. In case B, the continuous promotion of sustainability, in conjunction with a "*risk-margin*" in the target list and identified affective influence efforts, motivated the design team to explore alternative sustainability principles when initial ideas did not materialize as originally planned, resulting in exceeding the required BREEAM threshold. This demonstrated the significance of consistently promoting sustainability throughout the design process to inspire the design team to go beyond the predefined thresholds and integrate sustainability principles that may not be fully accounted for or measurable by sustainability assessment tools like GPR and BREEAM.

The last sub-question follows "***How can project managers strengthen their influencing abilities during the design phase to safeguard sustainability goals and ambitions of building projects?***"

The findings of this research show that the project managers in the cases used the extent of their authority, accountability, and affective influence to safeguard the sustainability goals and ambitions set out in the project requirements defined by the client after consultation on sustainability.

However, as asserted in answer to the previous sub-question, an additional differentiation can be observed concerning safeguarding sustainability versus actively promoting it. This differentiation has also contributed to exceeding the threshold of merely ensuring the minimum set of sustainability goals and ambitions. Specifically, in relation to sustainability assessment methods, namely GPR and BREEAM, recognizing the importance of achieving all initial goals and ambitions that are not encompassed by these methods. Thus, the answer to this sub-question includes how project managers can strengthen their influencing abilities to safeguard and promote sustainability goals and ambitions by means of authority, accountability, and affective influence.

Project managers can improve their ability to influence by putting sustainability on the same level of importance as budget, schedule, and quality. Using the extent of their *authority* to prioritize sustainability in the project. This can be achieved by the project manager establishing a position for individuals in the design team with expertise on sustainability representative of the importance and priority given to sustainability. In Case A and its inter-organizational, multilayered structure, this probably would have been challenging. In case B, this proved relatively easier.

Involving sustainability expertise early in mentioned consultations already contributes to influencing the client in his requirement setting, promoting sustainability. Especially when project managers are themselves not experienced in sustainability or less intrinsically motivated toward sustainability (ref. Case A).

By appointing sustainability experts in their teams, a transformation of team mindset and motivation can be set in motion by project managers. Initiatives to early on organize team events aimed at creating joint awareness, intrinsic motivation, enthusiasm, and ambition, as well as team-building, have proven to be meaningful and successful in safeguarding of sustainability goals and ambitions. Continuous attention to these aspects can help design team members feel involved in the process and motivated to contribute fully. In case B, this approach proved to be very effective. The inclusion of experimental, challenging, and fun goals and ambitions may boost inspiration and motivation.

As emphasized before, contractually including GPR and BREEAM, provides project managers with the tools to prioritize sustainability from the start of the design phase and organize their own and the design team members' *accountability* for sustainability principles. The categories used by GRP and BREEAM can help the project to focus. Safeguarding sustainability by continuously controlling and monitoring the progress in collaboration with the project managers, to check whether the thresholds are met.

However, project managers are recommended to use their authority and affective influence to avoid diluting other goals and ambitions included in the original concept, design, or requirements due to the thresholds created by sustainability assessment methods, GPR, and BREEAM. Referring to the newly identified unintended barrier discussed in the first-sub question. In other words, to avoid dilution of sustainability features because they are not accounted for in such methods or are not objectively quantifiable in the methods utilized. By continuously prioritizing and promoting sustainability, clients and design team members are encouraged to go beyond the sustainability requirements set in GPR and BREEAM, even though additional investment may be involved. Here, long-term, life-cycle-related, social, and environmental benefits can be promoted as an added value to the project, the client's organization image, and the relationship with its neighbors (case B).

It also recommended that when additional goals and ambitions, those exceeding the threshold of sustainability assessment tools, are to be pursued, they must be included contractually and administrated in the project documentation, as observed in case B, in which margins were added for sustainability. Otherwise, the project manager and the design team will not prioritize them. Clear roles and responsibilities for these goals and ambitions and monitoring and evaluation processes be established to guide the delivery process.

In steering the design team through the design phase, from concept design to final design, the project manager can influence team efficiency, accountability, collaboration, and success by using his role as manager and leader to create a safe environment based on mutual trust, optimism, altruism, transparency, and openness, wherein a collective vision pertaining to sustainability was fostered, aiming to ensure sustained motivation and commitment. In other words, *affective influence*. Whether by authority or affective influence, the design team and stakeholders will benefit when such a project environment can be established.

Authority is mentioned here again, as project managers can use this in achieving an as optimal as possible design team composition with committed and motivated individuals. Certain decisions in this process are not within their influence, such as those laid down in the contract or enforced by the client. However, involving intrinsically motivated sustainability advisors can help the project manager influence the client and design team members to go beyond the status quo and improve their ability to incorporate sustainability by gaining support and collaboratively establishing a highly sustainable concept.

Case B illustrates how affective influence, through creating a positive work environment and fostering informal and formal relationships with the client and design team members, positively contributed to the design process. It prevented obstacles and kept team members motivated to continue their work through friendship and sympathy. This way, sustainability will also not be seen as an administrative checklist as the concept is collaboratively established and thus is motivated by "*commitment to broader-based values and purpose*", "*building consensus and collaboration*", and "*genuine transparency and ethical behavior*".

Therefore, by employing affective influence and consistently promoting sustainability, it is possible to cultivate a willingness to surpass the established thresholds of GPR or BREEAM. This can effectively foster motivation and commitment among both the client and the design team to incorporate additional sustainability aspects.

Thus, besides safeguarding the thresholds created with sustainability assessment methods, design teams can be encouraged to surpass the thresholds by means of continuing the promotion of sustainability as the design progresses through authority, accountability, and affective influence.

Musawir et al. (2017) also suggested the continuous alignment of the benefits envisioned in the project's goals and ambition by incorporating Benefit Management in project management practice. Effective benefits management necessitates strong leadership in establishing a governance framework encompassing appropriate structures, roles, responsibilities, and accountabilities. However, Musawir et al. (2017) lacks specific guidance regarding the associated leadership style or the utilization of affective influence.

This research highlights that project managers with authentic and transformational leadership characteristics are more capable of employing affective influence, which can prove beneficial in the management approach suggested by Musawir et al. (2017). It is particularly noteworthy because the study demonstrates that although the project initially considered long-term economic benefits, such as energy savings, to guide sustainability decisions during the planning phase, team members frequently shifted their focus to immediate outputs measured at project delivery once GPR and BREEAM requirements were established and responsibilities were assigned. Consequently, there was a disregard for the long-term benefits. The requirements were treated merely as checklist items that project managers and sustainability advisors monitored and controlled, indicating a lack of integration of Benefit Management in the examined cases.

Furthermore, the observations show that project managers play an essential role in stimulating communication and collaboration, which can be associated with the project's process and leadership, as stated by Anantatmula (2010) and Lambrechts et al. (2019). However, these aspects of project management are not yet included in the description of project managers' accountability, as defined by Stellingwerf and Zandhuis (2013) and Sommerville et al. (2010). Introducing a shift in the conversation about accountability and process-related aspects can help stimulate project managers to employ affective influence during the design phase of building projects.

Finally, the main conclusions of the research are presented in answering the main research question, which goes as follows, "**How can project managers use their position to influence project teams toward safeguarding sustainability goals and ambitions during the design phase of building projects?**"

In the first sub-question, the barriers causing the dilution of sustainability in building projects are discussed. Project managers should be aware of these barriers and determine how to address these during the early planning of the design phase of the project.

Sub-question two focuses on the role of project managers, both as managers and leaders, and proposes a conceptual framework as a guideline for safeguarding sustainability in the design phase of building projects. Authority, accountability, and affective influence have their own place in directing, guiding, and motivating the design team to achieve successful projects with sustainability benefits as one of the guiding and equally important objectives.

Similarities and distinctions between theory and practice are discussed in the third and fourth sub-question. While the third sub-question emphasizes how project managers used authority, accountability, and affective influence to prevent the dilution of sustainability principles, the fourth emphasizes on how they can strengthen their influencing abilities. From this, a strong interaction is observed between safeguarding and actively promoting sustainability. Continuous promotion is an essential factor toward successfully safeguarding sustainability.

Finally, as highlighted in response to the final sub-question, project managers can play a crucial role in safeguarding and continuously promoting sustainability goals and ambitions during the design phase of building projects. The following conclusions and recommendations are made on how project managers can use their position to influence project teams toward safeguarding sustainability goals and ambitions during the design phase of building projects

First, project managers can use their *authority* to prioritize sustainability in the design team and among other stakeholders (f.i. clients, own organization, and others). This can be achieved by:

- Ensure that at the start of the project, the sustainability goals and ambitions are agreed upon and well-documented with the client; in this phase, a dialogue on using margins with respect to achieving sustainability can take place.
- Utilize his position to establish a design team with committed and motivated individuals with preferable experience in sustainable building projects and take action in case of not functioning team members affecting team performance and interaction.
- Appoint sustainability experts/advisors who can provide guidance and support to the team and give them the proper platform, communication lines, and involvement.
- Clearly communicate with sustainability experts/advisors the importance of sustainability to the design team, emphasizing its value throughout the project.
- Select, if not already contractually determined, in consultation with stakeholders and sustainability experts/advisors, project tools and methodology, such as GPR and BREEAM, to define, implement, monitor, and manage, objectively quantify and safeguard sustainability requirements, goals and ambitions.
- Allocate resources and time for sustainability training and workshops to enhance the team's understanding and skills.
- Establish regular communication channels and platforms for sharing sustainability-related information and updates.
- Encourage collaboration and knowledge-sharing among team members through cross-functional meetings and discussions.

Next, project managers should take *accountability* for sustainability principles and the long-term benefits (on top of other project responsibilities) and, by contractually organizing all sustainability goals and ambitions, the team's roles, responsibilities, and accountability. This can be achieved by:

- Develop and include a comprehensive sustainability framework in project contracts, clearly outlining the goals, targets, and responsibilities within the design team; sustainability assessment methods such as GPR and BREEAM can support this process.
- Create within this framework sustainability margins exceeding the thresholds of assessment methods and tools used, taking additional long-term life-cycle benefits into account.
- Establish, in support of the integrated design process, a balanced composition of disciplines within the design team.
- Assign specific roles and responsibilities for sustainability within the team, ensuring that everyone understands their individual contributions, specifically the role of the sustainability advisors/experts.
- Implement regular progress assessments to monitor and track sustainability performance throughout the design phase, executed either in collaboration or by the sustainability advisors/experts.
- Conduct periodic sustainability audits to identify areas for improvement and ensure compliance with established sustainability standards.
- Foster a culture of continuous improvement by regularly reviewing and updating sustainability practices based on lessons learned.

Lastly, employ *affective influence* – in good collaboration with sustainability advisors – to continuously promote and embed a sustainability mindset within the design team and other stakeholders (f.i. clients, own organization, and others). This also aims to cultivate ownership, motivation, enthusiasm, ambition, and social value within the design teams, ultimately establishing a positive work culture that actively promotes sustainability. This can be achieved by:

- Engage sustainability advisors and experts to collaborate closely with the design team, providing continuous guidance and support.
- Organize, preferably in the planning and design phases, co-location of design teams to enhance communication, collaboration, and information sharing. This fosters creativity and innovation through improved coordination and more informed decisions, resulting in better teamwork and design outcomes. Furthermore, it helps establish trust, empathy, and understanding among clients and team members through informal relationships.
- Organize workshops and training sessions focused on sustainability, promoting knowledge sharing, and fostering a shared sense of purpose.
- Foster open and transparent communication channels to encourage team members to share ideas and perspectives related to sustainability.
- Establish a safe environment based on mutual trust, optimism, altruism, transparency, and openness within the design team.
- Organize social events and team-building activities that emphasize sustainability values and create a positive work culture based on formal and informal relationships.
- Promote growth in sustainability strategy and culture within own organization, supporting and enforcing sustainability mindset within organization and resources to the benefit of underlying project and future company strategy and culture.

Project managers can become affective leaders by employing authority, accountability, and affective influence to establish, safeguard, and promote sustainability goals and ambitions. The conceptual framework, known as the *Sustainability Safeguarding Framework*, developed in this research can be used as guidance in their preparation and management of the design phase to safeguard and continuously promote sustainability.

As in many things, a good beginning makes a good ending. The importance of well-defined sustainability goals and ambitions, including margins, a strong design team composition with appropriate roles for sustainability advisors/experts, and a clear organizational structure and communication lines at the start of the design phase are emphasized. The project manager should be given the opportunity and

be supported to be influential in establishing this baseline for the project. Whether by employing authority, accountability, or affective influence, the design team, stakeholders, and the project will benefit throughout the design phase.

Within the project, sustainability is given a high priority and should not be diluted by management solely on the Iron Triangle. Being aware of the barriers, the project manager should closely cooperate with the sustainability advisors to promote and safeguard sustainability within the design and among stakeholders. The use of methods and tools, such as GPR, BREEAM, or others, are essential in monitoring project performance on sustainability. The established margins will contribute to successfully reaching goals and ambitions while offering the opportunity to enhance sustainability and add long-term life-cycle benefits to the building.

Safeguarding sustainability goals and ambitions depend highly on the project managers and sustainability advisors/experts' ability to promote, influence, and embed strong sustainability values within the design team and create an environment of mutual trust, optimism, altruism, transparency, and openness, facilitating open communication, collaboration, and teamwork.

With these conclusions and recommendations, this research provides project managers with greater insight and understanding of their influence on design teams and other stakeholders and their ability to successfully cope with the uncertainty and complexity of integrating and safeguarding sustainability goals and ambitions in project planning and design.

6.1. Recommendations for Academic Future Research

Specific recommendations can be given for further academic research based on the research findings.

An exciting avenue for future research would involve exploring the management framework proposed in this research and its potential use by project managers seeking to enhance their management and leadership capabilities and influence in integrating and safeguarding sustainability goals and aspirations in construction projects.

Also, it could be interesting to research how to incorporate a more formal role of authority in the project organizational structure for a sustainability advisor, alongside or within the core team of the project manager, from concept to delivery. This supports the integration of sustainability and its accompanying benefits alongside cost, time, and quality within the context of the Iron Triangle. Alternatively, the same could be explored for an integrality manager with a strong sustainability background. In a more complex building environment, with the incorporation of increasing demand for sustainability, such a role could be very beneficial. In other fields of engineering, such a role is given to systems engineers; an authority accountable for managing the complexities of multidisciplinary projects and systems of systems.

This research highlights that employing affective influence by harnessing emotion and fostering informal relationships can be advantageous in establishing a secure atmosphere of mutual trust, optimism, sympathy, altruism, transparency, and openness that is conducive to promoting sustainable practices. Consequently, it is suggested that future work on this framework should expand upon the concept of affective influence, explore and identify methods aimed at emotional involvement and the cultivation of informal relationships. Especially focusing on how such methods can be applied to strengthen collaboration and teamwork in inter-organizational design teams.

Moreover, it should be noted that the scope of this research was restricted to just two case studies, each featuring participants from Arcadis, a company known for its strong focus on sustainability. As such, it is recommended that further research should be conducted across a more diverse range of projects, including those undertaken by organizations with lower levels of sustainability strategy and culture. This approach could potentially lead to a greater understanding of the barriers that exist in relation to sustainable practices.

Finally, this research revealed two previously unidentified barriers related to the organizational structures of design teams and sustainability assessment methods and related financial benefits; subsidies. Although the latter is widely regarded as drivers of progress, they can inadvertently limit projects from

surpassing the certification thresholds and reaching more long-term benefits. Therefore, it is recommended that future research focus on gaining a deeper understanding of these tools and exploring potential strategies for modifying them to promote higher levels of sustainability by, for instance, encouraging the use or formally incorporating sustainability margins, or awarding exceeding thresholds by a progressive subsidy scheme. Also, subject tools could be continuously adapted to the latest state-of-the-art sustainability practices and innovations, including those providing long-term lifecycle benefits.

6.2. Limitations

This research encountered several limitations. The limitations are defined in three categories and are elaborated on in the following sections.

Limited Scope

The research had limited scope as two buildings were analyzed in the multiple case study, which also limited the number of practitioners interviewed and the available perspectives. While the results may not be generalized, the detailed examination of the two case studies offers a nuanced understanding of the factors that contribute to project success. Thus, despite the limited scope, the research allowed for an in-depth analysis of the management and leadership aspects that impact the success of sustainable building projects, providing valuable insights and recommendations for project managers in the building industry.

Language Barriers

Language barriers became a significant issue during data gathering and analysis as the research was written in English, whereas the interviews were conducted in Dutch. This was decided based on the fact that those interviewed speak Dutch within their organizations and projects and are more comfortable speaking Dutch than English. However, translating spoken Dutch into written English hampered the analysis process. Besides the researcher's own translation, Translation programs such as Deelp and Google Translate were used to overcome linguistic barriers. It is important that there are still limitations. Also, the imprecise use of words in Dutch spoken language has an effect. Due to possible remaining inconsistencies in the translation, interpretation and evaluation of data retrieved from the interviews, the validity of the research findings may have been somewhat influenced. Subtle nuances in Dutch could have been overlooked or not fully captured during the translation process. These nuances may have a consequential effect on the interpretation and analysis of the results.

Occurrence of biases

Qualitative research focuses on the knowledge gathered through people, reference projects, and literature. The beliefs, understandings, opinions, and views of people are investigated. Thus, the data gathered and analyzed may be unstructured, at least in their "*raw*" form, but tend to be detailed, and hence "rich" in content and scope (Fellows & Liu, 2015). Even though the data is "*rich*" in content, the possibility of bias by the interviewee and researcher exists, also in this research. Bias is an aspect of subjectivity for which the discussion exists among research whether this is beneficial or problematic for research (Roulston & Shelton, 2015).

Interviewee biases ensue when selective memories prevail and when the interviewee stresses negative or positive outcomes, beliefs, understandings, opinions, and views of the project analyzed in the multiple case study. While the researcher's bias, i.e., observer bias, ensues when the researcher's prejudicial perspectives impact observations of a particular setting (Roulston & Shelton, 2015). Both types of biases in quantitative research are potential causes of inaccuracy or invalidity throughout the preparation and execution of the study and during the analysis and presentation of the results. Therefore, to prevent this, this research focuses on interrogating the relationship with theory, in other words, literature, as suggested by Roulston and Shelton (2015), and transcript validation by the interviewees.

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A

Data Collection Interviews

The variety of interviewees provides a holistic perspective on the three case studies. The interviewees are listed in section A.1. The semi-structured interviews were approximately 50 to 70 minutes and conducted online through the Teams platform. During the interviews, an interview protocol was utilized, attached in section A.2. Before each interview, an interview consent form was shared with the interviewees regarding the interview and the use of the information derived from the interview, attached in section A.3.

A.1. Interviewees Empirical Research

Table A.1: Interviewees multiple case study

Project	Role	Organization	Date
Case A	Project Manager A [1]	External	20/01/2023
	Project Manager B [2]	Arcadis	28/11/2022
	Sustainability Advisor B [3]	Arcadis	10/02/2023
	Architect [4]	External	21/02/2023
	Sustainability Advisor A [5]	External	13/02 /2023
Case B	Program Manager [6]	Arcadis	24/01/2023
	Project Manager [7]	Arcadis	25/01/2023
	Architect and Design Manager [8]	Arcadis	02/03/2023
	Installation Advisor and BREEAM Expert [9]	Arcadis	13/01/2023

A.2. Interview Protocol

During the interviews, a protocol was utilized with semi-structured interview questions. This approach combines a pre-determined set of open questions that encourage conversation with the ability for the interviewer and interviewee to explore particular topics or responses further. The protocol is structured into an introduction, sustainability and project management, and a conclusion.

Interview Protocol

Interviewee: [Name]
Organization: [Organization Name]
Job Title: [Job title]
Project name: [Project name]

Introduction

First of all, I would like to thank you for your participation in this interview. As mentioned in previous correspondence, this interview is part of my thesis research conducted for the Master's program in Construction, Management, and Engineering at Delft University of Technology.

My research focuses on exploring and understanding management and leadership skills and how they can be strengthened to enhance the influence of project managers in safeguarding sustainability goals and ambitions during the design phase of building projects, or preferably, to strengthen them as research shows that in most cases, sustainability goals and ambitions are not all achieved during the project's duration.

This interview is an essential step in my research, in which I aim to gather experience-based data and insights on the topics under investigation, which will become the primary source of information for my research. This interview consists of two parts, which focus on your experience in integrating sustainability in building projects, particularly the discussed case, and the project management skills used for this purpose. This interview will take about 45 minutes. You can refuse to answer the questions and always withdraw from this research.

Practicalities

To validate the data from this interview and use it in my research, I would like to confirm if I may record this interview. The recordings will only be used by myself for transcription purposes and will be properly destroyed after the research is completed, as stated in the previously sent interview consent form. I will use both Teams and my phone for the recording, as a backup.

[START RECORDING]

Part I – General

- To start, can you briefly tell me about your role at [organization name] and during the project [project name]?
- At what point did you become part of the project team? And what was your position in the project team?

Part II – Sustainability and Project Management

During the (planning and) design phase, the goals and ambitions are translated into requirements and ultimately integrated into the final design. Since parties have their own interests and goals for the project, this can be challenging, costly, and time-consuming. This certainly applies to the topic of sustainability. First, I will ask you some questions about the vision of the project on sustainability. Followed by questions related to your (and the project manager's) role in safeguarding this vision during the translation process of sustainability goals and ambitions to the final design.

- What was the client's vision on sustainability when the project started?
- In what ways did you influence, motivate, and inspire the client to add more sustainability to their vision and requirements (PvE) while defining the project's goals and ambitions, i.e., vision? Or were you not part of this process?
- Can you take me through the translation process of sustainability goals and ambitions into requirements and ultimately into the final design?
  - What worked well and what did not?
  - How did you know what was working and what was not?

Now, questions related to your (and the project manager's) role in safeguarding this vision during the translation process of sustainability goals and ambitions to the final design.

- How did you use your position to manage, motivate, and inspire the design team to safeguard sustainability and incorporate the related principles into the design during the design phase?
  - What skills and behaviors you use?
  - Was this done informally or formally?
  - What worked well and what worked against it?
- (question for all interviewees except the project manager) Did you notice or feel that the project manager-managed, motivated, and inspired the design team to incorporate sustainability into the design? And did the design team members' strategy, vision, attitude, and culture change in relation to sustainability as a result?
  - How did he or she do this? What skills and behaviors did he or she use?
  - Was this done informally or formally?
  - What worked well and what worked against it?
- In what way did you/the project manager use your/his or her position as the leader of the design team to safeguard sustainability in the design process?
  - How did you/ he or she make your/his or her position clear in the team?
  - Did you/ he or she use your/ his or her authority as a project manager to safeguard sustainability?
- In what way did you/the project manager take responsibility for safeguarding sustainability during the (planning and) design phase, in addition to time, cost, and quality? And where do you see sustainability in the traditional success criteria of time, cost, and quality?
- How were the roles and responsibilities structured in the design team for achieving sustainability?

To conclude this part, I have to final question about the completed design.

- Were sustainable ambitions translated into the final design of the project? In other words, were all the goals and ambitions met?
- What were the most common reasons for parties (for example, the client, architect, or other design team members) to deviate from sustainable goals and ambitions during the (planning and) design phase of the project?

Part III – Conclusion

To conclude the interview, I have two or three concluding and closing questions.

- How do you envision the role of the project manager evolving in light of the increasing emphasis on sustainability in building projects?
- Do you have any additional experiences related to the discussed topics that you would like to share? Or can you highlight any other difficulties you encountered during the (planning and) design phase of [project name] unrelated to sustainability?
- Do you know of other team members who could be valuable to interview to gain further insights on the discussed topics? If so, who? And may I mention your name when contacting them?

Closing remarks

Those were all my questions! I want to thank you for your time today and your contribution to my research with your answers and recommendations. Within two weeks, I will send you the transcribed interview for review and validation. I will also share my results with you once my thesis is completed, if you would like!

Thank you!

A.3. Interview Consent From

Interview Consent Form

This agreement is between [name interviewee] and [name interviewer] for the participation of [name interviewee] in the graduation research of [name interviewer] by means of an interview.

Hereby I agree to the following points:

- I voluntarily agree to participate in this research study.
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I declare that I have been clearly informed about this research. I have been able to ask questions about the study, and my questions have been answered to my satisfaction.
- I agree to my interview being audio-recorded with the purpose of transcribing and analyzing the information.
- I understand that signed consent forms and original audio recordings will be retained by the interviewer until the research study has been completed. After which, the recordings will be deleted.
- I understand that the information provided by me will be used only for academic purposes of the graduation project unless indicated that certain information is confidential.
- I understand that all information I provide for this study will be treated confidentially.
- I agree that my information can be quoted in research outputs. In case of quotation, this will be notified to me.
- I understand that in any report on the results of this research, my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview that may reveal my identity or the identity of others I speak about.
- I acknowledge that the graduation research report, which may contain information from the interview, will be publicly published on the TU Delft educational repository to be used for future research and learning. In the published graduation research report, I will not be identified as a participant and will not contain my personal details unless agreed otherwise.
- Before publication, I will receive the graduation research report to review and validate the information and quotations retrieved from the interview.
- I understand that I am free to contact the interviewer to ask questions about the research or to seek further clarification and information.

Regarding the case project, [project name], please circle yes or no:

The case study must remain classified and anonymous in the research report. Yes / No

In case the "*yes*" is circled, information that may lead to the identification of the case study, [project name], will not be used or will be disguised in the report. However, project information that is necessary for reviewing the report will be added to an appendix which will not be published on the TU Delft educational repository and will only be made available to the graduation committee of [Interviewer] her graduation research.

Name interviewee: [name interviewee]	Name interviewer: [name interviewer]
Date (DD/MM/YYYY):	Date (DD/MM/YYYY):
Signature interviewee:	Signature interviewer:

B

Interview Data

The gathered interview data is transcribed and analyzed using the Gioia method and flexible-pattern matching in ATLAS.ti. A total of 600 quotes relevant to the research topic are identified. These quotes are organized and presented in tables, providing a structured visualization of the encountered topics, including barriers, safeguarding, and promoting. Due to the large number of quotes, the tables are scaled down in size, but they still provide a comprehensive overview. To read the content, please zoom in.

B.1. Case A

Summary of Barriers Encountered Toward Sustainability

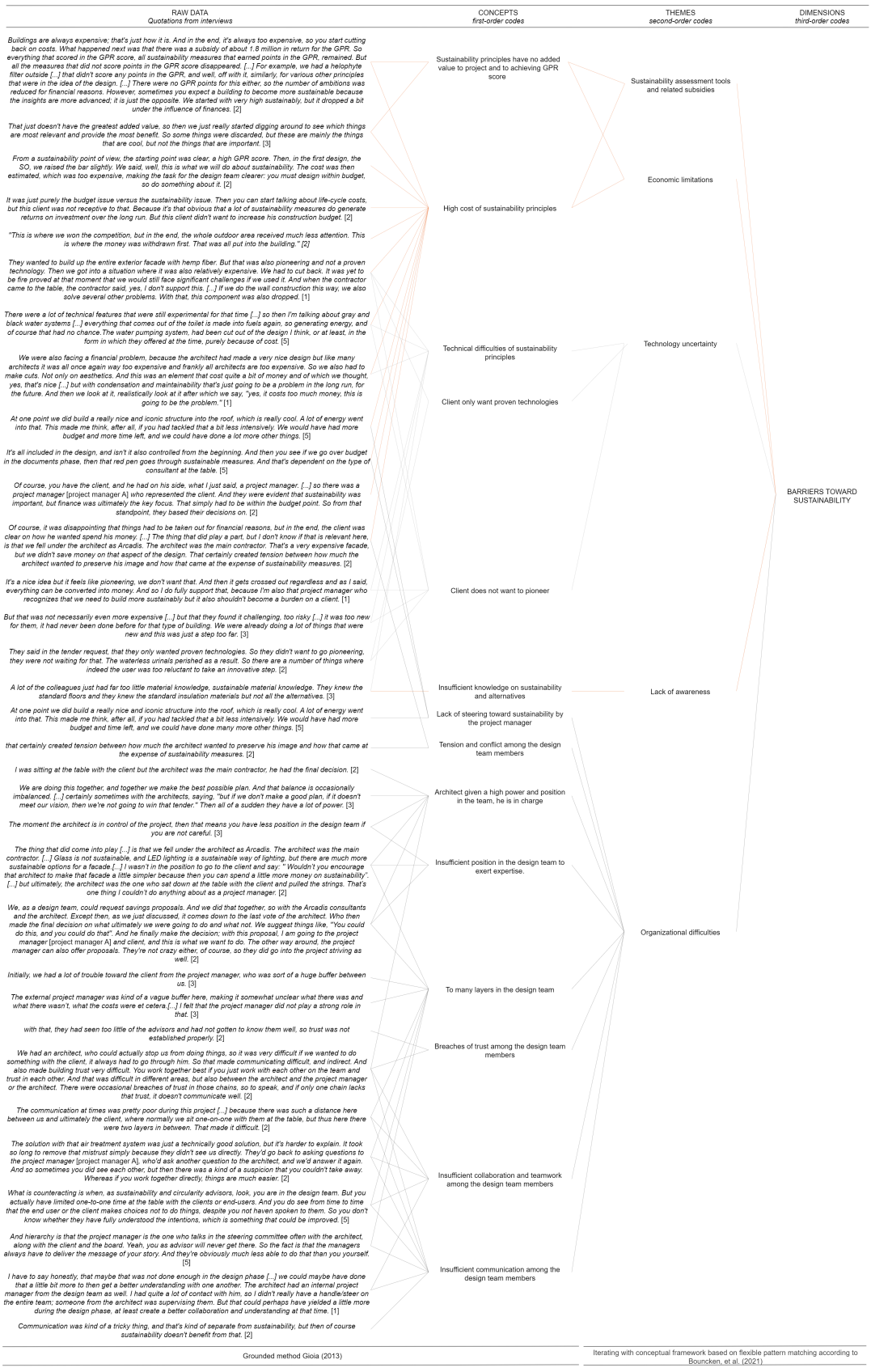

Figure B.1: Data structure of barriers encountered toward sustainability case A

Safeguarding Sustainability

Figure B.2: Data structure of safeguarding sustainability case A.

Promoting Sustainability

Figure B.3: Data structure of promoting sustainability case A.

B.2. Case B

Summary of Encountered Barriers Toward Sustainability

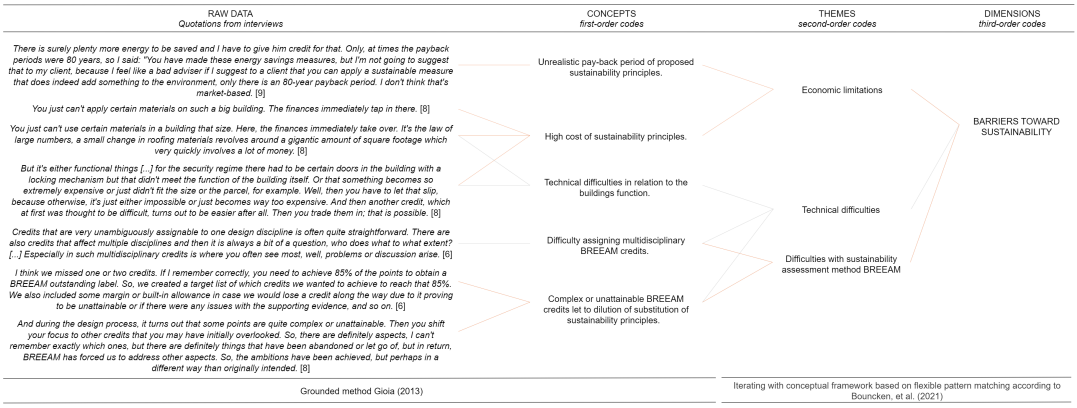

Figure B.4: Data structure of barriers encountered toward sustainability case B.

Safeguarding Sustainability

Figure B.5: Data structure of safeguarding sustainability case B.

Promoting Sustainability

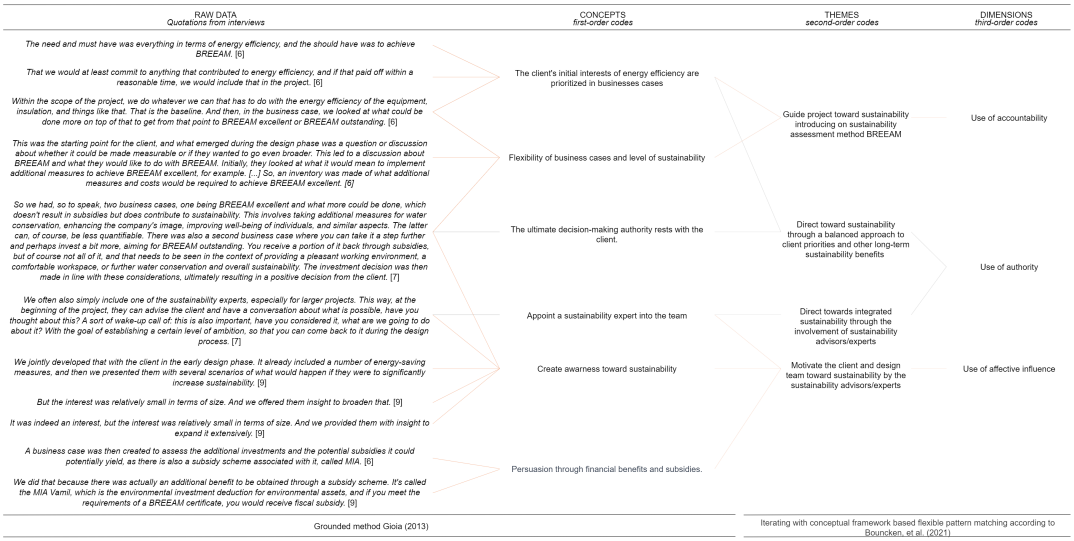

Figure B.6: Data structure of promoting sustainability case B.

C

Organizational Structures Cases

C.1. Organizational Structure Case A

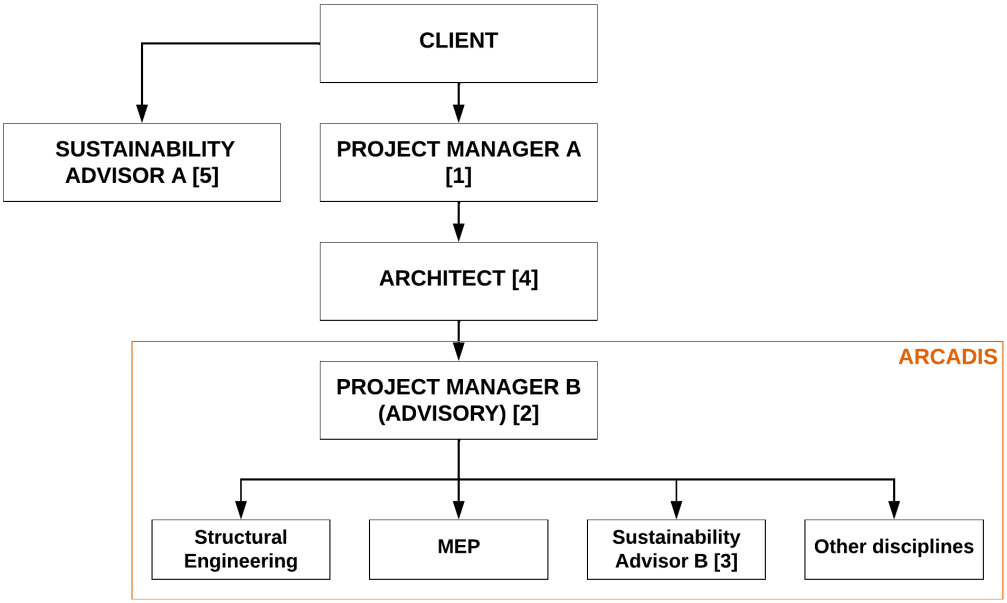

Figure C.1: Organizational structure design team case A.

C.2. Organizational Structure Case B

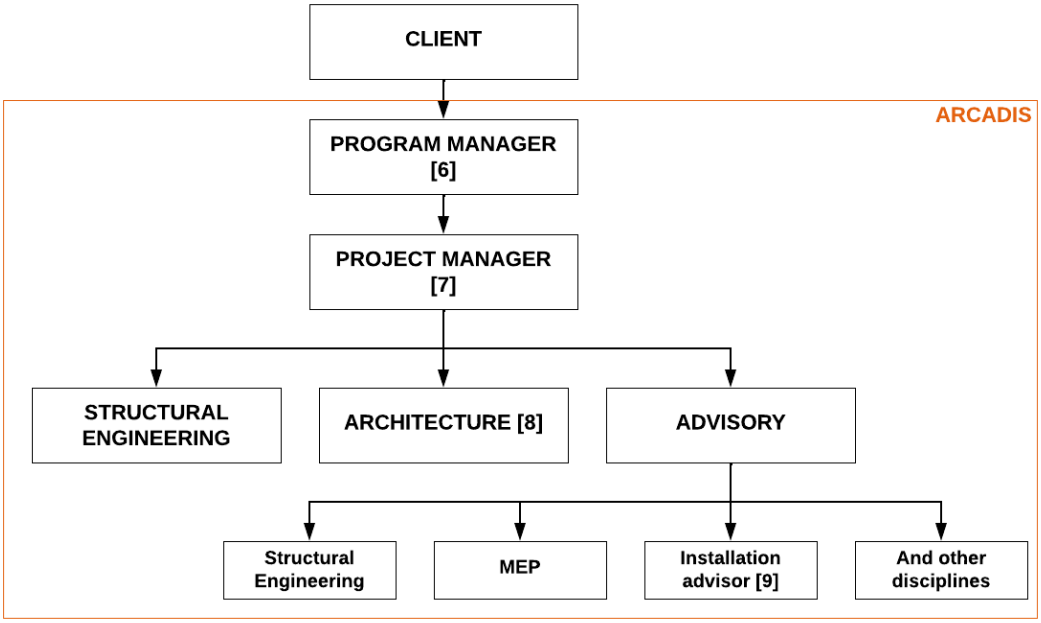

Figure C.2: Organizational structure design team case B.