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STAKEHOLDER ENGAGEMENT IN ECOLOGICAL QUARRY SITE RESTORATION
Case Rudus LUMO programme

ABSTRACT

Reetta Grönlund: Stakeholder Engagement in Ecological Quarry Site Restoration Case Rudus LUMO programme
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This master's thesis focuses on stakeholder engagement in ecological quarry site restoration. Although quarrying is vital for societies as it produces raw materials for industries, it can be harmful to the environment. However, it is possible to restore the ecological functions of the sites after mineral extraction has finished. Corporate sustainability management is a way for companies to contribute to sustainability by reducing their negative social and environmental impacts. Therefore, ecological quarry site restoration is an important way for companies to conserve biodiversity and reduce their negative impacts. Stakeholder engagement is an integral part of corporate sustainability management. Furthermore, stakeholders are fundamental in ecological quarry site restoration as they possess knowhow that quarrying companies often do not have.

This master's thesis is a case study examining Rudus Oy's LUMO programme and stakeholder engagement that emerged at its inception. LUMO programme focuses on conserving biodiversity in ecological quarry site restoration and making the sites fit for multipurpose use after restoration. The research aims to examine how stakeholder engagement emerged while Rudus Oy started their LUMO programme. The research question states as 'How does stakeholder engagement emerge and evolve in the starting phase of an ecological quarry site restoration process?'

The theoretical framework of this study is composed from corporate sustainability management, stakeholder engagement and ecological restoration, sustainability, stakeholder theory, stakeholder engagement and ecological restoration. Corporate sustainability management explains how companies can reduce their negative environmental impacts and what are the key aspects to consider. Stakeholder engagement investigates the vital role of stakeholders and how engagement emerges and is maintained. Lastly the purpose and process of ecological restoration is explained.

The study utilizes a qualitative case study approach and the data is generated using interviews with Rudus' representatives and documents. The data is analysed inductively through qualitative content analysis. The main findings from the research include exploration of the varying ways stakeholders are engaged in the different ways in the stages of ecological quarry site restoration, and the importance of an open dialogue with stakeholders in both engaging them and ensuring successful restorations.

Four propositions derived from the research results are: (1) Top management's role in establishing a sustainable way of operating and engaging stakeholders is indispensable. (2) Stakeholder engagement in ecological quarry site restoration emerges from a need to collaborate and works at best when all involved stakeholders have clear roles. (3) Communicating with stakeholders on an open and upfront basis undoubtedly advances stakeholder engagement. (4) Finding joint interests and win-win solutions through opportunities for collaboration are key to successful stakeholder engagement.

This master's thesis contributes to the stakeholder and ecological restoration literature by introducing further comprehensive understanding on the importance and methods of stakeholder engagement in quarry site restoration. In conclusion, the study proposes that various elements of stakeholder engagement have significant importance in quarry site restoration. Further research suggestions include examining the stakeholder engagement in one site and looking at stakeholder engagement from a global perspective, perhaps comparing two countries.

Keywords: biodiversity, ecological quarry site restoration, environmental management, case study, corporate sustainability, corporate sustainability management, stakeholder, stakeholder engagement

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1 INTRODUCTION

1.1 Selection of the topic

This qualitative case study focuses on Rudus Oy's Rudus LUMO programme (later LUMO programme). Rudus Oy, a leading Finnish company producing rock-based construction materials, introduced its LUMO programme in 2012, which has the aim of increasing biodiversity in Rudus production sites by ecological restoration (Rudus Oy, 2020a). Quarry site restoration is not new in Finland, as the Finnish Land Extraction Act 11 § (1981) states that "a permit to extract land resources must be accompanied by regulations on what the applicant must do to avoid or minimize the damage caused by the project". Although quarry site restoration has been a standard in Finland for decades (Land Extraction Act, 1981), restoring quarry sites conserving biodiversity is relatively new. In Finland, Rudus Oy was the first to start ecological quarry site restoration.

Quarrying industry is vital for society as quarrying produces raw materials for several industries (Fugiel et al., 2017). Quarrying is quite invasive and harmful for the environment, with some areas in the world having been destroyed because of quarrying (Wang et al., 2018). However, according to Wilker et al. (2016), once quarrying has finished, it is possible to restore the land to its original use or even improve the environment and create new land uses. As the topics of climate change and the rapid decrease in biodiversity are global issues, ecological quarry site restoration is relevant and current. Ecological quarry site restoration is a way for companies in the quarrying field to protect the environment and therefore contribute to the global effort toward sustainability (Symes & Rusche, 2018).

Sustainability aims to secure intergenerational equity (Bansal & DesJardine, 2014). Moreover, in a sustainable world, nature's capacities would never be exceeded (Winsemius & Guntram, 2002). Sustainability is divided into economic development, social development and environmental protection (United Nations, 2002) Winsemius and Guntram (2002) state that sustainability can be pursued by meeting environmental, social and economic needs simultaneously.

For businesses to be sustainable, their financial needs need to be achieved without compromising their own or others capability to meet their needs in the future (Bansal &DesJardine, 2014;

Slawinski & Bansal, 2015). For a business to be sustainable, sustainability needs to be one of the core values (Hörisch et al., 2014). Corporate sustainability management is a way for companies to contribute to sustainability by reducing their negative social and environmental impacts (Schaltegger & Hörisch, 2017).

This study examines stakeholder engagement in the quarrying industry through corporate sustainability management. Stakeholder refers to "any group or individual who can affect or be affected by the achievement of the organization's objectives" (Freeman, 1984, 46). Furthermore, stakeholder engagement involves communicating to and with the stakeholders (Kujala & Sachs, 2019). Stakeholder engagement is at the core of this study as organizations require collaboration across industry boundaries to achieve sustainability (Bocken et al., 2014). The success of an organization is dependent on the success of its stakeholders (Stubbs & Cocklin, 2008). Therefore, stakeholder engagement is an integral part of corporate sustainability management.

Ecological quarry site restoration as a way of working for the companies is relatively new. Therefore, there is only a limited amount of existing research on the topic, particularly when linking it to stakeholder engagement. After Rudus Oy started the ecological quarry site restorations with LUMO programme, they both engaged many new stakeholders and engaged some of the existing stakeholders in a new way to obtain the necessary knowledge to implement ecological quarry site restoration. As LUMO programme is a forerunner in ecological quarry site restoration, this study provides important information on both the ecological restoration process and stakeholder engagement.

Understanding how ecological quarry site restoration is initiated will enlighten the process, particularly with regards to stakeholder engagement which ties ecological restoration to society. As a result of the research and discovering the key factors of stakeholder engagement, it will be easier for other organizations to make similar changes and engage relevant stakeholders with the process. Furthermore, at best, it can ease the worry of climate change as different actors see how environmentally harmful operations, such as quarrying, may be reversed, and in addition, help the environment conserve biodiversity (Wilker et al., 2016).

The research is done in collaboration with Business2Nature (B2N), a research project at Tampere University. The aim of the B2N research project is to develop a stakeholder-driven understanding of ecosystems in urban environments. This is done by examining the relationship between businesses

and nature. The project is funded by the Academy of Finland for 2016-2020. (Business2Nature, 2019.)

1.2 Aim of the study and research question

The aim of the study is to examine how stakeholder engagement emerged while Rudus Oy started their LUMO programme and thus, ecological quarry site restoration in Finland. Furthermore, the research investigates what kinds of decisions were made in LUMO programme and what happened in the starting phase of LUMO programme to understand how stakeholders became engaged. Hence, the research question has been chosen to cover these topics.

How does stakeholder engagement emerge and evolve in the starting phase of an ecological quarry site restoration process?

Theoretically, the focus is on understanding the linkages between corporate sustainability management, stakeholder engagement and ecological restoration. Empirically, the research examines how the stakeholder were engaged in LUMO programme in the starting phase of LUMO programme. To answer the question, the primary data was collected from interviews with key people engaged in LUMO programme at the start of it. The data collected covers the time period between 2012 and 2017. As this research is a case study and therefore a qualitative study, interviews were considered the most appropriate data collection method to provide the most comprehensive understanding of the stakeholders involved in the case. The interviews included both the understanding of the beginning phase of LUMO programme and how different stakeholders were engaged to it. The final set of data consists of seven interviews. A set of secondary data consists of four documents to further familiarize with the case. Qualitative content analysis was used to analyse the data. Identifying the stakeholders helped in evaluating their roles and importance in the case, and finally how stakeholder engagement emerged, and corporate sustainability management was achieved.

1.3 Main concepts

Biodiversity: The variability of all living organisms in the different ecosystems of which they are part (United Nations' Convention on Biological Diversity, 1992). "The variety of living organisms;

the biological complexes in which they occur, and the ways in which they interact with each other and the physical environment" (Groves et al., 2002, 500).

Corporate sustainability: "The ability of firms to respond to their short-term financial needs without compromising their (or others') ability to meet their future needs" (Bansal & DesJardine, 2014, 71)

Corporate sustainability management: Aiming at reducing negative social and environmental impacts and contributing to sustainable development with corporate actions, often embedded in the context of competitiveness and business environment (Schaltegger & Hörisch, 2017).

Ecological restoration: Restoring any endangered ecosystems (Kollman et al., 2016) with the focus of conserving biodiversity (Aronson & Alexander, 2013). Restoration is done through both enhancing the values in productivity and protected landscapes (Evans et al., 2019).

Stakeholder: Stakeholder refers to "any group or individual who can affect or be affected by the achievement of the organization's objectives" (Freeman, 1984, 46). Stakeholders are individuals or groups who either dependent on the organization and whom the organization is dependent on (Näsi, 1995).

Stakeholder engagement: Activities which organization incorporates to include and involve stakeholders in a positive manner in their practices (Greenwood, 2007). Stakeholder engagement comprises the process of establishing, developing and maintaining stakeholder relations (O'Riordan & Fairbrass, 2013).

1.4 Research design and structure

The research process started in spring 2019 with examining potential research topics. Climate change leading to biodiversity decreasing and companies responding to it with corporate sustainability management is discussed vastly in the public recently and therefore became an interesting research topic. Moreover, as B2N research project examines relationship between businesses and nature through stakeholder engagement, they were contacted to see if they had a research topic in mind. Together with the research project, LUMO programme was found as the case for the study and furthermore, preliminary aim of the study, and research questions were

established. Autumn 2019 was used for researching existing literature and familiarizing with the topic.

After familiarizing with the literature, in January 2020, the theoretical framework was written while also deciding the methodology. The potential interviewees were detected with Rudus and B2N research project and they were approached. The interviews were collected at the same time as writing the methodology and the introduction. Additionally, secondary data was searched in order to create a comprehensive picture of the topic. A qualitative content analysis was done, and the findings written. After the analysis, the conclusions based on the theoretical framework and findings were made. Lastly, the research was analysed and suggestions for further research were composed in April 2020.

The structure of this study will be the following. The first chapter provides the context and an introduction to the topic of ecological restoration and stakeholder engagement together with the research scope and aim. It comprises the purpose, background, research questions and main concepts used. The second chapter presents the previous literature along with the theoretical framework for the study. At this point, the justification for the theory of choice is provided.

The third chapter explains the methodological choices regarding data collection and analysis. In addition, this chapter describes the process of data collection and analysis. The fourth chapter introduces and explains in detail the findings of the research and summarizes the most important issues regarding the starting phase of ecological quarry site restoration and stakeholder engagement. The final chapter concludes the entire research by presenting the key contributions to research and managerial implications. In addition, the evaluation of the study and suggestions for future research are presented.

2 THEORETICAL FRAMEWORK

2.1 Corporate sustainability management

2.1.1 Corporate sustainability

Corporate sustainability refers to company actions towards sustainable development (Landrum, 2018). Bansal and DesJardine (2014, 71) define corporate sustainability as "the ability of firms to respond to their short-term financial needs without compromising their (or others') ability to meet their future needs". Therefore, time becomes central to corporate sustainability (Bansal & DesJardine, 2014). Companies cannot ignore their impact on the environment without risking their image and licence to operate (Houdet et al., 2012). Therefore, corporate sustainability management, with companies' actions reducing negative social and environmental impacts (Schaltegger & Hörisch, 2017), tries to answer to the problems created by the long-term time frame. Overall, Hörisch et al. (2015) argue that companies need effective corporate environmental and sustainability management in order to reduce their negative environmental and social impacts.

In corporate sustainability management, the focus is on the win-win perspective which empathizes the advantages, that companies incorporating environmental practices have received (Houdet et al., 2012). Furthermore, Marcus et al. (2010) state that the 'win-win-win' outcomes mean doing good financially, socially, and environmentally. Additionally, according to Dyllick and Muff (2015, 2) "more and more business executives agree that sustainability-related strategies are necessary to be competitive today and even more so in the future".

Companies need to put corporate sustainability as one of their core values (Hörisch et al., 2014) in order to strive towards sustainability (Bocken et al., 2014). Furthermore, Stubbs and Cocklin (2008) state that companies should see sustainability as a driving force for business and develop their capacities accordingly in collaboration with their stakeholders. Corporate sustainability requires applying environmental, social and economic perspectives in all areas of business (Bansal, 2005). Therefore, sustainable companies take a holistic perspective on sustainability throughout the entire organization. Corporate sustainability measures performance through financial, social and environmental success. (Stubbs & Cocklin, 2008.) In corporate sustainability, environmental, social

and economic needs should be met simultaneously (Winsemius & Guntram, 2002; Schaltegger & Burritt, 2018).

2.1.2 Becoming sustainable

Understanding the motivations for organizations to respond to sustainable issues can shape the mechanisms, such as legislation, that lead to sustainable actions and additionally lead to different outcomes (Bansal & Roth, 2000). Additionally, the relationship between sustainability and an organization can be multidimensional and the ethical motivations for sustainability management can have vital implications on operational designing of corporate sustainability activities (Schaltegger & Burritt, 2018).

A study by Bansal and Roth (2000) on the motivators for companies to become sustainable and engage in corporate sustainability reveals three motivators, which are competitiveness, legitimation and ecological responsibility. Competitiveness means the potential to improve long-term through ecological responsiveness. Legitimation highlights the role of institutions and societal structures while pursuing sustainability management (Schaltegger & Hörisch, 2017) and the possibilities to conduct environmental audits or complying with legislation in order to bring high standards to the organization (Bansal & Roth, 2000). Initiatives for ecological responsibility, are often done out of the sense of obligation and responsibility (Bansal & Roth, 2000).

A more recent study from Schaltegger and Hörisch (2017) shows that out of the two rationales, profit-seeking and legitimacy-seeking, sustainability management practices of large companies are usually driven by legitimacy-seeking instead of economic thinking. Legitimacy-seeking includes strong stakeholder-mindset where stakeholders and their needs are held important (Lee, 2011). Regarding legitimacy-seeking, sometimes companies and/or stakeholders can change and incorporate sustainability through policies (Winsemius & Guntram, 2002).

Sustainable business models may help organizations implement corporate sustainability management (Abdelkafi & Täuscher, 2016). Lüdeke-Freund (2010, 21) describe sustainable business model as a "business model that creates competitive advantage through superior customer value and contributes to sustainable development of the company and society". There are no fixed sustainable business models, but rather companies create their own model based on their needs and the desired outcomes (Bocken et al., 2012). However, sustainable business models often focus on

maximizing environmental and social benefits (Bocken et al., 2014). Abdelkafi and Täuscher (2016) explain that the usage of sustainable business models can help organizations capture value through environmental focus in their operations.

Focusing on corporate sustainability can lead to financial benefits and competitive advantage (Abdelkafi & Täuscher, 2016). Moreover, when organizations differentiate whilst striving towards sustainability with corporate sustainability management, that may lead to competitive advantage (Winsemius & Guntram, 2002). Competitive advantage may lead to sustainable activities bringing profits to the organization (Stubbs & Cocklin, 2008; Holton et al., 2010). However, it may take time before sustainable business models reach profitability, hence the focus should be on long-term thinking (Bocken et al., 2014).

Companies need to take a holistic perspective on sustainability and implementing corporate sustainability management activities in order to make it successful (Stubbs & Cocklin, 2008). Implementing corporate sustainability management often fails if employees are not convinced that top management is committed to the change, thus highlighting the role of top management in showing an example in changes (Winsemius & Guntram, 2002). However, it is not enough that top management is committed to shift towards sustainability. Trust and commitment to change must be spread throughout the entire organization. (Holton et al., 2010.) Creating a new corporate culture which incorporates sustainability in all aspects of the organization is important to be done together with all stakeholders to engage them (Winsemius & Guntram, 2002).

The role of management is leading the change towards corporate sustainability management is important. The actions by the management are simultaneously guided by both environmental and stakeholder needs simultaneously. (Winsemius & Guntram, 2002.) Furthermore, managers focus on how their actions for sustainability increase social, economic and environmental success in the society (Schaltegger & Burritt, 2018). Additionally, there are increasing expectations for businesses to do more for the communities (Wang et al., 2016), therefore, making corporate sustainability management even more important. Hence, a transformational change in corporate culture may be needed when moving towards sustainability (Holton et al., 2010).

Corporate sustainability highlights the balance between short- and long-term needs which are necessary for intergenerational equity (Slawinski & Bansal, 2015). Although corporate sustainability is popular, it is often practiced with a short-term horizon. (Bansal & DesJardine,

2014). However, short-termism, which means decisions and outcomes that are best for the short term (Laverty, 1996), is often lacking sustainability (Bansal & DesJardine, 2014). Organizations may be tempted to choose short-term options due to financial benefits, individual biases or averting risks. However, organizations' survival is dependent on their ability to produce long-term perspectives and solutions. (Slawinski & Bansal, 2015.) Nevertheless, balancing the present and the future is fundamental for corporate sustainability (Slawinski & Bansal, 2015) and therefore, the emphasis on sustainability should be on the future thinking without replacing the short-term (Hörisch et al., 2014).

It may be challenging for stakeholders to understand if the organization is truly operating sustainably or whether there is for example greenwashing. Organizations may implement corporate sustainability activities only to satisfy stakeholders, therefore minimizing risks to meet standards, instead of truly engaging with sustainability activities to exceed expectations (Bansal & Roth, 2000). Therefore, there is a need from external stakeholders, such as legislators, to detect companies which are not complying with their sustainability promises to make sustainability actions real across the industries (Grilly et al., 2016). Moreover, some of the well-intentioned corporate sustainability management initiatives fail because organizations misread stakeholder expectations and needs (Winsemius & Guntram, 2002).

2.1.3 Environmental management

Environmental management refers to initiatives that organizations take to improve their environmental performance (Darnall et al., 2010). Environmental management is a complex process and therefore requires cross-departmental collaboration (Russo & Fouts, 1997). The environmental initiatives include "establishing environmental management departments, designing environmental management procedures, transforming or updating production equipment, recording environmental protection information, training relevant personnel, and changing corporate culture" (Ma et al., 2020, 2).

Environmental management is founded upon three aspects: social benefits, the environmental benefits and the economic benefits (Pinto et al., 2018). All three aspects are crucial for building a sustainable society (Broman & Robert, 2017) and as there is a concern about making natural resources available, the importance of environmental management grows (Pinto et al., 2018). Social benefits are an outcome of human and social capital increasing. Environmental benefits evolve from

the increase of natural capital through conserving natural resources and biodiversity. The economic benefits result from the productive capital increase based on growth, development and efficiency. (Delai & Takahashi, 2013.)

Environmental management helps organizations "identify and minimize the potentially negative environmental effect of their operations, comply with existing laws and continually improve in this direction" (Ozusaglam et al., 2018, 113). Environmental management activities can positively influence organization's environmental competitiveness creating competitive advantage. However, there are no automatic economic benefits of corporate environmental protection activities. (Wagner & Schaltegger, 2004.)

Moreover, implementing environmental management systems (EMS) enhances organization's competitive advantage (Darnall & Edwards, 2006). EMS provides "a formal system of articulating goals, making choices, gathering information, measuring progress, and improving performance" regarding the usage of resources and emissions (Florida and Davison, 2001, 64). The most well-known EMS is the ISO 14000 standard which sets out the criteria for environmental management systems and furthermore, companies can be certified with that (International Organization for Standardization, 2020). EMS improve organization's performance as there are formalized structures and processes that enable organizations to manage their impacts upon the environment (Ozusaglam et al., 2018).

Environmental management has a controversial role. At the same time environmental management is seen as improving organization's performance (Darnall et al., 2010) by increasing labor productivity with improving employees' satisfaction (Reinhardt, 1999) and reduce labor costs (Wagner, 2011). On the other hand, environmental management creates non-core business activities such as process documentation, environmental consulting and environmental litigation (Frondel et al., 2018) which need resources and therefore decrease productive investments (Lannelonguel et al., 2017). Additionally, environmental management often requires "significant changes in the production systems, which needs companies to change their production processes and use more environmentally friendly technologies and equipment" (Ma et al., 2020, 2), which can be seen either as positive or negative aspect depending on the perspective.

2.1.4 Synthesis on corporate sustainability management

Corporate sustainability management refers to companies' actions reducing their negative social and environmental impacts (Schaltegger & Hörisch, 2017). To manage to reduce the negative impacts, companies need effective corporate environmental and sustainability management (Hörisch et al., 2015). Corporate sustainability management focuses on the win-win perspective (Houdet et al., 2012). Moreover, focusing on corporate sustainability can lead to financial benefits and competitive advantage (Abdelkafi & Täuscher, 2016).

Companies implement corporate sustainability management practices usually out of two rationales, profit-seeking and legitimacy-seeking (Schaltegger & Hörisch, 2017). However, corporate sustainability requires applying environmental, social and economic perspectives in all areas of business (Bansal, 2005). Therefore, sustainable companies take a holistic perspective on sustainability throughout the entire organization. Moreover, trust and commitment to change must be spread throughout the entire organization. (Holton et al., 2010.)

Environmental management refers to initiatives that organizations take to improve their environmental performance (Darnall et al., 2010). Furthermore, environmental management helps organizations identify and minimize their negative environmental effects (Ozusaglam et al., 2018). Hence, environmental management is a vital part of corporate sustainability management.

2.2 Stakeholder engagement

2.2.1 Stakeholder theory

Stakeholder theory brings an understanding of the environment in which the organization operates, as stakeholder concepts create knowledge of the external and internal changes to organizations' strategic operations. Stakeholders are all groups and individuals who can affect or are affected by the organization. Stakeholders in a broad context cover co-workers, shareholders, and communities (Winsemius & Guntram, 2002). It is important to understand that the connection between the company and the stakeholders is bilateral, depending on the relationship one or both are dependent on the other one/each other. Furthermore, stakeholder theory examines the relationships between an organization and its stakeholders. (Freeman, 1984.)

Noland and Phillips (2010) emphasize that organizations simply interacting with stakeholders is not enough, they need to engage and involve the stakeholders in their operations. Therefore, companies have moved towards more collaborative stakeholder engagement (eg. Burchell & Cook, 2006). Freeman et al. (2017) identify four elements of stakeholder engagement; examining stakeholder relations, communicating with stakeholder, learning with and from stakeholder and integrative stakeholder engagement which help understand stakeholder theory from both managerial and pragmatic perspectives. This chapter examines stakeholder engagement through the four elements.

2.2.2 Examining stakeholder relations

Identifying stakeholders

Stakeholder identification is important to make stakeholder engagement effective and specific (Freeman, 1984). In order to establish successful engagement, the company needs to understand why they are engaging, what matters to engage on and who they need to be involve (AA1000 Stakeholder Engagement Standard, 2015). Amaeshi and Crane (2005) emphasize that effective stakeholder engagement needs to identify who can affect and or are affected by organization's activities. The growing interest lies in stakeholder interactions and the types of stakeholder relationships (eg. Mitchell et al., 1997).

Stakeholder identification includes identifying the relevant issues (Krick et al., 2005) and the urgency and severity of the issues they create, for example, though stakeholder salience (Donaldson & Preston, 1995). Mitchell et al. (1997, 854) define stakeholder salience as ''the degree to which managers give priority to competing stakeholder claims''. The stakeholder salience model which identifies three key attributes: power of the stakeholder, urgency of the demands by stakeholders and the legitimacy of the demands, is an effective way to identify stakeholders and how to respond to stakeholder demands in stakeholder management (Mitchell et al., 1997). Although the stakeholder salience model is widely used and well-known, it has been criticized for lacking the aspect of mutual collaboration and shared interests (eg. Friedman & Miles, 2002).

Furthermore, the relevant stakeholders are found based on the issues the organization wants to engage in (Lane & Devin, 2018). Stakeholder mapping, which Shirey (2012, 401) explains as "the process of creating pictures to clarify the position of an organization's stakeholders" helps companies identify their stakeholders.

Value creation

In order to reach mutually benefitting situations, it is important to understand what stakeholders value (Freeman, 1984). The win-win perspective regarding stakeholders emphasizes mutual connection and benefits both are receiving from the collaboration (Lane & Devin, 2018). Additionally, Berchicci and King (2007) argue that companies achieving win-win situations can create long-term value through more strategic attention to their environmental and social impacts. Furthermore, Myllykangas et al. (2010, 70) argue, that "the question of who and what really counts should be replaced by the question of how value is created in stakeholder relationships". That is necessary as stakeholder relationships are processes which evolve (Myllykangas et al., 2010).

Subsequently, the Stakeholder Value Creation (SVC) model developed by Kujala et al. (2019) aims to understand how value is created and maintained in relationships between organizations and stakeholders. The model highlights three attributes that are important when creating value for both the organization and its stakeholders: joint interests, ability to collaborate and trust. The model indicates that stakeholder relationships should consist of joint interests built on shared objectives and the ability to collaborate with a mutual understanding of the importance of information sharing. These two attributes are based on trust which creates an easier atmosphere to engage in joint value creation. (Kujala et al., 2019.)

Tantalo and Priem (2016) state that in order to create value and utilize stakeholder synergy, organizations can use three methods. The first way is increasing the utility received by a stakeholder group, for example proving flexible working hours, without minimizing the value received from another stakeholder group. The second way is using value-creation innovations which can benefit and increase value for several stakeholder groups simultaneously. The third way states, synergy may occur when stakeholders use the innovations and through communication and cooperation, the motivation and trust in the organization may rise among other stakeholders. All three methods highlight managers role in value-creation and meeting stakeholder needs. (Tantalo & Priem, 2016.)

2.2.3 Communicating with stakeholders

Stakeholder dialogue

A greater emphasis is put on stakeholder dialogue and developing that (Burchell & Cook, 2006). Furthermore, as Kujala and Sachs (2019, 230) state "Stakeholder engagement involves not only communicating to stakeholders but also communicating with stakeholders and therefore, moving from stakeholder debate to stakeholder dialogue is an integral part of stakeholder communication". Stakeholder dialogue means "a structured interactive and proactive process aimed at creating sustainable strategies" (Kaptein & Van Tulder, 2003, 210). In a broader sense, stakeholder dialogue refers to any two-way communication between the organization and its stakeholders (Lehtimäki & Kujala, 2017).

Stakeholder dialogue consists of exchanging opinions, discussing expectations, and developing guidelines for business practices (Kaptein & Van Tulder, 2003). Listening and engaging to what the other one is saying are core aims of a dialogue. Furthermore, listening and finding compromises are vital for successful dialogue. (Burchell & Cook, 2008.) Organizations and stakeholders can find mutual benefits and opportunities through listening and dialogue (Kaptein & Van Tulder, 2003). For organizations, stakeholder dialogue provides ways to identify and answer to stakeholder demands and needs (O'Riordan & Fairbrass, 2008). Additionally, stakeholder dialogue allows stakeholders to express their views and challenge organizations' perspectives (O'Riordan & Fairbass, 2008).

Stakeholder dialogue is essential when organizations want to improve their relationship with stakeholders. Moreover, stakeholder dialogue can improve trust between the organization and its stakeholders. However, expectations of the outcomes from the dialogue should be discussed in advance to avoid misunderstandings and agree to realistic goals. (Burchell & Cook, 2008.) Overall, stakeholder dialogue is an open process where "surprises and other unexpected elements are recognized as openings for continuous experimentations and new opportunities" therefore an open mind in stakeholder dialogue is essential (Heikkinen et al., 2019, 29).

In stakeholder dialogue, it may be necessary to create mutual interests among the stakeholders to manage the relationships (Hörisch et al., 2014). However, Kujala et al. (2017) state that although stakeholders may have different interests, while they advance their own interests, they see value in

collaboration. In addition to this, Brown and Dillard (2013) add that in managing stakeholder expectations, various stakeholder motives are seen important and necessary, there is no need to find compromise, as all stakeholders' views are useful and valued.

Effective dialogue

Effective stakeholder dialogue includes four elements: context, event, stakeholders and management response. The context refers to understanding the external, uncertain factors around the organization and its stakeholder. Events mean changes in circumstances and eventually, being able to react to those. Stakeholders point out the importance of identifying and analysing the factors influencing the dialogue. Lastly, management response indicates strategic planning regarding stakeholder dialogue. (O'Riordan & Fairbass, 2008.) Overall, McDonald and Young (2012) state that the key success factor for partnerships to be effective and successful is open and constant communication between the partners; it needs to be clear for both partners what the other partner is doing.

Managing a dialogue takes resources from both organizations and their stakeholder (Burchell & Cook, 2008). However, designing, implementing and maintaining communication processes with stakeholders is vital for high stakeholder management skills (Freeman, 1984). Different reporting methods support stakeholder dialogue as they create structure and processes to follow the dialogue. For stakeholders, seeing how the organization handles potential dilemmas through reporting, may show how serious the organization is about sustainability. (Kaptein & Van Tulder, 2003.) However, outcomes of stakeholder dialogue are difficult to measure as they are often abstract (Burchell & Cook, 2008).

2.2.4 Learning with and from stakeholders

Stakeholder engagement provides a way for an organization to learn from and with its stakeholders (Kujala & Sachs, 2019). The potential to learn emerges from having mutual interests whereas different interests may lead to conflicts (Calton & Payne, 2003). Successful collaboration between an organization and its stakeholders may be explained with a knowledge-based view, as stakeholders possess vital information and knowledge about environmental matters which the organization is dealing with (Rondinelli & London, 2003). Stakeholder engagement is analysed

with stakeholder input to strategies and methods (Lane & Devin, 2018) to ensure that learnings will be put forward in follow-up activities (Krick et al., 2005).

Learning between organization and its stakeholders should be bilateral to be sustainable. If stakeholders feel that that the dialogue is one-way, they may retreat and look for other ways for engaging, making the organization loose the learning opportunities. (Burchell & Cook, 2006.) Trust creates an environment where an organization and its stakeholders understand the importance of information sharing (Kujala et al., 2019) and therefore, provides openness and possibilities to learn (Burchell & Cook, 2008). Utilizing organizations and stakeholders' capabilities in collaboration may lead to greater corporate sustainability and environmental management (Rondinelli & London, 2003).

Multi-stakeholder learning dialogue refers "to construct meaning that can guide joint efforts to cope with messy problems that help shape complex, paradoxical relationships within stakeholder networks" (Calton & Payne, 2003, 7–8). Multi-stakeholder networks provide opportunities to learn through discussions and sharing experiences. Collaborative learning and discussions may lead to more engagement towards sustainability topics. (Heikkinen, 2017.) Additionally, dialogue may lead to discovering new learning capabilities as discussions are discourses where the aim is to maintain a dialogue among different stakeholders (Calton & Payne, 2003).

2.2.5 Integrative stakeholder engagement

Integrative stakeholder engagement combines all previously mentioned aspects of stakeholder engagement, building collaborative relationships (Kujala & Sachs, 2019). Value creation happens in networks and new systems, resulting to cross-sector collaboration and the need for engaging with stakeholders (Bocken et al., 2014).

Cross-sector collaboration may be difficult if an organization and its stakeholders are fundamentally different and therefore it is important to understand the differences. However, if shared interests are created regarding corporate responsibility, it can enhance collaboration between organizations and stakeholders. (Rondinelli & London, 2003.) McDonald and Young (2012) state that organizations have been forced to improve their corporate sustainability practices in order to meet stakeholder expectations. Different stakeholders use different mechanisms, such as lobbying and governmental pressure for influencing organizations' sustainability actions (Viveros, 2017). Therefore,

organizations constantly need to adapt as external situations change and those affect stakeholder expectations. Collaboration method and the type of relationship between the organization and its stakeholders depend on the organization's strategies, therefore every relationship is different. (McDonald & Young, 2012.)

There are different ways to achieve an integrative view (Freeman et al., 2017). The ways are defined by how organizations develop their stakeholder orientations (Greenwood, 2007). Some organizations engage with stakeholders to overcome for example ecological or social events for trust building (Freeman et al., 2017). Other organizations see stakeholder engagement as a strategic strength to increase co-creation opportunities with stakeholders (Harrison et al., 2010). Lastly, some organizations are driven by strong moral responsibility to engage with stakeholders (Jones et al., 2007). Overall, collaborative relationships in integrative stakeholder engagement are established with various stakeholders forming a network (Kujala & Sachs, 2019). Stakeholder engagement includes embedded networks and syncing with stakeholder expectations build responsible and sustainable businesses (Maak, 2007). For an organization to be successful in long-term, learning to serve its stakeholders and their needs better is fundamental (Freeman, 1984).

2.2.6 Synthesis on stakeholder engagement

Stakeholder engagement includes establishing, maintaining stakeholder relations (O'Riordan & Fairbrass, 2013). Furthermore, four elements of stakeholder engagement have been identified: examining stakeholder relations, communicating with stakeholder, learning with and from stakeholder and integrative stakeholder engagement help understand stakeholder theory from both managerial and pragmatic perspectives (Freeman et al., 2017).

Examining stakeholder relations includes stakeholder identification which is important to make stakeholder engagement effective and specific (Freeman, 2984). Stakeholder identification includes identifying the relevant issues (Krick et al., 2005; Lane & Devin, 2018) and mapping the stakeholders (Shirey, 2012). Additionally, it is vital to understand what stakeholders value (Freeman, 1984) and find win-win situations in order to create long-term value through strategic attention to environmental and social impacts (Berchicci & King, 2007). Finding joint interests and willingness to collaborate and creating trust with them, creates and maintains value between organizations and stakeholders (Kujala et al., 2019).

Communicating openly and actively with stakeholders is essential for successful partnerships (McDonald & Young, 2012). Stakeholder dialogue is an integral part of stakeholder communication (Kujala & Sachs, 2019). Stakeholder dialogue consists of exchanging opinions, discussing expectations, and developing guidelines for business practices (Kaptein & Van Tulder, 2003). Effective stakeholder dialogue includes understanding the environment where the organization operates and potential changes in it (O'Riordan & Fairbass, 2008).

Stakeholder engagement provides a way for an organization to learn from and with its stakeholders (Kujala & Sachs, 2019). However, learning should be bilateral to be sustainable (Burchell & Cook, 2006). Utilizing both organizations and stakeholders' capabilities may lead to greater corporate sustainability (Rondinelli & London, 2003).

Integrative stakeholder engagement combines all previously mentioned aspects of stakeholder engagement, building collaborative relationships (Kujala and Sachs, 2019). However, every relationship is different as collaboration methods depend on the organization and stakeholders' needs and strategies (McDonald & Young, 2012). Overall, stakeholder engagement includes embedded networks and syncing with stakeholder expectations build responsible and sustainable businesses (Maak, 2007).

2.3 Ecological restoration

2.3.1 Purpose of ecological restoration

Extracting natural resources, such as rocks and sand, often results in land degradation, where the ecological value of the site is compromised (Smith et al., 2017). Therefore, ecological restoration is necessary when the natural environment is incapable of supporting biodiversity optimally on its own (Symes & Rusche, 2018). Ecosystem restoration is vital to conserving the biodiversity worldwide and maintaining long-term sustainability of our planet (Aronson & Alexander, 2013). United Nations' Convention on Biological Diversity (1992) defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and ecosystems". Overall, ecological protection focuses on protecting and improving ecosystems and conserving biodiversity (Brown et al., 1987).

Ecological restoration is a broad concept because of the variety of types of restorations (Perring & Ellis, 2013). Ecological restoration refers to restoring any endangered ecosystems, such as bogs, grasslands, dunes, and floodplains (Kollman et al., 2016). "Ecological restoration is achieved not through direct intervention for designated outcomes, instead, it requires the manipulation and conditioning of the ecosystem's biophysical attributes" (Clewell & Aronson, 2013, 3).

Restoration can include a wide range of activities, including "improving the productive capability of degraded landscapes and enhancing conservation values in both productive and protected landscapes" (Evans et al., 2019, 2826). Several outcomes are possible and can be the focus of the restoration process. These end goals can be habitat creation, species conservation, ecosystem services, stakeholder engagement, mineral planning and resource management. (Wilker et al., 2016.)

Wortley et al. (2013) examined the success of ecological restoration and they found an increase of studies which consider ecosystem functions in terrestrial restorations which implies progress in restoration ecology. However, according to Kollman et al. (2016, 723) "deepening the understanding of ecosystem functioning in a restoration context to achieve ecologically self-sustainable ecosystems through restoration remains a challenge." In addition, "biodiversity is often ignored because of its complex roles and the unclear mechanisms in providing human well-being" (Huang et al., 2019). These are major challenges which need to be overcome in the coming years for ecological restoration to become more successful.

2.3.2 Ecological restoration as a part of business operations

The authorities, nature organizations and the companies can choose themselves the best way to restore the site, however, often companies choose the cheapest option for restoration as the benefits of the restoration are difficult to estimate. In addition, it may be challenging to add the benefits into the financial analyses and communicate those to the authorities giving companies extraction permits. (Wilker et al., 2016.) Additionally, biodiversity is not easily understood nor transferred to monetary value and therefore "organizations attempt to help companies understand the importance of biodiversity by making them aware of the risks and opportunities linked their dependencies on healthy ecosystems" (Houdet et al., 2012, 43). However, a lot of the companies are budgeting only a limited amount of money for the restoration (Wilker et al., 2016).

From an organizational viewpoint, what values drive ecological restoration is important as that shapes how the restoration is carried out. The values driving the restoration can be divided into four categories (figure 1). (Clewell & Aronson, 2013.)
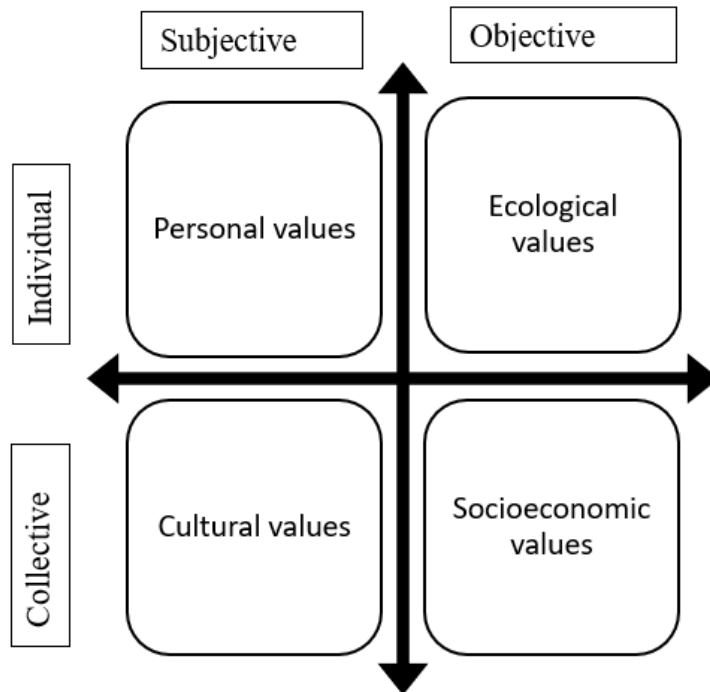
Figure 1: Four-quadrant model for ecological restoration (Clewell & Aronson, 2013, 16)

The model shows four quadrants and two hemispheres. The subjective values, which express opinions and emotional responses which thus, are difficult to measure. The objective values can be measured and analysed. The other hemisphere consists of values relevant to the individuals and the other, values relevant to collective groups. The upper left quadrant shows emotional reaction to ecological deterioration. That may lead to people taking on restoration projects whether as practitioners, financiers or by expressing opinions to decision-makers, all of which provide the satisfaction of doing something proactive to solve the issue. (Clewell & Aronson, 2013.)

The upper right quadrant shows ecological features that we value as attributed to healthy ecosystems and where we rationally respond to ecological deterioration based on our understanding. The lower right quadrant shows our collective socioeconomic values towards ecosystem deterioration such as flooding or scarcity of seafood. Restoration offers a collective way to recover our socioeconomic values by improving ecosystem services. The lower left quadrant shows our collective cultural values towards ecological deterioration, such as public sites that have been

damaged. Collectively these places can be restored and that strengthens the social unity and the environment. (Clewell & Aronson, 2013.)

Overall, it is important for businesses to monitor the restored sites in collaboration with the stakeholders for a long-term both from social and ecological perspectives. Better long-term monitoring would create more understanding of the benefits of the restoration and emerge greater benefits to restoration projects. (Jellinek et al., 2018.)

2.3.3 Process of ecological restoration

No matter what the basic values driving the restoration process are, people feel satisfied as they have participated in the restoration either directly or indirectly. Furthermore, no matter why the restoration is undertaken, the steps of restoration are the same. The Society of Ecological Restoration (SER) has issued a guideline of fifty-one steps for ecological restoration from the beginning of conception to writing the final reports. These steps have been divided into six groups: conceptual planning, preliminary tasks, implementation planning, implementation tasks, postimplementation tasks, and evaluation and publicity. (Clewell & Aronson, 2013.)

Conceptual Planning determines, usually by a feasibility study, whether restoration should be conducted. The project site is identified and filmed to show land use and other features. The site is analysed in order to understand how severe deterioration has happened and what kind of ecosystem there is to be restored. (Clewell & Aronson, 2013.) The ways of restoring a quarry site are chosen based on the desired outcomes and taking into consideration the ecosystem benefit valuation. This means examining the ecosystem and valuing the benefits within each stage of the chain and choosing the restoration method based on the results. (Wilker et al., 2016.) Furthermore, the justification to commence ecological restoration is given. Importantly, the stakeholders are identified and engaged in the project. In addition, the goals for the restoration are developed and agreed upon. (Clewell & Aronson, 2013.) As nature constantly shifts and changes, it is impossible to restore an ecosystem to its original state. Therefore, organizations often set the goal of ecological restoration to the point before exploitation of resources and thus, human intervention. (Perring & Ellis, 2013.)

Once it has been decided that the restoration is feasible, there are several preliminary tasks to be concluded before the final decision to start conducting the restoration. These tasks include

administrative, such as budgeting, and technical, such as an ecological inventory describing the site's biodiversity and physical environment, functions. It is important to document both empirical information about the site and photo documentation. A plan for monitoring and protocols for data analysis should be established. In addition, the connection with all the stakeholders should also be established to begin the collaboration. (Clewell & Aronson, 2013.)

Implementation planning evolves around developing and planning all the tasks during the restoration process. In addition, all the steps, their role and implementation, are described in detail in order to make the execution as easy as possible. Once all the steps are identified, the final budget is prepared. Everything is scheduled according to the plans and training is offered for the restoration staff. Implementation tasks include making monitoring plans and implementing those. This can be done or overseen by the restoration practitioners. (Clewell & Aronson, 2013.)

Postimplementation tasks focus on the aftercare, preserving and supporting of the natural environment until they can cope independently. The nature of aftercare can be determined once the responses made by the environment to restoration have been identified. Furthermore, monitoring and documenting the aftercare is an important task, as they are needed to evaluate the success of the restoration process. (Clewell & Aronson, 2013.) Restoration and seeing the outcomes of it, however, is a long process and requires long-term monitoring in order to evaluate the successes of restoration programs (Block et al., 2001; Willis et al., 2007). The last step is to evaluate the project based on the documentation, report the case for future research and projects and make the project public by articles and technical presentations (Clewell & Aronson, 2013).

2.3.4 Synthesis of ecological restoration

Quarrying is vital for societies because it produces raw materials for several different industries (Fugiel et al., 2017). However, extracting resources is invasive and may result in land degradation (Smith et al., 2017). Therefore, restoring the sites is vital in order to converse biodiversity and sustainability (Aronson & Alexander, 2013). Restoration can include several different activities (Evans et al., 2019) and the method for the restoration is chosen by the operator, nature organization and the authorities (Wilker et al., 2016). Clewell and Aronson (2013) state that from an organizational perspective, there are four values for beginning restoration and those define how the restoration is carried out: personal -, ecological -, cultural - and socioeconomic values.

It takes a long time to evaluate the success of restoration projects (Block et al., 2001; Willis et al., 2007). It can therefore be difficult to estimate the benefits of restoration and unfortunately often companies choose the cheapest option for the restoration (Wilker et al., 2016). Additionally, another challenge ecological restoration faces, is the complex role of biodiversity and the lack of understanding of how it provides human well-being (Huang et al., 2019).

Stakeholders are vital for ecological restoration. Generally, stakeholders feel satisfied when they have participated in the restoration either directly or indirectly. The Society of Ecological Restoration's (SER) guideline for ecological restoration lists the steps into the six groups: conceptual planning, preliminary tasks, implementation planning, implementation tasks, postimplementation tasks, and evaluation and publicity. Each group involves several steps, and the basic idea of the steps is the same no matter how the restoration is done (Clewell & Aronson, 2013.)

2.4 Synthesis of the theoretical framework

Stakeholder engagement, corporate sustainability management and ecological restoration all impact each other. When wanting to begin ecological restoration, stakeholder engagement and corporate sustainability management are vital aspects. Companies must be willing to change and adapt new ways of working and stakeholders in order to become successful. Therefore, the synthesis examines how stakeholder engagement and corporate sustainability management are viewed in each of the stages of ecological restoration.

Engaging with stakeholders is necessary in ecological restoration. Additionally, for the restoration to be successful on the long-time horizon, corporate sustainability management is vital regarding leading the change and the actual work. Therefore, understanding how stakeholder engagement and corporate sustainability management are connected to ecological restoration is vital.

Table 1: Synthesis of the theoretical framework

Stages of ecological restoration	Corporate sustainability management	Stakeholder engagement
Conceptual planning	- Seeking for opportunities to engage with sustainable matters - Deciding to start a project and the purpose by applying environmental, social and economic perspectives - Analysing the site - Informing the officials about the project and seeking changes in the aftercare plans - Leading the change within the organization and engaging the stakeholders - Agreeing on the goals of the restoration - Identifying the needs for stakeholder engagement	- Stakeholder identification - Value creation and finding joint interests - Agreeing on the goals of the restoration - Expert knowledge in site analysis - Making the aftercare plan - Involving local actors to get their approval - Seeking approval for the changes in the aftercare plans from officials
Preliminary tasks	- Budgeting - Leading the project - Develop capabilities for both the company and the stakeholders - Planning the monitoring	- Stakeholder dialogue - Learning with and from the stakeholders - Expert knowledge in describing the site
Implementation planning	- Leading the project - Training the staff - Planning and allocating resources - Applying sustainable business models in the implementation planning - Scheduling the restoration steps considering the environmental, social and financial aspects	- Specifying the aftercare plans with cross-sector collaborations utilizing both stakeholders' and the company's capabilities - Utilizing expert knowledge in training the staff
Implementation tasks	- Collaboration on the projects - Providing resources for the projects - Using all opportunities to inform about the project - Leading the project	- Collaborating on the projects (experts, environmental organizations, local actors) - Media coverage
Postimplementation tasks	- Leading the monitoring and documenting	- End-user collaboration to preserve the site - Expert knowledge in determining the nature of the aftercare
Evaluation and publicity	- Analysing and evaluating the restoration - Pushing for the changes in the ways of working based on the reports and analysis of the restoration - Long-term planning of the continuation - Showing example to others in the field within the country and worldwide	- Expert knowledge in reporting - Lobbying the politicians and governmental agencies to make changes in how matters are handled - Media coverage - Changes in the ways of working throughout the field

Conceptual planning includes deciding to begin restoration, analysing the site to determine the ways of restoration. Additionally, stakeholders are identified and the goals for the restoration are agreed upon. (Clewell & Aronson, 2013.) From corporate sustainability management side, this step includes seeking opportunities to engage with sustainable matters and deciding to start a project, leading the change within the organization (Winsemius & Guntram, 2002; Hörisch et al., 2014) and agreeing on the goals of the restoration together with the stakeholders (Clewell & Aronson, 2013). From stakeholder engagement viewpoint stakeholder identification (Freeman, 1984), value creation

and finding joint interests (Kujala et al., 2019) are the most important and additionally, using expert knowledge and involving relevant stakeholders in acquiring approvals for the project (Clewell & Aronson, 2013).

Preliminary tasks include administrative and technical tasks and establishing a monitoring plan and protocols for data analysis. For corporate sustainability management, budgeting and planning the monitoring are important tasks. (Clewell & Aronson, 2013.) Additionally, top management's role in leading the project and showing example is vital (Winsemius & Guntram, 2002). Stakeholder engagement includes stakeholder dialogue (Kaptein & Van Tulder, 2003; Kujala & Sachs, 2019) and learning with and from the stakeholders (Burchell & Cook, 2008; Kujala & Sachs, 2019).

Implementation planning includes developing and planning the tasks for restoration and scheduling the process based on the plans (Clewell & Aronson, 2013). From corporate sustainability management side important steps are scheduling the restoration considering the environmental, social and financial aspects (Bansal, 2005; Stubbs & Cocklin, 2008) and applying sustainable business models in the implementation planning (Abdelkafi & Täuscher, 2016). In stakeholder engagement, it is necessary to specify the aftercare plans with cross-sector collaboration (Bocken et al., 2014) utilizing both stakeholders' and the company's capabilities (Stubbs & Cocklin, 2008).

Implementation tasks include executing the restoration (Clewell & Aronson, 2013). From both corporate sustainability management and stakeholder engagement perspectives, the main tasks are collaboration on the projects (Rondinelli & London, 2003; McDonald & Young, 2012) and informing different actors about the work (O'Riordan & Fairbass, 2008; McDonald & Young, 2012). From the company side, leading and managing the project through implementation is vital (Winsemius & Guntram, 2002).

Postimplementation tasks focus on determining, monitoring and documenting the nature of aftercare (Clewell & Aronson, 2013). Top management leads the monitoring (Winsemius & Guntram, 2002). However, determining the conditions and monitoring the restored sites should be done in collaboration with stakeholders (Jellinek et al., 2018) and using expert knowledge in that is advisable (Clewell & Aronson, 2013).

Lastly, evaluation of the restoration is done based on the documentation and publicity is pursued by articles and other presentations (Clewell & Aronson, 2013). For corporate sustainability

management, analysing the restoration and reporting is vital as through analysis, pushing sustainability to the core of the operation (Hörisch et al., 2014), long-term planning (Bocken et al., 2014; Slawinski & Bansal, 2015) and showing example to the others (Winsemius & Guntram, 2002) are possible. When wanting to change the way of working throughout the industry, lobbying politicians to change legislation and policies (Bansal & Roth, 2000; Schaltegger & Hörisch, 2017; Viveros, 2017) is essential.

3 METHODOLOGY

3.1 Case study

This is a case study of Rudus Oy's LUMO programme. The focus is on stakeholder engagement in the beginning of LUMO programme. A case study is chosen to investigate the case in its context and gain deeper understanding of it (Eriksson & Kovalainen, 2008). A case study is often an appropriate research method when the research questions include "how" and "why" questions (Yin, 2018). Case study was chosen as the aim of this study is examine how stakeholder engagement emerged while Rudus Oy started their LUMO programme. Previous literature on the topic help guide the direction of the study. However, the existing literature is not used at directly answering the research question but rather help compose conclusions alongside the analysis of the gathered data. (Yin, 2018.)

This case study is a qualitative research. Qualitative research is suitable when examining real-life complex matters (Walle, 2015). This case investigates a real-life case and complex matters such as biodiversity and stakeholder engagement. Qualitative research investigates non-numeric data and the in-depth understanding of different issues (Saunders et al., 2012). In case studies, the data is usually collected from multiple sources, such as documents, interviews and observations (Yin, 2018). In this study, the primary data is collected from interviews, and secondary data from documents. The data collected provides deeper understanding and information about stakeholder engagement in ecological quarry site restoration. The data collected covers the time period between 2012 and 2017. The aim of the research was to examine how stakeholder engagement emerged while Rudus Oy started their LUMO programme. The first five years of the programme present the decisions behind establishing LUMO programme, the start of LUMO programme, the first pilots, the success of LUMO programme and therefore, the changes LUMO programme put forward in quarry site restoration in Finland. Hence, this timeframe was chosen.

3.2 Rudus Oy and LUMO programme

Rudus Oy is a Finnish rock-based construction material producer. Rudus has approximately 90 concrete factories and almost 120 quarry sites across Finland. In addition, Rudus has 32 recycling centres across Finland. In total, Rudus has over 900 employees. In addition, Rudus has operations in

Estonia and Russia through its subsidiaries. The company values are the joy of work and diligence, rectitude and responsibility. Since 1999, Rudus has been a part of a globally working Irish CRH concern. CRH operates in 31 countries and they employ about 78 000 employees in about 3 100 sites. (Rudus Oy, 2020b.)

Due to responsibility being an important part of the operations, Rudus Oy started their LUMO programme in 2012 as one aspect of their corporate responsible operations. The purpose of LUMO programme is increasing biodiversity in quarry sites and some factories. This is done by actions conserving biodiversity during the extraction and after extraction has finished. The sites of LUMO programme are all different and the actions carried out vary greatly due to the different nature of the sites and what kinds of species have been found at each. (Rudus Oy, 2020a.)

3.3 Data collection

The research is a case study of LUMO programme on how stakeholder engagement emerged from the beginning of ecological quarry site restoration in Finland. The primary data consists of interviews with people who worked at Rudus Oy in the starting phase of LUMO programme. Interviews were conducted with people who were the key drivers of the initiative to start ecological quarry site restoration.

All participants in the research were volunteers and had no obligation to take part. In order to respect participants' privacy and confidentiality, all interviewees were asked verbally to consent whether they wanted to stay anonymous or whether their names could be mentioned in the research. Although all interviewees agreed to their names being mentioned in the research, it was decided to use codes for each interviewee as mentioning their names was not seen necessary nor of bringing added value to the research.

As the nature of the research is exploratory, semi-structured interviews were considered the most suitable method of collecting primary data. The key advantage of semi-structured interviews is that the questions and themes of the interviews are predetermined but there is the freedom to explore some areas or matters further if seen necessary in the interviews (Almeida et al., 2017). Thus, this method provided flexibility and allowed for further discussion of key topics raised by interviewees.

As the research was a case study on LUMO programme, which is a narrow area of interest, the number of relevant people to be interviewed was limited. The key interviewees were identified with B2N research project and Rudus Oy regarding whom they recommended to be interviewed. All interviewees were contacted through email. The interviews were conducted between January and February 2020, using both in-person and remote access tools, whichever was seen the most convenient for both the interviewee and the interviewer. In addition, an interview made by the B2N research project was utilized in this research. This interview was conducted in June 2019 at one of the sites of LUMO programme.

With one of the interviewees, an interview neither in person nor by using online tools could not be arranged due to conflicting schedules. Thus, the research questions were sent to the interviewee by email and answers were collected in a written form. These answers were included in the data analysis as a part of the primary data.

All in all, a total of 7 people was interviewed. The lengths of the interviews varied between 33 minutes and 96 minutes with an average of 69 minutes. All the interviews were recorded with the permission of the participants and once completed were transcribed. The audio files for the interviews totalled 344 minutes, which were subsequently transcribed into 61 pages to which 3 pages from the email interview were added making it a total of 64 pages.

Table 2: Details of the interviews

Code	Date	Place	Length	Amount of text transcribed	Position in Rudus at the time of working there
I1, I2	25.9.2019	Face to face	81 minutes	26 pages	Environmental team
I3	22.1.2020	Face to face	65 minutes	8 pages	Top management
I4	23.1.2020	Face to face	96 minutes	12 pages	Environmental team
I5	10.2.2020	Skype	33 minutes	6 pages	Environmental team
I6	11.2.2020	Face to face	69 minutes	9 pages	Top management
I7	10.3.2020	Email	3 pages	3 pages	Top management

The interview questions were formulated based on the themes from the available literature. The questions were grouped into three themes which were: background of the interviewee, beginning of LUMO programme and the stakeholders involved in LUMO programme. Using these three themes, the questions were formulated and organized, comprising a total of 22 questions. However, due to the nature of semi-structured interviews as a method of data collection, the order of the questions and the number of questions asked varied greatly due to the interviewees answering several questions at the same time and the interviewer asking specific questions.

Table 3: Details of the secondary data

Code	Date of retrieval	Name of the document	Number of pages	Source
D1	13.11.2019	New potentials of nature conservation in Pirkanmaa	65	Centre for Economic Development, Transport and the Environment
D2	27.1.2020	Rudus' nature mappings in spring 2013	26	Rudus Oy
D3	27.1.2020	Rudus' nature mappings in autumn 2013	31	Rudus Oy
D4	18.2.2020	Ecosystem Hotel – a safeplace for the species during the changes in land use	53	Finnish Environment Institute

The secondary data, which was collected to complete the primary data from the interviews, included company reports and other documents which were obtained from Rudus Oy and by doing an Internet search on LUMO programme. There is considerable amount of material regarding LUMO programme available and therefore, an extensive search was done. These documents were chosen due to their high relevance showing the stages of the beginning of LUMO programme.

3.4 Qualitative content analysis

The research is qualitative, in which the research studies participants' in-depth understanding of different issues in order to develop a conceptual framework (Saunders et al., 2012). A qualitative method was chosen as the aim was to examine how stakeholder engagement emerged while Rudus Oy started their LUMO programme and furthermore, what were the reasons and events leading to the start of LUMO programme. Secondary data supplements the primary data and helps create a broader understanding of the topic. The qualitative content analysis helps to follow and establish a timeline for the events and decisions that led Rudus Oy to start the LUMO programme, what happened during the timeline and how stakeholder engagement emerged during the process.

The qualitative content analysis uses different focal messages, such as written, spoken and visual communication, for the analysis. Furthermore, qualitative content analysis often examines multifaceted, complex phenomenon. Content analysis can be used to analyse either qualitative or quantitative data. (Elo & Kyngäs, 2008.) In this research, as the idea is to examine how people answer and which words are used in answering, it is used as a qualitative data analysis method. Coding is used as a qualitative content analysis method. Coding allows the researcher to categorize the main input from the research and helps present the findings in a transparent way (Linneberg & Korsgraad, 2019).

Once the interviews were completed and transcribed, the transcripts were imported to Atlas.ti which is a data analysis program that enables the researcher to organize and analyse qualitative data. I started by preparing an outline for the data analysis which is shown below in table 4.

Table 4: Stages of the analysis

Stages	Description
1 Familiarization of the data	- Skimming through the transcripts to familiarize with them - Developing a big picture of the data and the concepts
2 The first cycle of coding	- Developing the first codes from one transcript - Executing the first cycle of coding
3 The second cycle of coding	- Developing more codes and finetuning some of the original codes from all transcripts - Executing the second cycle of coding
4 Categorising the data	- Developing the main categories based on the codes - Categorising the codes into the main categories
5 Connecting the concepts and stakeholders by highlighting	- Reading through the transcripts once more - Connecting the stakeholder engagement methods to the stakeholders by highlighting
6 Data analysis	- Connecting concepts - Compiling interpretive explanations - Translating the codes into English

I started with familiarizing myself with the data. I first skimmed through and then read through the transcripts. While reading, I started to develop a big picture of the data and the main concepts. I wrote down some of the initial thoughts about the main concepts and ideas while reading. This helped me in the later stages when connecting the concepts. (Koskinen et al., 2005.)

I used inductive coding in which the analysis begins with raw data from multiple sources which I then grouped into specific themes (Creswell, 2013). In inductive coding, the codes are directly developed from the data. Coding is usually done in cycles and often the codes develop from the first cycle, meaning that the original codes may change. (Linneberg & Korsgraad, 2019.) Coding frame is used to develop different categories and the goal is to produce a good description of the material (Schreier, 2013). Therefore, I started the first cycle of coding by reading one transcript and highlighting the important words. Furthermore, I turned those words directly into codes. I then used those codes in all transcripts in Atlas.ti to see how well they functioned. After this first cycle of coding, I read the rest of the transcripts and highlighted the main concepts. From this highlighting, I developed more codes and finetuned some of the original codes into more accurate ones for the purpose of coding. After this, I did a second cycle of coding.

When all the codes were developed and coded, I combined similarities with the transcripts and codes and based on that, developed main categories from the codes. Furthermore, I then categorized the codes under the main categories.

After coding, additionally, I read through the transcripts once more to identify the stakeholders from the transcripts. In addition, I highlighted and connected the stakeholder engagement methods with the stakeholders. I used highlighting because that allowed me to draw lines between matters and write notes on the transcripts. I did the analysis data-driven but utilized the theoretical framework while making the conclusions. Therefore, the data-driven analysis is presented in chapter 4 and combined with the theoretical framework in chapter 5.

4 FINDINGS

4.1 Identifying stakeholders

Nine different stakeholder groups were identified in the data: environmental organizations, officials, local actors, Rudus employees, hired/outsourced workers, governmental agencies, politicians, media and other companies in the field. Under these stakeholder groups, 22 stakeholder types were identified. Table 5 below introduces the stakeholder types under the stakeholder groups.

Table 5: LUMO programme's stakeholders

Environmental organizations	Officials giving extraction permits	Local actors
- Vuokon luonnonsuojelusäätiö - Finnish Environment Institute - The Finnish Association for Nature Conservation	- Municipality officials	- Locals - 4H club - Sports clubs - Village organizations - Schools and universities - Cities
Rudus employees	**Hired/outsourced workers**	**Governmental agencies**
- Top management - Environmental team - Site employees	- Expert group - Consulting firms - Machine workers	- Centre for Economic Development, Transport and the Environment (ELY) - Regional State Administrative Agencies (AVI) - Ministry of the Environment
Politicians	**Media**	**Other companies in the field**
- Politicians	- Media	- Other companies in the field

The basis for involving stakeholders was that Rudus did not possess enough knowhow in biodiversity and ecological quarry site restoration in order to start LUMO programme and therefore, conserve biodiversity. All stakeholders were chosen based on the need of the programme and the collaboration was based on both parties benefitting from the joint work as both had common interests regarding the goal of the collaboration.

Out of the different environmental organizations, LUMO programme collaborated with Vuokon Luonnonsuojelusäätiö, Finnish Environment Institute and The Finnish Association for Nature Conservation. They were mentioned as important stakeholders. Their role was highlighted in the interviews. Especially, their knowledge, ability and willingness to collaborate and use the sites after restoration were mentioned important factors. Most of the pilots were done in collaboration with the

different organizations. Additionally, Rudus met with them on a yearly basis to discuss the current matters in the organizations and prospective collaborations.

Quarrying is a subject to licence in Finland, and the municipality officials are the ones to give out extraction permits, thus they are vital for Rudus and LUMO programme. Rudus toured the different officials to explain LUMO programme and the way of ecological quarry site restoration. Open discussion and explaining to the officials what LUMO programme involved, was highlighted in the interviews.

Local actors include several different types of actors. Local people are important to get engaged as it is often them who disapprove the plans to begin quarrying. Locals often complain to the judicial system when a company seeks for an extraction permit. The longest complaint processes take decades and go through all three levels of the Finnish judicial system. Locals are also vital as it is them who use the sites after restoration, therefore hearing their opinion and getting their approval is vital for the operations. Local organizations, 4H clubs, sports clubs and village organizations, were important as it was LUMO's goal for the sites to be versatile after restoration and it is then often the local organizations that look after the sites. Rudus collaborated with many local organizations in the pilots, meaning both planning the pilots and executing the restorations.

Rudus has collaborated with Aalto University architecture and landscaping architecture students and the expert group when the students and the expert group had been invited to Rudus and together to design bat houses and the landscaping of a concrete factory. This was a win-win-win situation as the students were interested in hearing from the experts, for the experts it was interesting to hear the students' innovative ideas and for Rudus this was an opportunity to be a trendy and desirable employer in front of future's employees. Hyvinkää city was involved in restoring the Suomies site as they built a nature path in the site that is now an official nature path of the city. Additionally, local schools organized some trips to the sites.

Rudus employees have been categorized into three sectors: the top management, the site employees and the environmental team. Naturally, Rudus had employees that are not part of these three groups, but regarding LUMO programme, it is these three groups that are relevant and mentioned in the data. Thus, the rest of the employees have been limited outside this research. The entire idea of LUMO programme came from top management and they were the key drivers for the programme. Additionally, their role as showing example and commitment to the programme was seen vital and

engaging other employees as well. The site employees were naturally in key role in the execution of the pilots as they happened at the sites. Depending on the site, their activeness and role differed. Moreover, some site employees were active, and generated ideas to conserve biodiversity and execute restoration on their own.

The environmental team has several roles in LUMO programme. In the beginning they planned and executed the trainings to the site employees and outsourced workers. Additionally, they took part in the nature mappings with the expert group. The environmental team also had a major role in planning and writing the aftercare plans which are included in the applications for extraction permits. Moreover, the environmental team attended different trainings themselves and gave speeches at different seminars and other events.

The experts can be divided into two: the expert group consisting of biologists, university professors, researchers and nature photographers and experts from consulting firms. The expert group consisted of 10-20 experts from different backgrounds. Experts were used to provide knowhow and facts, which Rudus did not possess themselves and general support regarding LUMO programme, such as assisting with writing the aftercare plans and explain to the officials why ecological quarry site restoration is beneficial. Experts also carried out the nature mappings on sites and assessed what kinds of restorations could be done. Additionally, they trained Rudus employees about biodiversity and conserving it. The role of the experts in the beginning of LUMO programme was highlighted in the interviews. Additionally, Rudus uses outsourced machine drivers in the quarry sites and as the style of restoration changed from planting pine trees to LUMO method, the drivers needed to be trained and kept informed about the changes in the working methods.

Governmental agencies, Centre for Economic Development, Transport and the Environment (ELY Centres); Regional State Administrative Agencies (AVI) and Ministry of the Environment, were kept updated on what was going on in LUMO programme and were invited to press conferences and met on a yearly basis. Additionally, the Ministry of Environment initially informed Rudus about the scale of the issue of biodiversity loss is in the world and further informed. part of the CEO network that was established by FIBS. This is a clear example of important peer support.

Politicians were mentioned to be in a small role in the whole LUMO programme. Politicians were invited to different press conferences organized regarding LUMO programme but only a few were interested in the loss of biodiversity at the beginning of LUMO. Although nowadays increasing

biodiversity is in the government's agenda, thus making it a more and more relevant and interesting topic.

Media also did not have a big role, although there have been articles and such in media about Rudus sites in general and some about LUMO programme as well. Additionally, some tv-interviews were done about LUMO programme.

Other companies in the field were mentioned in the sense that Rudus was the initiator of ecological quarry site restoration with the focus on biodiversity in Finland. After Rudus became the forerunner, other companies followed. Rudus so to speak was the source of the snowball effect in terms of ecological quarry site restoration which others wanted to follow. In addition to Rudus being the forerunner in Finland, some of the other companies in the field were also part of the established CEO network.

The most important stakeholders were in addition to Rudus' own employees, municipality officials, local people and the expert group. Municipality officials and the local people gave their approval for the projects and the expert group provided the facts and necessary knowhow. In addition, the large collaboration partners, the Finnish Environment Institute and the Finnish Association for Nature Conservation are very important stakeholders.

4.2 Timetable for the starting phase of LUMO programme

As the idea of the research is to understand how stakeholder engagement emerges and evolve at the beginning of ecological quarry site restoration, a timeline showing how LUMO programme began is important. The timeline shows what happened and when, and when were different stakeholders introduced to LUMO programme. The following figure 2 shows the timeline which has been established from the data.

Since 1980s: Historical factor

- Landscaping in the sites based on Land Extraction Act

2012: Conceptual planning and preliminary tasks

- Rudus leaders see examples from abroad about ecological quarry site restoration --> thought fom Rudus to start ecological quarry site restoration
- Beginning of LUMO programme
- Rudus CEO visiting Santahamina garrison and photo exhibition
- The Finnish Defense Forces giving a presentation to Rudus leaders about Santahamina garrison
- Establishing the expert group
- Expert group presenting their wishlist about different site types to conserve for Rudus employees

2013: Implementation planning and implementation tasks

- Nature mappings at Rudus sites: looking for pilot sites and presenting the idea and engaging the employees
- First pilots on sites
  - Discussions with the neighbours
  - Discussions with the officials
- Rethinking the aftercare plans for the sites with the expert group

2014: Implementation planning and implementation tasks

- More pilots on sites
  - Discussions with the neighbours
  - Discussions with the officials
- FIBS' biodiversity Master Class - training
- Yearly discussions with some organizations to show what is happening with LUMO programme

2015: Implementation planning and implementation tasks

- Pilots on sites
- Yearly discussions with some organizations to show what is happening with LUMO programme

2016: Postimplementation tasks and evaluation and publicity

- LUMO-work continues
- Yearly discussions with some organizations to show what is happening with LUMO programme
- LUMO-programme wins UEPG's sustainable development biodiversity-class
- Rudus becomes forerunner in quarry site restoration in Finland

2017: Postimplementation tasks and evaluation and publicity

- LUMO work continues
- Yearly discussions with some organizations to show what is happening with LUMO-programme
- Rudus sells Kakslammi site to Vuokon Luonnonsuojelusäätiö and the site was named conservation area

Figure 2: Timeline for the starting phase of LUMO programme

The timeline shows the most important events in the starting phase of LUMO programme. Additionally, it shows how different stakeholders were engaged in the programme. Stakeholder engagement is furthermore explained in the next sub-chapter.

4.3 Stakeholder engagement

Stakeholder engagement is explained through the timeline presented above. As LUMO programme is not only one ecological quarry site restoration but an entire programme around restoration, it is difficult to directly implement the ecological quarry site stages. However, certain patterns have been identified. Therefore, stakeholder engagement will be presented through three stages: conceptual planning and preliminary tasks (year 2012); implementation planning and implementation tasks (years between 2013 and 2015); and postimplementation tasks and evaluation and publicity (years between 2016 and 2017).

4.3.1 Conceptual planning and preliminary tasks

Leading towards the beginning of LUMO programme

Since the 1980s, the Land Extraction Act included that sites need to be landscaped after the extraction of minerals has ended. Then, the way of landscaping was very simple and often consisted of flattening the areas and planting, usually forestation with pine saplings. However, in 2012 at the same time Rudus leaders saw examples from abroad of ecological quarry site restoration with the focus on conserving biodiversity and Rudus realized that the method of landscaping the sites was lacking and not the most effective as the pine forests were growing poorly. Since there was no exact understanding of what landscaping should entail. As the Land Extraction Act is non-specific and only states that landscaping needs to be done, there was room for flexibility and alternative methods of landscaping previously unimagined by Rudus. They were very excited by this new way of conserving the sites and they decided that Rudus should start doing similarly. Therefore, LUMO programme was established.

Start of LUMO programme

With the whole LUMO programme, in addition to conserving biodiversity, the plan in the background was securing the operations and continuing those. Therefore, an important factor in LUMO throughout the programme was to use the resources available as well and effectively as possible for the good of both the company itself and nature. Hence, from the start, people and nature worked together in LUMO programme considering each other in all activities.

In addition, to the LUMO programme, Rudus has created a responsibility charter based on working with sustainable development principles. The responsibility promise 2030 states that "when we take some area to our use, then at the point when we are leaving, we hand it back richer in values of nature" (I3). In LUMO programme, Rudus decided to focus on biodiversity loss as they learned that climate change and biodiversity loss are the biggest threats and many actors were already working for climate change. Additionally, Rudus saw their potential to work for biodiversity due to having the appropriate resources but also their responsibility to act.

The word LUMO comes from Finnish 'luonnon monimuotoisuus' meaning biodiversity. The role of nature in LUMO programme is essential and thus the entirety of the programme is based upon nature and its protection. LUMO method used at sites for restoration means conserving biodiversity in the actions used for restoration. Therefore, the goal of LUMO programme was set to increasing biodiversity.

> " The site is, on the perspective of biodiversity, on a better state after our operations than before them." (I7)
>
> ("Toimipiste on luonnon monimuotoisuuden näkökulmasta paremmassa asennossa toimintamme jälkeen kuin ennen sitä." (I7))

In addition to increasing biodiversity, one important goal of LUMO programme was that the sites were multipurpose after restoration. Therefore, it was important from the beginning that the areas remain versatile, that there was something for everyone.

Supporting LUMO programme's beginning

Shortly after the establishment of LUMO programme, the CEO of Rudus visited Santahamina garrison and discovered that biodiversity can be advanced in the shooting range as that is an open field, which is becoming rare in Finland and after that, he saw a photo exhibition of Santahamina wildlife. Seeing those pictures, he was excited and decided to furthermore advance the LUMO programme by inviting the Finnish Defence Forces to give a presentation to Rudus leaders about Santahamina garrison. After the presentation, an expert group, which the Finnish Defence Forces contact had, was established to advance LUMO programme.

Many interviewees stated that LUMO programme started by acquiring the expertise about nature and biodiversity because Rudus did not possess enough knowledge. The experts were paid a salary

and naturally engaged to the work that way. Although getting these experts engaged in a project where they would not believe in, might be impossible, at least if you believe the interviewees.

> " Even though they were our hired experts ... many of them had quite strong principles, as precisely nature, that they prioritize nature, that influencing them would have been impossible." (I6)
>
> ("Vaikka olihan ne tietysti, et ne oli meidän palkkaamia asiantuntijoita ... monet on semmosia aika vahvasti periaatteen ihmisiä, niin kuin luonto nimenomaan, että ne menee se luonto edellä, et kyllä niihin vaikuttaminen ois ollut kyllä ihan mahdotonta." (I6))

The expert group visited Rudus to present their 'wish list' of various types of environments which they hoped to increase for example in Southern Finland. The visit was done in a voluntary spirit to try to get Rudus engaged and start doing something. The 'wish list' presented three types of environments: sunlit hillsides, meadows and wetlands. It was clear that the quarry sites included all three types of environments, therefore making it an easy decision for Rudus to get involved.

> " ... three types of areas on top of the wish list that could not be found and the common factor of them was that they were quite open places all. So, there were specifically these sunlit hillsides, where the sun can shine more or less directly to a very sandy soil… Then the other one was just meadows... and then the third one being wetlands. And basically, our areas consist of all three and then we noticed a type of equation that if one wishes for these types, we can easily arrange that, meaning it is easily compatible to our extraction of natural resources." (I3)
>
> ("… kolme semmosta toivomuslistan kärjessä olevaa aluetta joita ei löytynyt ja niillä oli yhdistävänä tekijänä se et ne oli aika aukeita paikkoja kaikki. Eli oli nimenomaan tämmöset paahderinteet joissa aurinko pääsee porottamaan jokseenkin suoraan tämmöseen hyvin hiekkaiseen maaperätyyppiseen maastoon... Sitten toinen oli ihan niityt... ja sitten kolmas oli kosteikot. Ja käytännössähän meidän alueiltahan löytyy niitä kaikkia, ja sit me havaittiin siinä sellainen yhtälö että jos tämmöisiä alueita toivotaan, niin me pystytään niitä hyvin helposti järjestämään, elikkä se on ihan tämmönen niinku erittäin helposti yhteensovitettavissa näihin meidän luonnonvaran ottamisiin." (I3))

Rudus' decision to become involved in creating such sites was an easy one, as Rudus' sites were suitable to creating such environments. Furthermore, key stakeholders were already interested.

Therefore, Rudus agreed with the expert group, named the LUMO team, that they would start advising Rudus on biodiversity matters. The importance of the expert group for LUMO programme was highlighted in most of the interviews.

The municipality officials were not a new stakeholder group for Rudus as in order to start quarrying, you need a permit, which is approved by the officials. Although, LUMO programme deepened and opened new ways of engaging with the officials. As the long-term traditional way of restoring quarry sites was to flatten the site and plant pine trees, the officials were used to that way of doing. As Rudus had learned that that was not the best way to restore the sites when considering the biodiversity, at first, Rudus needed to spend time in explaining to the officials that the old way was no longer sufficient, as there was new knowledge, and they should consider other aftercare plans. The whole purpose with the officials was to be upfront and honest about LUMO programme and its goals and this was done by being in close contact with the officials and as in advance as possible. First, there was a need to change some of the existing quarrying permits in order to change the decisions so that the aftercare could be done using the LUMO method.

Rudus toured the officials to explain LUMO programme and its purpose to engage them and to make them more open to new ways of restoring. Rudus faced an issue with some officials that they were suspicious about LUMO's deep purpose. They suspected that as Rudus was changing their way of operating to protecting nature and conserving biodiversity there would be some hidden agenda behind the change. Therefore, some officials thought that Rudus was trying to save money as some restorations were cheaper to do in LUMO method. However, these suspicions were dismissed quite fast as Rudus used the experts to be more convincing and showing the actual benefits in doing the restoration differently. In addition to touring the municipality officials, with or without the biologists, explaining LUMO programme, there were other engaging methods used as well. The purpose of sending notifications to the decision-makers was to inform them and be open about what was going on in LUMO programme.

Although, it is the municipality officials who approve the quarrying permits, the governmental agencies, Centre for Economic Development, Transport and the Environment (ELY Centres); Regional State Administrative Agencies (AVI) and Ministry of the Environment are important as well because the first two agencies consult the municipality officials regarding the permits. Thus, first at the same time as Rudus toured the municipality officials, and the neighbours, in explaining

LUMO programme, they visited the ELY and AVI experts as well to explain what was going on and thus engaging them.

The neighbours have always been important stakeholder to Rudus, they did not only come into the picture because of LUMO programme. Whenever Rudus considers applying for a permit to open a new site, they organize an event where they invite neighbours from that area to inform them and answer any potential questions.

Overall, the problem with applying the permits for quarrying is that there are many instances complaining about the applications, thus making the process of acquiring the permits very long as the complaints go through the legal system. Longest process for Rudus in which they got the permit took 14 years. Therefore, by hearing the neighbours early on, one goal is to make the opposition less although removing that completely has not been successful in any case. The complaining has not changed even in the case that the aftercare of the sites is done in the LUMO method, the people still want to use all options to try to avoid the site from coming. However, when the neighbours saw that all opportunities to complain were used, they got on board in planning how the restoration could be like because it is naturally in the neighbours' interest to have the site in multipurpose use afterwards as is also in LUMO's goals.

LUMO programme started from top management's initiative and they became aware of the extensivity of the loss of biodiversity first. Moreover, they were the first ones being engaged and then showing the example to the rest of the staff. Their corporate sustainability management was a key factor why LUMO programme became successful.

> " The most essential in it was that top management was very engaged in it and acted as an example by taking the way of working forward." (I5)
> ("Oleellisenahan siinä oli että siinä oli sitten johto hyvin sitoutunu siihen ja tavallaan esimerkkinä sitten viemässä sitä toimintamallia eneepäin." (I5))

> " Background support for the work has been strong the entire time because of top management's support." (I5)
> "Taustatuki sille tekemiselle ollu vahva sitten koko ajan sen johdon tuen myötä." (I5)

Role of politicians stayed low in the beginning years of LUMO programme no matter the attempts to engage them. In the beginning, Rudus organized a seminar where they invited a lot of different

stakeholders. Many came, but no politicians showed up. At the time it was seen that politicians were not interested in biodiversity, more talk was on climate change, however, this has been changing in the very recent years and now more and more talk is on increasing biodiversity perhaps considerably because of LUMO programme and its success.

Key stakeholder engagement methods

Table 6: Stakeholder engagement methods in conceptual planning and preliminary tasks

Stakeholder engagement method	Stakeholder/s engaged
Establishing the expert group	Expert group
Informing the municipality officials	Municipality officials, top management, environmental team, experts
Informing the governmental agencies	Governmental agencies, top management, environmental team, expert group
Discussions with the neighbours	Neighbours, top management, environmental team, site employees
Top management's engagement and example	Everyone (though especially Rudus' employees)
Press conference	Media, politicians, environmental organizations, governmental agencies, top management, environmental team
Payment	Rudus employees, expert group

The table shows the different stakeholder methods used during conceptual planning and preliminary tasks stage.

4.3.2 Implementation planning and implementation tasks

As stated before, an important step, in the beginning, was the nature mappings and then choosing the pilots through which LUMO programme is executed. All pilots included stakeholders, as Rudus staff is a stakeholder group, but some of the pilots were done in cooperation with stakeholders other than Rudus' own people. Planning the pilots and implementing them, were naturally an important step for LUMO programme as they were the way to see how the programme works. These pilot projects are shown in table 7.

Nature mappings and planning the pilots

In 2013, the expert group alongside some Rudus employees started nature mapping Rudus sites, to see what kinds of sites Rudus had, what species could be found and what could be done to those to improve biodiversity. Additionally, the plan was to inform the employees, give training and therefore, get them engaged in LUMO programme. Trainings informed and educated the people and in addition, got them engaged in LUMO programme due to giving a reasonable amount of time for each site so people felt heard and recognized. The purpose of the tours included all these aspects.

>"For the regional visits, the goals had been set to increase the engagement of the regional staff to LUMO programme, collecting information about the conditions of the sites to LUMO team, establishing a key staff network, building collaboration between the field and LUMO team and finding the first LUMO sites." (D2, D3)
>("Maakuntakierrosten tavoitteeksi oli asetettu maakuntien henkilöstön sitouttamisen lisääminen Lumo-ohjelmaan, tiedon kerääminen lumotiimille alueiden tilasta, avainhenkilöstöverkoston perustaminen, yhteistyösuhteiden luominen kentän ja lumotiimin välille sekä maakunnallisten ensimmäisten lumokohteiden löytäminen." (D2, D3))

The expert group had identified large empty areas rare in Finland, and those areas are important for some species which live in specifically sun-lit areas, fields or wetlands. From the nature mappings, the expert group identified several endangered species, such as moor frog, sand martin and Sphingonotus caerulans. With LUMO method of restoring quarry sites, Rudus has managed to create better conditions for these endangered species and managed with the improved conditions to increase the number of sand martins.

After the tours, they suggested different ways of increasing biodiversity. Based on those suggestions, Rudus together with the experts started rethinking how to do the aftercare and the aftercare plans differently. As the experts were paid, they were already engaged in LUMO programme that way, but during the nature mappings and through the pilots, they saw what kind of a big impact could be achieved through LUMO programme and got even more engaged.

>" But though actions they saw that we were serious … big areas of land which we control … different sides of the country and through that there is a possibility to do those actions on different sides that those can affect it big time" (I5)

("Mutta tekojen kautta näkivät että tosissaan ollaan ... isot maa-alueet mitä hallitaan ... eri puolilla tätä maata ja sitä kautta sitten on mahdollisuus tehdäkin niitä tekoja eri puolilla että sehän voi vaikuttaa siihen isostikin." (I5))

In addition to paying salary for the outsourced machine drivers, Rudus organized diversity and safety training for them to get them engaged in the LUMO programme and the new way of restoring. The idea behind the training was to both educate the drivers on what to do but also to make them understand what biodiversity is and why it is endangered and thus, why we should protect it. The training was first done by the environmental team but after, when the site employees were already engaged, they handled the training for the machine drivers.

Pilots

All the LUMO programme cases were carried out with a 'win-win-win' perspective: "firm money and resources are used in the most sensible way; it brings value to nature and something good for the image" (I4). Regarding the stakeholders, there were clear 'win-win' cases as well, especially with the collaboration cases where LUMO method of restoring the sites brought Rudus good publicity and they were able to conserve biodiversity and thus, advance LUMO programme. Meanwhile the stakeholders were able to promote their case and, in some instances, gain the use of the site after the restoration.

Table 7: Collaboration projects

Collaboration project	Stakeholders involved
Ecosystem Hotel (Raasepori)	the Finnish Environment Institute
Hyvinkää nature path (Suomies)	Hyvinkää city and the Finnish Environment Institute
Employing long-term unemployed with employment benefits (Suomies)	the Finnish Association for Nature Conservation
Kakslammi Conservation Area (Hausjärvi)	Vuokon Luonnonsuojelusäätiö and local sports club
Butterfly field and the sheep (Oulu)	4H club

Some of the site's staff were not prompted and they discovered ways of increasing biodiversity on their own and wanted to act. After trainings when the pilots were starting, it was important that the sites had engaged people who were interested in nature and conserving biodiversity since they were given free hands to try out different ways so then they had some existing knowledge from their interests and from the training. In many sites, there was something done, however the extensiveness of the activities varied between the sites.

" ... in our personnel, we had local nature people who were very excited about nature matters and then they thought those themselves and then in several sites there was in some something smaller and in some something bigger done." (I6)

("… meidän henkilökunnassa oli paikallisia luontoihmisiä, jotka oli tosi innoissaan luontoasioista ja ne sitten ideoi niitä itse ja siellä sitten monellakin montulla tehtiin jossain vähän pienempiä juttuja ja joissain isompia." (I6))

An example mentioned by most interviewees was a case of sand martins, which in Finland have been classified as extremely endangered and thus are protected at one of Rudus sites. As the and martins were taking over the product piles, the expert group advised the site employees to shape a bank for the sand martins. Immediately after the site employees had built the bank, the sand martins moved there and therefore, the operations could continue, and biodiversity was conserved.

The case of sand martins was one of the pilots found during the field visits and in total, about 10 sites were chosen as pilots in which the restoration started in 2013 and during 2014-2015, there were many LUMO projects ongoing. Alongside the pilots starting, Rudus talked with both the officials, who in Finland give out the extraction permits, and the neighbours not only to inform them but also to get them on board. Additionally, Rudus' environmental team alongside the expert group started to rethink the aftercare plans for the quarry sites, which are necessary for the extraction permits, in order to increase biodiversity. The purpose in the aftercare plans was to show how the sites would be in better state after restoration than before the extraction. The thought behind the aftercare plans is vital for the whole purpose of LUMO programme.

"That it is exactly that that those nature mappings are done in the sites, and based on them, the operations on the site during the extraction of aggregate and especially the aftercare and aftercare in a way that this end result, that the state of diversity is better when we leave than what is was before we came." (I6)

("Et se on just se että niillä montuilla tehdään ne luontokartoitukset, ja sit sen mukaan suunnitellaan sen montun toiminta sen kiviaineksen oton aikana, plus sitten ennen kaikkea se jälkihoito ja jälkikäyttö sillä lailla että tämä lopputulos, että sen luonnon monimuotoisuuden tila on parempi kun me lähdetään kun mitä se oli ennen kun tultiin." (I6))

One successful and innovative example of cooperation and stakeholder engagement is the Ekosysteemihotelli, 'Ecosystem Hotel', with Finnish Environment Institute, in which species from

the sun-lit environment by a highway construction were transferred to an old quarry site. Before starting to relocate the plants, Rudus met with all involved instances to inform everyone and get an agreement that the work which was starting was a good idea. This was agreed, and then for Rudus, it was easier to start the work knowing that they had the officials' approval for the work. The survival of these species was followed for several years. The first transfers including the species Dianthus arenarius (classified extremely endangered) and Thymus serpyllum (near-threatened species) and Antennaria (near-threatened species) were done in 2014. They were observed between 2015 and 2018 and the population of all three species had increased. The plan was to save the endangered species from the road construction was a success.

Engaging the local people into LUMO programme was very important for several reasons. Firstly, Rudus constantly tries to keep constant, open relationship with the neighbours that they have a connection with them. Rudus organized public events to explain both LUMO programme and Rudus' operations in general. Secondly, as one of the goals of LUMO programme was to have the area after the restoration and landscaping an open outdoor space for the neighbours and other locals to use, that needed someone to use it afterwards. One way to engage neighbours and get ideas of the landscaping, was to hear neighbours' opinions and ideas and to potentially find someone to look after the area after the restoration is completed. Key to this engaging method was by informing the neighbours in advance and making them feel acknowledged. A challenge for Rudus was how to find that user in order to give up the area in a smart way.

> " The most challenging site with the LUMO method is kind of how we smartly let go of the sites after they don't have our business side anymore and a type of outdoor usage is very good." (I3)
>
> ("LUMOutuksen niin kuin haastavin puoli on se et miten me saadaan fiksusti luovuttua näistä alueista sitten sen jälkeen kun niissä ei oo tätä meidän bisnesspuolta enää, ja tämmönen ulkoilukäyttö on erittäin hyvä." (I3))

Local organizations were engaged due to the same reasons as the neighbours because the idea was to get their approval that the site comes to the area and to find a user and carer for the site afterwards. For engaging the different local organizations there were also different methods. In Oulu, there was a site where after quarrying had ended, there was a big field with a lot of butterflies. Rudus decided to keep the field, make it more open with LUMO method and in order to keep it open, they invited a local farmer to bring his sheep out to pasture and the local 4H club looked after

the sheep. Although Rudus paid for the 4H club, thus engaging them, it was also a learning experience for the kids from the 4H club at the same time.

Rudus and Vuokon Luonnonsuojelusäätiö did a collaboration in Kakslammi site in Hausjärvi where they together restored the site. Vuokon Luonnonsuojelusäätiö organized voluntary work and invested money to prune local plans as a plan to keep the area open and in multipurpose use for the locals. In Hausjärvi, together with Rudus and Vuokon Luonnonsuojelusäätiö a local sports club, Ryttylän Kiri, was involved in planning the aftercare for the site as they wanted to continue using the site after restoration. They came to do voluntary work restoring the site and additionally, to nature paths which are on-site, there is a frisbee golf course which Ryttylän Kiri manages.

> " ... then they (the local sports club) wanted to continue using the area and for them to be able to use the area, they came as voluntary work to do like for example stairs and uproot lupins and other" (I4)
>
> (" ... sitten ne (paikallinen urheiluseura) halus niinku jatkossakin käyttää sitä aluetta ja siitä edestä että ne sai käyttää sitä aluetta niin ne tuli sit talkoilla tekemään sinne tämmösiä niinku vaikka portaita ja lupiininkitkemistä ja muuta" (I4))

In the Suomies-site in Hyvinkää, there were both the Finnish Association for Nature Conservation and the Finnish Environment Institute were engaged in the project. People from the Finnish Environment Institute designed and built nature artwork for the site making it also more engaging for the locals who come use the site when they can explore the artwork. With the Finnish Association for Nature Conservation Rudus hired unemployed people to do work on the restoration. In this agreement, Rudus provided the management and the Association for Nature Conservation the expertise, thus both parties using their strengths for a common good and for shared goals.

> "… The Finnish Association for Nature Conservation's Uusimaa district was our partner and then together with employment money, we hired these unemployed who did the clearing there. We provided the management and the Association for Nature Conservation then the expertise for that." (I6)
>
> (" ... Suomen Luonnonsuojeluliiton Uudenmaan piiri oli meidän kumppani ja sitten palkattiin yhdessä tämmösii työttömiä työllistämisrahoilla, jotka teki sitä raivausta siellä. Me tarjottiin työnjohto ja luonnonsuojeluliitto sitten sen asiantuntemuksen siihen." (I6))

In addition to the pilots

In 2014, The Confederation of Finnish Construction Industries RT (CFCI) started a CEO network where of the six biggest construction firm CEOs, the CEO of Rudus, the director of Ministry of the Environment, the director Finnish Environment Institute and the director of FIBS, environmental responsibility organization, met once a year to promote the consideration of biodiversity in the construction sector. When FIBS started a biodiversity Master Class in 2014, the CEO network encouraged many companies to take part in the training. The aim of the training was for the companies taking part in the training to work on creating diversity plans. Rudus took part in the first training in 2014 to further develop LUMO programme.

Especially for the environmental team, but for the entire LUMO work, participating in the Master Class training was a good way to engage further with matters regarding biodiversity and get expert opinions and suggestions on what should be done regarding LUMO programme. The Master Class training's purpose was to develop biodiversity plans. As there were 10 companies taking part in the training, it was also an opportunity to collaborate and contemplate ideas together.

> " In that (Master Class training) for the partaking companies, they tried to work on biodiversity plans about how they would promote biodiversity. And we went along to the first training." (I6)
>
> ("Siinä (Master Class-koulutuksessa) pyrittiin työstämään näille firmoille tämmösiä luonnon monimuotoisuussuunnitelmia, kuinka ne veis eteenpäin luonnon monimuotoisuutta. Ja me sitten lähettiin siihen ekalle kurssille mukaan." (I6))

Through the expert group and their work mapping the sites, Rudus got into connection with the environmental organizations which was quite unusual for an aggregate producer as they were often seen as destroying nature. Finding a common ground, increasing biodiversity created such strong joint interests, that Rudus and the environmental organizations were able to put aside the general disagreements over quarrying.

> " ... we have been on different sides in the beginning … different teams, and then we can excitedly collaborate and promote biodiversity issues" (I6)
>
> ("... ollaan ihan eri puolilla alun perin ... siis todella ihan eri leireissä, niin sit kuitenkin voidaan tehdä yhdessä innoissaan yhteistyötä ja viedä monimuotoisuusasioita eteenpäin" (I6))

In fact, the environmental organizations became one of the most important stakeholder group for Rudus regarding the LUMO programme. Therefore, Rudus started yearly visits with each of the organizations to inform about LUMO programme and mutually agree if there was something they could collaborate with. These discussions and finding the evidence, the endangered species from the sites, led to the collaborating in the pilot projects.

The locals and the site employees alike, were engaged with the Finnish Nature Days where the sites organized workshops for building birdhouses. These events were popular, and it was a rather easy way to engage the neighbours and get them closer to LUMO programme and the sites itself.

> ”We started organizing especially during the Finnish Nature Days those open doors at our sites, wherein quite many sites they, for example, organized types of birdhouse workshops … and then the people, kids and parents, could come to build up those birdhouses.” (I6)
>
> (“Ruvettiin järjestämään etenkin näitten Suomen luonnon päivien yhteydessä semmosia avoimia ovia niillä meidän montuilla, jossa sitten järjestettiin esimerkks aika monella paikalla tommosii lunnunpönttötalkoita ... ja siellä sit sai tulla tulla ihmiset, lapset ja vanhemmat sinne sit kokoamaan niit linnunpönttöjä.” (I6))

Finding the evidence and being able to show through the success of the pilots that LUMO method was working, got the employees engaged very fast. As LUMO programme was something completely new for Rudus, that also contributed to why people were so fast engaged in the work.

> ” ... we could show that this aftercare is actually working and wanted matter and that motivated our own personnel to do that type of work that it was that type of nice thing where you did not have to force anyone but people downright voluntarily wanted to come along to do those things.” (I3)
>
> (”... pystyttiin osoittamaan sitä että tää jälkihoito on oikeesti toimivaa ja haluttua juttua niin se motivoi totta kai meidän omaakin henkilökuntaa tekemään sen tyypppistä hommaa että se oli semmosta mukavaa hommaa mihin ei joutunu käskemään ketään vaan ihmiset suorastaan vapaaehtoisesti halusi tulla mukaan tekemään niitä asioita.” (I3))

LUMO programme had a very clear goal from the start, increasing biodiversity. Similarly, to having a clear overall goal, everyone was given goals and indicators for the work. One way of recognizing, thanking and in addition, engaging people was the yearly competition for the staff where there were

different categories, LUMO being one of them, and people were awarded based on their actions. The thought is that the staff did not see all aspects of the competition, that it tried to engage them and inform them about responsibility, it was thought as something fun to do, but overall it was seen successful and a different way of pushing forward the responsibility message than internal notifications.

> ” ... some actions which people did and which were taken into the aftercare and other plans so we had those, yearly we distributed responsibility prizes, so there was always an own category for LUMO and that was a kind of internal thanksgiving which was not more than a diploma on the wall, but with that, we wanted attention for peoples' actions” (I5)
>
> (”... jotain tekoja mitä tekivät ihmiset ja otettiin jälkihoihossa ja muussa suunnitelmaan niin meillä oli myös semmosia, me vuosittain jaettiin vastuullisuuspalkintoja, niin siellä oli aina sitten myös tälle LUMOlle niin oma kategoriansa ja sieltä niinku tämmöstä sisäistä palkistemista joka ei ollut tosin ku diplomi seinälle, mutta silläkin haluttiin huomiota niille ihmisten teoille” (I5))

With students, there has not been many engagement initiatives. Rudus though has collaborated with of Aalto University architecture and landscaping architecture students. Rudus organized a few evenings where they invited the experts and the students for a nice evening in Rudus' office and the agenda for the evening was for the experts to share different thoughts about how conserving biodiversity could be done and what kinds of nests different species need and then the students planned different options and the best plans were rewarded. This was an easy method for Rudus to engage both the students and experts and get another win-win-win situation and show themselves as an attractive and interesting employer.

With Hyvinkää city, there has been collaboration on the Suomies site as Hyvinkää city has been part of planning the aftercare for the site and currently, the nature paths on-site are official nature paths of the city. As the quarrying sites are generally isolated from the cities/communities, because they take large space, there are not many schools to collaborate with. However, in Oulu, where the butterfly field is, a local school did some trips to see it during their classes and thus, were engaged in LUMO programme that way.

There are some controversial answers about the role of media among the interviewees. This is probably due to differences in opinion on how much is a lot of engagement. There were many

attempts to engage with both media. There were some writings on the newspapers whenever there was a new site opened and additionally, Rudus engaged the media by asking them to write articles about LUMO programme and its progress. Overall, the role of politicians and media compared to the other stakeholders remained small. Naturally, they are both needed if wanting to make ecological quarry site restoration a bigger matter because if for example there would be a will to change the Land Extraction Act to add more details about how the restoration should be done, that is a question for the politicians. However, that did not come up in the interviews, thus presumably that has not been discussed with the companies at least.

Additionally, there were several engagement methods that were more general of nature. As openness and informing people about LUMO programme and what was going on, was a major aspect of LUMO programme, a public Facebook page and Twitter account were created for LUMO programme. Additionally, all invitations to talk about LUMO programme in different seminars or other events were accepted. Overall, successful factors for LUMO programme included the openness and sharing about the advancements and those were achieved by meeting stakeholders in person and engaging them with both the information and the evidence of the programme's achievements.

> ” It was those face-to-face meetings that were the most important. And then collecting this, research and material” (I4)
>
> (” Niin kyl se oli se ihan niinku face-to-face tapaamiset niin kyl ne oli, sitä tärkeintä. Ja sit ihan niinku justiin tän, tutkimustulosten ja aineiston kerääminen” (I4))

Table 8: Stakeholder engagement methods in implementation planning and implementation tasks

Stakeholder engagement method	Stakeholder/s engaged
Nature mappings	Expert group, environmental team, site employees
Trainings	Environmental team, site employees, outsourced employees
Rethinking the aftercare plans	Expert group, consulting firms, environmental team, top management
Pilots	Site employees, environmental team, top management, environmental organizations, local actors
Voluntary work	Sports clubs, site employees, environmental organizations, cities
Discussions with the neighbours	Local people, Rudus employees
Establishing the CEO network	Top management, other companies in the field, Ministry of the Environment
Master Class training	Environmental team
Finnish Nature Days	Site employees, local people
Convincing with evidence	Everyone
Yearly competitions for the employees	Environmental team, site employees
Planning evenings	Expert group, students, Rudus employees
Nature trips	Site employees, schools
Media coverage	Everyone (though especially media)
Social media	Rudus employees, media, neighbours, experts, environmental organizations
Attending seminars and other events	Top management, environmental team, environmental organizations, governmental agencies
Top management's engagement and example	Everyone (though especially Rudus employees)
Payment	Expert group, consulting firms, Rudus employees, 4H club

The table shows the different stakeholder methods used during implementation planning and implementation tasks stage.

4.3.3 Postimplementation tasks and evaluation and publicity

Measuring and evaluating LUMO programme's success

At some point, LUMO programme started measuring the quantity of species by taking specific species to observation and counting the amount of them on a recurring basis. Naturally, this can be

a challenging method yet still proved effective in measuring the success of the LUMO programme. Another way to measure LUMO's success was to measure the hectares which had been restored in the LUMO method. Rudus set itself a goal to be a forerunner in ecological quarry site restoration with the focus on increasing biodiversity, and this was reached soon after the beginning of LUMO programme which was a welcomed surprise to Rudus.

The success of LUMO programme gained the attention of other organizations and was hence easy to get stakeholders engaged in the project due to the success of the programme and proof of increasing biodiversity from helping the endangered species.

LUMO programme showing example

2016, was a milestone in LUMO programme as LUMO programme won UEPG's ("Union Européenne des Producteurs de Granulats"), meaning the European Aggregates Association, sustainable development biodiversity-class award. Receiving European acknowledgment meant that Rudus had become a forerunner in ecological quarry site restoration both in Finland and Europe. As a forerunner, Rudus was able to show leadership in increasing biodiversity in quarry site restoration.

> " ... was a forerunner so that became that in the field, so as an example of how in quite many situations, was visible about how things, this side (biodiversity) can be taken forward…" (I5)
>
> ("...oli edelläkävijä niin tuli siitä että oli alalla, niin esimerkkinä siitä että miten aika monessa yhteydessä esillä siitä että miten asioita, tätä puolta (luonnon monimuotoisuutta) voi viedä eteenpäin..." (I5))

LUMO programme gathered not only Rudus employees but the other stakeholders as well to work together on a bigger matter (biodiversity). Having such a clear goal from the beginning, helped the formation of the collaboration and LUMO programme becoming a way of working.

> " ... it (LUMO programme) formed into a way of working and especially by working together" (I5)
>
> (" ... muodostu siitä (LUMO-ohjelmasta) sitten semmonen toimintamalli ja tosiaan niinku yhdessä tekemällä nimenomaan" (I5))

Before the beginning of LUMO programme, there was very little talk about biodiversity and conserving it not only in the construction field but in the society more widely, and that was

probably a contributing factor on why it was so easy to get people on board to work on biodiversity and LUMO programme. As it was something very different, people wanted to try something new and work on LUMO programme. As mentioned before, in LUMO programme, all the stakeholders had a specific role and for Rudus that meant proving the projects and the money to start them.

In 2017, LUMO programme took an important step as Rudus sold the Kakslammi site, which had been restored using LUMO method, to Vuokon Luonnonsuojelusäätiö and the site was named a conservation area. It is a remarkable achievement that a former quarry site is now a conservation area. For Rudus, it was important that the site was looked after even after the restoration, naturally if no-one looks after it, sites close up with bushes and other plants, in order to keep the conditions optimal for all the species and for the locals to be able to use it as well. Thus, they decided to sell it for a formal one-euro price making it a good investment to both their reputation and achievement for LUMO programme.

Rudus, alongside other quarrying companies, did not have a favourable reputation, as often quarrying companies were destroying the environment. It was only after the success of the LUMO programme that people began to take notice and change their opinions. Thus, for Rudus, LUMO programme has been a change of operational model but also a boost for their image. In addition to polishing their image, Rudus quickly noticed that there were also positive financial opportunities with LUMO programme. Originally the idea with LUMO programme was to trial the project, but with the programme soon deemed a success, it became a way of operating and thus, changed the whole way of operating at Rudus. In addition to quarry sites, LUMO programme has been used in concrete factories.

In general, throughout LUMO programme the engagement methods have changed to more specific as people's knowledge about the topic grew but also as the first, easiest changes had been made. Many sites have already been restored in the LUMO method, and there are many further to come. naturally, Nowadays the upkeep of previously restored sites and the maintenance of LUMO programme within Rudus' business structure cannot be underestimated nor forgotten. Upkeep of such restored sites is being undertaken by users of the sites, Rudus' own employees and stakeholders; all of whom are engaged and involved in their preferred ways to ensure that the site remains in adequate condition.

Rudus was the leading company to start ecological quarry site restoration conserving biodiversity, and it became the forerunner fast and as other companies saw that LUMO programme became very successful, they followed the example. Thus, there has been a clear change in operational culture in the entire construction field because of Rudus and LUMO programme.

> " So, basically the acceptance to this type of operations came very fast and it was noticed in the entire sector so similar type of operations is done now also in the other companies in our field" (I3)
>
> ("Eli periaatteessa se hyväksyttävyys tän tyyppiselle toiminnalle tuli todella nopeasti ja se huomattiin ihan koko sektorilla elikkä vastaavantyyppistä toimintaahan tehdään nyt sitten myöskin näissä muissa niinku meidän alan yrityksissä" (I3))

Key stakeholder engagement methods

Table 9: Stakeholder engagement methods in postimplementation tasks and evaluation and publicity

Stakeholder engagement methods	Stakeholder/s engaged
Convincing with evidence	Everyone
Rudus becoming a forerunner in ecological quarry site restoration	Everyone (though especially Rudus employees, other companies in the field)
LUMO programme bringing people together	Everyone
LUMO method becoming a way of working	Rudus employees

The table shows the different stakeholder methods used during postimplementation tasks and evaluation and publicity stage.

4.4 Summary of the findings

As a part of LUMO programme, different stakeholders were engaged in different methods based on both Rudus and the stakeholders' interests. The following table 10 shows the different stakeholder engagement methods which are then discussed below.

Table 10: Summary of the stakeholder engagement methods

Ecological quarry site restoration stage	Stakeholder engagement method	Stakeholder/s engaged
Conceptual planning and preliminary tasks	Establishing the expert group	Expert group
	Informing the municipality officials	Municipality officials, top management, environmental team, experts
	Informing the governmental agencies	Governmental agencies, top management, environmental team, expert group
	Discussions with the neighbours	Neighbours, top management, environmental team, site employees
	Top management's engagement and example	Everyone (though especially Rudus' employees)
	Press conference	Media, politicians, environmental organizations, govenrmental agencies, top management, environmental team
	Payment	Rudus employees, expert group
Implementation planning and implementation tasks	Nature mappings	Expert group, environmental team, site employees
	Trainings	Environmental team, site employees, outsourced employees
	Rethinking the aftercare plans	Expert group, consulting firms, environmental team, top management
	Pilots	Site employees, environmental team, top management, environmental organizations, local actors
	Voluntary work	Sports clubs, site employees, environmental organizations, cities
	Discussions with the neighbours	Local people, Rudus employees
	Establishing the CEO network	Top management, other companies in the field, Ministry of the Environment
	Master Class training	Environmental team
	Finnish Nature Days	Site employees, local people
	Convincing with evidence	Everyone
	Yearly competitions for the employees	Environmental team, site employees
	Planning evenings	Experts, students, Rudus employees
	Nature trips	Site employees, schools
	Media coverage	Everyone (though especially media)
	Social media	Rudus employees, media, neighbours, expert group, environmental organizations
	Attending seminars and other events	Top management, environmental team, environmental organizations, governmental agencies
	Top management's engagement and example	Everyone (though especially Rudus employees)
	Payment	Expert group, consulting firms, Rudus employees, 4H club
Postimplementation tasks and evaluation and publicity	Convincing with evidence	Everyone
	Rudus becoming a forerunner in ecological quarry site restoration	Rudus employees, other companies in the field
	LUMO programme bringing people together	Everyone
	LUMO method becoming a way of working	Rudus employees

For LUMO programme, the stakeholders were chosen to get 'win-win' perspectives; important was both financial gain and becoming a forerunner as well as the ecological aspect of doing good for nature. With all the projects, the aim was to find these 'win-win' situations. To summarize, informing the stakeholders with openness and active discussion, convincing with the proof of LUMO programme's ability to conserve biodiversity, collaboration projects and top management being engaged and leading with example guaranteed LUMO programme's success.

Before LUMO programme not many actors were talking about conserving biodiversity. Thus, as LUMO programme was established with the goal of conserving biodiversity, it received a lot of attention immediately. This was a new way of working and talking about biodiversity as a major threat was something that had not been seen in Finland in the aggregate business. Furthermore, many stakeholders wanted to start working with the programme and thus became engaged because it was a new way of working. At the outset of a new project there was not a huge amount of previous knowledge, and many things were done intuitively with the idea of trying different things to see what works. Naturally, the role of the experts was huge in the beginning as they could provide knowledge and help. Luckily for LUMO programme, many endangered species were found, so the importance of the programme could be proven and supported with such evidence.

> " But very many of these issues were those that we did, at least according to my understanding, very intuitively … we basically just did quite many things right in the way that we were open and told our goals and informed about progress" (I4)
> ("Mutta tosi monet näistä asioista oli semmosta et me tehtiin ainakin mun käsityksen mukaan todella intuitiivisesti ... me tehtiin aika moni asia vaan niinku oikein siitä siis semmosessa että me oltiin avoimia ja kerrottiin meidän tavoitteet ja sitten tiedotettiin edistymisestä" (I4))

Rudus and LUMO programme initiated a complete change in how aggregate business and particularly quarry site restoration is undertaken in Finland. LUMO programme quickly became the forerunner and an example of ecological quarry site restoration. Other companies have followed LUMO programme's example and ecological quarry site restoration has solidified its role as a norm in the aggregate field in Finland. Additionally, LUMO programme has influenced the requirements for aftercare plans through the guidelines from the Ministry of the Environment and legislation.

5 CONCLUSIONS

5.1 Contribution to research

The purpose of conducting research is to contribute to the existing knowledge about the topic. The aim of this research was to examine how stakeholder engagement emerged while Rudus Oy started their LUMO programme. Thus, this study makes theoretical and practical contributions to research on stakeholder engagement and ecological restoration. Despite the existence of extensive literature on stakeholder engagement and ecological restoration, to the best of my knowledge there are no other studies combining these two topics and examining how stakeholder engagement emerges from ecological quarry site restoration.

A main theoretical contribution of this study is that stakeholders are vital in ecological restoration and open dialogue and finding win-win solutions increase stakeholder engagement and creates new stakeholder engagement methods. Furthermore, top management's commitment and example in leading corporate sustainability management and engaging stakeholders is crucial. Hence, this study contributes new knowledge on how stakeholder engagement emerges from the starting phase of ecological quarry site restoration and what are the key aspects of the process. Regarding practical contributions, this study provides concrete information on how to engage stakeholders in ecological quarry site restoration and how stakeholder engagement develops throughout the restoration, hence providing managerial implications, which are further elaborated in sub-chapter 5.2.

This study was conducted as qualitative research and the empirical research data was gathered from 7 semi-structured interviews which were supplemented by four documents. In order to fill the research aim, the interviewees were chosen because of their knowledge and position in the LUMO programme. The research data was analysed with qualitative content analysis, using inductive coding. The analysis was done data-based and in the conclusions, the theoretical framework was brought to support and supplement the results.

In the previous chapter, the timeframe for ecological quarry site restoration has been established and analysed. Through the timeframe, the emergent of stakeholder engagement was discovered. The results of the study have been summarized into four propositions, which have been formulated

based on the empirical results and the theoretical framework. In the following, the research question is answered with the propositions, thus summarizing the main aspects of the study.

Proposition 1: Top management's role in establishing a sustainable way of operating and engaging stakeholders is indispensable.

The existing literature emphasizes the importance of top management's role in incorporating sustainability management, Winsemius and Guntram (2002) state that often companies' effort in incorporating sustainability and sustainable ways of working fail because the employees are not convinced that top management is fully committed to the change. Furthermore, Wijethilake et al. (2017) describe that without top management's commitment to implementing sustainability practices, the implementations may not be practical. Additionally, the extent to which top management is committed to sustainability could influence setting strategies and allocating resources (Wijethilake & Lama, 2018), which furthermore impacts stakeholders concerns over organizations' capability to react to sustainability issues influencing their competitiveness (Hörisch et al., 2014).

Extensive support and engagement from top management were highlighted in the study and is seen as one of the key factors why LUMO programme was able to become a success and why Rudus became the forerunner in ecological quarry site restoration. Without top management's engagement, the interviewees said that LUMO programme could not have succeeded at all. Additionally, as LUMO programme was initiated by Rudus' top management and initially they were the driving forces leading by example and driving LUMO programme, it was possible to make ecological quarry site restoration a new way of operating both in the company but throughout the aggregate field. This was due to top management's influence, connections and engagement methods with the other companies and other instances. Previous research has not examined top management's role in quarrying field; however, this research proves that the discovery is applicable in quarrying as well.

Proposition 2: Stakeholder engagement in ecological quarry site restoration emerges from a need to collaborate and works at best when all involved stakeholders have clear roles.

From the beginning of LUMO programme, Rudus realized that they did not possess the knowledge to establish and execute LUMO programme and the ecological quarry site restorations: they did not have biology- nor appropriate environmental knowledge, and thus the need to acquire that

knowledge to get started generated the need to engage stakeholders in the programme. Furthermore, as quarrying and acquiring the permits for, are controlled by the municipality officials, and additionally, in order to limit the potential complaints by the neighbours, it was vital to engage these two stakeholder groups from the very beginning. Understanding the needs and reacting to them quickly provided LUMO programme with a good start and fast stakeholder engagement possibilities.

Lane and Devin (2018) emphasized catching stakeholders' interests and Kujala et al. (2019) stated that this can be done by a company setting clear goals and with them identifying joint interests with stakeholders. Setting clear goals for LUMO programme, conserving biodiversity and the quarry sites being in a better state after quarrying and restoration in comparison to before, made finding stakeholders effortless. Stakeholders' needs were identified in LUMO programme and in addition to Rudus' needs, they were made priority in the programme's operations (Stubbs & Cocklin, 2008). For LUMO programme the motivators were both environmental responsibility and wanting to do the right thing, but also financial and providing competitiveness. Furthermore, Rudus employees were rewarded and acknowledged based on their performance compared to the goals set, which increased the engagement.

As ecological quarry site restorations are long and complex processes, agreeing on the goals for the restorations as well as agreeing on everyone's role in the restoration is vital (Clewell & Aronson, 2013). Similarly, in LUMO programme, everyone had clear roles and therefore, engaging stakeholders and collaborating was straightforward. Previous research has not identified key factors contributing to successful stakeholder engagement. Therefore, this research provides new knowledge on the matter.

Proposition 3: Communicating with stakeholders on an open and upfront basis undoubtedly advances stakeholder engagement.

The theoretical framework states that stakeholder dialogue (Burchell & Cook, 2006) and participatory dialogue (Heikkinen et al. 2019) are vital for successful stakeholder engagement. Furthermore, McDonald and Young (2012) emphasize that successful partnership has open communication between partners. In ecological restoration, stakeholders are satisfied when they have somehow, either indirectly or directly, participated in the restoration (Clewell & Aronson, 2013). However, from LUMO programme's side, the importance of the stakeholder was highly

related to how much they participated in the programme. The importance of open and participatory dialogue has been researched and proven to be a vital factor in stakeholder engagement. However, the relation in ecological quarry site restoration has not been researched before. Hence, this research has been able to demonstrate the importance in ecological quarry site restoration as well.

Relying on McDonald and Young's (2012) notice that successful partners constantly explain to each other what they are doing, similarly, in LUMO programme, the yearly visits to the important stakeholders to explain what was going on and furthermore, find mutual matters to collaborate in, were viewed essential. Using concrete evidence that LUMO programme was successful in conserving biodiversity helped to convince stakeholders of the programme and hence increased stakeholder engagement.

Active discussions and informing different stakeholders and creating different stakeholder engagement methods were key factors for LUMO programme's success. Informing the stakeholders included both making them aware of what was going on in LUMO programme and actively seeking input and suggestions on what could be done in the programme. It is important to note that a dialogue consists of two-way communication (Lehtimäki & Kujala, 2017), thus both parties need to be engaged in the discussions. For Rudus, it has always been important to keep a constant active relationship with the neighbours for example. However, with LUMO programme that engagement increased as the intention of the LUMO programme was that the sites would be for multipurpose and communal use after restoration; thus, the neighbours were a key role.

Proposition 4: Finding joint interests and win-win solutions through opportunities for collaboration are key to successful stakeholder engagement.

Houdet et al. (2012) state that the 'win-win perspective' empathizes the positive effects that companies engaging with environmental practices have received. Lane and Devin (2018) emphasize the mutual connection and benefits both are receiving from the collaboration from a win-win situation. On the contrary, Martinez et al. (2019) criticize win-win being too optimistic, win-win referring to a final resolution instead of open-ended relationship and stakeholder engagement being intersecting rather than embedded.

However, finding joint interests and furthermore collaboration projects is based on a mutual understanding and good communication. As stakeholders are actively communicating with each

other, trust is built which is an outcome of successful collaboration. (Kujala et al., 2019.) Similarly, in LUMO programme, finding win-win situations and building collaboration projects based on mutual interests has been deemed essential and a good way of building a solid relationship and stakeholder engagement. LUMO programme's example shows that finding collaboration projects leads to several stakeholder engagement opportunities arising. Additionally, in LUMO programme, finding the end-users for the sites after the restoration has been great way to increase stakeholder engagement, as with the end-user, the ecological quarry site restoration can be done in collaboration to benefit both parties. Although, win-win being criticized, this research determines win-win situations in stakeholder engagement in ecological quarry site restoration vital for a successful collaboration.

To conclude, top management's example in engagement is vital for both sustainability management in establishing a sustainable way of operating and engaging stakeholders in the operations. Furthermore, stakeholder engagement in ecological quarry site restoration emerges from a need, and open discussion and finding win-win solutions increase stakeholder engagement and create more stakeholder engagement opportunities. Overall, stakeholders play a vital role in ecological quarry site restoration and accepting and understanding their roles within the operating company, is essential for a successful collaboration.

5.2 Managerial implications

In addition to the scientific contribution, this research and research results also matter from a practical perspective. Quarrying industry plays a vital role for the societies, as quarrying produces raw materials for example for the construction, building and manufacturing sectors (Fugiel et al., 2017). Although quarrying can be extremely harmful to the environment (Wang et al., 2018), once quarrying is finished, ecological restoration can be done in order to improve the environment, such as to conserve biodiversity, and create new land uses. (Wilker et al., 2016). Stakeholders are central in corporate environmental strategies (Jang et al., 2017) and stakeholders in ecological restoration are essential to get successful outcomes out of restoration projects. Open communication (McDonald & Young, 2012) and stakeholder dialogue (Burchell & Cook, 2006) are key elements to successful stakeholder collaboration. Hence, my research results provide knowledge about stakeholder engagement emerging from ecological quarry site restoration supports the practical implications of the research.

My research results show that several different types of stakeholder engagement methods emerge from the starting phase of an ecological quarry site restoration, although they all arise from a need to collaborate with either the company in question or the stakeholder either directly or indirectly. Different stakeholders have their roles and several different stakeholder groups are needed in ecological quarry site restoration processes. The importance of the different stakeholders and the actions they do varies greatly, and their role or importance may change during the process and its development.

Most importantly the research results show that open communication and the provision of information upfront is vital for all stakeholder groups no matter the actions and engagement. Furthermore, stakeholder dialogue and acknowledging the stakeholders is an effective way to get more stakeholders engaged. The significant role of top management is notable, in leading with example in engaging the stakeholders and driving the change in the organization with sustainable management.

For the case programme, my research provides information on how stakeholder engagement emerged from the different decisions and actions taken by the case company in the starting phase of ecological quarry site restoration. Additionally, the results show in a broader context, how stakeholder engagement emerges and functions in the aggregate field and how one could start ecological quarry site restoration effectively. The propositions made as conclusions of the research provide support in the future when considering the relationship between stakeholder engagement and ecological restoration. All in all, the research provides a comprehensive and extensive analysis of how stakeholder engagement occurs in ecological restoration.

5.3 Evaluation and future research suggestions

An important part of conducting a research is evaluating the used research methods, process, findings and overall, the entire research. The qualitative research aims to understand a phenomenon in the context through further description and analysis. (Tuomi & Sarajärvi, 2018.) When analysing the research, I evaluate it through validity, reliability and potential limitations. Validity refers to proficiency and accuracy of the research and its findings; and additionally, how well the research answers to the research questions and the research aim (Eriksson & Kovalainen, 2008). Reliability refers to the repeatability of the research and the analysis (Hirsjärvi et al., 2009). As with all scientific research, this study also has some limitations which are worth keeping in mind.

I have tried to answer to validity with an extensive theoretical review. Furthermore, the case study method examines a specific case and the analysis is about that. Therefore, the conclusions of the research are based on the theoretical framework and case study, providing knowledge of the phenomenon through the case study. However, this research does not provide a general picture of the starting phase of ecological quarry site restoration and how stakeholders can be engaged in the process. Rather, this is a case study presenting one model for carrying out ecological quarry site restoration and how stakeholders can be involved and engaged in the process. If wanting to create a more holistic picture of how ecological quarry site restorations are carried out worldwide and how stakeholders are engaged in those processes, a considerable amount of additional research material would have been necessary. As this is a case study from a Finnish company, there is no foolproof certainty whether research results would have been similar if similar research is done somewhere else other than Finland. However, this research provides some implications and ways of working regarding ecological quarry site restoration and stakeholder engagement in it for organizations and other parties.

This research has been conducted documenting each stage of the process and all decisions have been described, explained and expressed as clearly as possible in the methodology chapter. Furthermore, they have been consistently used throughout the research. Additionally, the interview questions have been added as appendix A to allow similar interview structure to be used. Therefore, the repeatability of the research should be possible using the same methods and choices.

Additionally, I recognized the importance of taking into consideration the ethical implications of my research. The entire research was done independently and objectively to ensure that the research was done ethically according good research practices. As the interviews comprised the primary data for the research, conducting them in an ethical and academic manner was of great importance. All participants to the research were volunteers and had no obligation to take part in it. In order to respect participants' privacy and confidentiality, all interviewees were asked verbally to consent whether they wanted to stay anonymous or whether their names could be, if seen necessary, mentioned in the research.

Another important factor in scientific research is the position of the scholar executing the research. My position as a student may affect the premises of the research due to the lack of knowledge and experience in conducting research. In addition, before the research, I did not possess any knowledge of ecological quarry site restoration, thus all knowledge has been gathered during this research. That

is at the same time a limitation, because I am solely relying on the existing literature and the findings from the data, primarily being the interviewees, when conducting the research, but also a strength because I have no previous ideas or models of working in mind, thus forcing me to observe the data with open and objective eyes.

Lastly, as the data from the research was gathered, transcribed and analysed in Finnish and then translated to English before written down, the possible impacts of interpretations and issues with translations should be acknowledged. Although I have translated texts from Finnish to English before, I am not a professional translator. Hence, it is a possibility in the analysis that there are some translations that are not identical or capture the entire meaning of the source. However, I have done my best in translating the data and analysis results to ensure that the content is correct and that there is no room for any misinterpretations. In addition, I have asked a native English speaker to read through the entire research paper to check grammatical matters.

This study took an organizational perspective to stakeholder engagement in ecological quarry site restoration. The focus was purely from the LUMO programme's perspective of the restoration and how stakeholders were engaged. Thus, it would be interesting to conduct other research, perhaps considering only one quarry site and investigate the stakeholder perspective and interview them to get a further understanding on how they feel the engagement worked. Additionally, this study focused only into Finland and how ecological quarry site restoration began here. However as ecological restoration happens worldwide, more studies could be made taking either a singular country or global perspective, looking into another country or comparing how ecological quarry site restoration happens around the world.

Another interesting perspective would be to take a long-term view. As ecological quarry site restoration projects take decades, long-term research could map the journey from the very beginning of planning a quarry site and the application of the permit and thus, additionally the aftercare plans, though quarrying to finally, the restoration after quarrying has finished. Alternatively, one could investigate LUMO programme in 20 years to examine if the same stakeholders are still engaged, and if the stakeholder engagement has remained the same or if it has changed.

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APPENDIX

Appendix A: Interview questions (translated from Finnish to English)

General questions
Do you want to stay anonymous in this research?

Background
1. In which company and which role do you currently work at?
2. If you do not work at Rudus anymore, when did you work at the company? What was your role and responsibilities at Rudus?

Beginning of LUMO programme
3. When was the need to begin quarry site restoration (and LUMO programme) raised and started to talk about?
4. How and why was LUMO programme started? Which events led to the establishment of the programme?
5. When was LUMO programme established?
6. How was LUMO programme initiated? What was done in the beginning of the programme?
7. What are LUMO programme's goals?
8. What is concretely done in LUMO programme? What is LUMO programme composed of?
9. What were the most important steps and events in the first five years?
10. How do you see the meaning of nature in LUMO programme? How do nature and people work together? What is the meaning of the environment?
11. What is/was your role in LUMO-programme?
12. Who were involved in LUMO programme from Rudus' side and what were their roles?

Stakeholders in LUMO programme
13. Why were stakeholders engaged in the beginning of LUMO programme?
14. Which stakeholders were engaged in the beginning of LUMO programme?
15. What was stakeholders' role in LUMO programme?
16. How were stakeholders engaged and incorporated to LUMO programme?
17. Did stakeholders' role change in the beginning of LUMO programme? If yes, how?
18. What kind of collaboration was done/is done with stakeholders? What was easy in the collaboration? What was difficult? What was surprising?
19. What has inspired/inspires in LUMO programme? What are you proud of about LUMO programme?

Extra: Is there anything on your mind that you think would potentially help me in conducting the research?