GOVERNMENT, GOVERNANCE, AND NATURE-BASED SOLUTIONS

Understanding the relationship between the governance of central government organizations and effective nature-based solution adoption and implementation

Cuschieri A.

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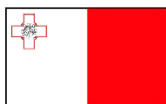|	
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Author:	Cuschieri Adiel
Student ID:	s1078698
Master's Programme:	Spatial Planning Cities, Water and Climate Change Nijmegen School of Management Radboud University
Thesis Supervisor:	Dr D.A.A. Samsura (Ary) Nijmegen School of Management Radboud University
2nd Reader:	Dr I.V. Barba Lata (Iulian) Nijmegen School of Management Radboud University
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Abstract

Over the past century, the world has undergone extreme changes fuelled by an exponential population boom and an industrial revolution. These changes have increased humanity's footprint on the world and shifted the rate and demand for natural resources. It has led to negative impacts, both to the natural systems such as causing biodiversity loss, as well as to human well-being, such as decreasing physical and mental health. Arguably, the biggest impact has been humanity's contribution to climate change. Different solutions have been considered to increase sustainability practices and to find a balance between the environment and society. A new concept emerged to address these challenges, known as nature-based solutions. Even though the concept is less than a decade old, scientific research has shown promising results for its use in local and national scales, particularly when compared to grey-infrastructure alternatives. Yet, there is a lack of nature-based solutions use, particularly by central governmental bodies. This research studies existing barriers that inhibit the effective use adoption and implementation of nature-based solutions by such organizational structures and proposes a new framework to link the two variables together. It adds to the nature-based discourse by shining light on how nature-based solutions require a strong organizational structure to facilitate their effective implementation.

This study aims to answer the following research question: How do existing barriers of central governments organisational structure affect nature-based solution adoption and implementation? It proposes that organizational structure in central governments is dependent on four underlying traits: adaptability, bureaucracy, involvement and mission. When these traits are insufficiently carried out, they act as barriers on the effectiveness of nature-based solution adoption and implementation. Data to answer the research question was collected from three separate sources. The primary data was collected through an extensive desk study and through a set of semi-structured qualitative interviews with governmental officials responsible for project implementation. These results were confirmed by observing the interactions of governmental project coordinators at a nature-based solution project meeting.

The framework proposed in this thesis was tested out in the context of Malta, and the results showed that the country lacked both effective organization structure as well as effective nature-based solution implementation. Governmental officials showed a lack of conceptual understanding of the country and lacked any form of guidelines for nature-based solution implementation. The lack of effectiveness resulted in the lack of adequate stakeholder engagement, monitoring and upscaling of projects. Additionally, the lack of nature-based solution implementation in Malta was directly linked to weak organizational structure in the central government, particularly due to the lack of good adaptability, bureaucracy, and mission traits. This can be seen in the lack of capacity, lack of coordination, as well as lack of strategies and vision for NbS implementation.

Preface

It is with great pride and honour that I can finally share my master's thesis research on nature-based solutions, a study I undertook as part of my Spatial Planning Masters Programme at the Radboud School of Management. I am so grateful to have had the opportunity to study such a concept, which I truly believe is the key to a healthier society and a greener future. Nonetheless, I could not have done this alone, and I am so thankful to every single individual who supported me in the process.

First and foremost, I would like to thank my academic mentors who provided an unwavering source of knowledge and growth. I would like to thank my supervisor, Ary Samsura, for his invaluable guidance and insightful comments throughout the entirety of the project. Your patience, enthusiasm, and insight were great sources of motivation for me. I would also like to thank every other lecturer who taught me throughout my year at Radboud. The education I received at this university superseded every other, and without each and every one of you, I would not be the confident researcher I am today.

Next, I would like to express my gratitude towards individuals in the Maltese public sector. This includes gratitude towards my colleagues at the Maltese Public Works Department, who encouraged and supported my decision to study on a full-time basis, as well as every individual who participated in this thesis' interviews. All of you were so passionate about your work and so persistent in striving towards a better future. It was truly an honour to listen to what you had to share. Additionally, I would like to express my gratitude for the financial support I received from the ENDEAVOUR Scholarships Scheme that partially funded this research through the European Social Fund. The scholarship provided a sense of stability in a time of stress, and I am truly lucky to have had such aid.

Lastly, I would like to thank all my loved ones who have encouraged and supported me during the long hours of research and writing. I dedicate this thesis to all of you. To my partner, Chris, who was so patient with me and who had faith in me even when I did not. To my mum, Vicky, and dad, Leslie, who gave me all the space and encouragement I could ever ask for. To my sister, Liesel, and brother, Nate, who would work with me on video calls late at night. To my Maltese friends who kept encouraging me, particularly Matt, who helped me mould this thesis into the best version it could ever be. And to all the new friends I made in Nijmegen, who were a part of this journey and this adventure. All of you hold a special place in my heart.

Once again, I would like to thank everyone who has helped me complete this thesis. Your support has been invaluable, and I would not have been able to finish this project without you.

Adiel Cuschieri

Nijmegen, December 2022

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1. Introduction

1.1. Contextual Background

Over the past two centuries, the world has experienced significant changes driven by the industrial revolution and the associated boom in the world population. Natural landscapes have been replaced by agriculture land, cities, roads, and other infrastructure. In fact, only an estimated 3% of the Earth remains untouched by human activity, mostly due to the direct and indirect eradication of important species from ecosystems (Plumptre et al., 2021). These changes have not only affected the wild flora and fauna but have been proven to cause major challenges for human society on a global level. The flourishing of western civilization has its side effects (Buhaug & Urdal, 2013). For a while these negative effects were predominantly felt in the developing world, however, in the past half a century, they have also started to directly affect western communities (Liddle & Lung, 2010).

Climate change is arguably the most notable and problematic side effect of industrialization, particularly because it causes several major societal challenges in relation to water security, food security and disaster risks (de Haen & Hemrich, 2007). To date, the climate change phenomena has increased the earth's overall temperature by at least 1.5° since 1880 (NOAA National Centers for Environmental Information, 2022). Whilst an increased temperature might mean a longer frost-free growing season in colder climates, it also means more drought in warmer climates, and whilst winter-cold related deaths will decrease, summer-heat related deaths will increase (NASA, 2022). It also means that new crop pests will be emerging or spreading faster, together with animal and human diseases (European Commission, n.d.). Every problem has a solution if one is willing to look hard enough. Sometimes, the solutions can be rather costly, limiting their accessibility to the wealthier portion of society. But climate change solutions cannot be reserved for such a small portion of the world's population, particularly when individuals such as those with a low-income, who are unemployed, or are old, are the ones mostly affected by climate change. These individuals who are part of different social groups that are the most vulnerable to climate change, are also the ones with the least resources or physical capability to combat its effects (EEA, 2019).

Surfacing research has been correlating major societal challenges with anthropogenic causes, making it evident that the way forward in development is to work with nature rather than outside of it (Raworth, 2012). Hard engineering solutions have failed to show that they are sustainable, as they tend to be very expensive, short-lived, and come with their own set of drawbacks. Groynes, for example, have become a standard solution to prevent longshore drift, erosion, and flooding. However, not only are they costly and an eye-sore, but they also tend to cause erosion further down the coast (The Flood Hub, 2021). Instead, soft-engineering solutions such as Dune regeneration could be used as an alternative to reduce beach erosion and flooding, with minimal side effects such as reducing beach access. **Soft-engineering solutions put into practice natural ecological principles and tend to have less of an impact on the natural environment**. They are also self-sustaining and more affordable in the long-term, in comparison to their hard-solution counterparts, making them ideal engineering solutions for the future (French, 2006).

Coastal management is not the only field that distinguishes between hard and soft engineering techniques. Green roofs, for example, could be considered as a soft solution towards achieving infrastructural insulation; they contribute towards keeping buildings cooler

during summer and warmer during winter (EPA, 2021). This would lead to a reduction in the energy and resources required to cool down or heat up the building. Simultaneously, a green roof provides a habitat for different species and contributes to decreasing other anthropogenic affects such as the *urban heat island effect* (EPA, 2021). These solutions, that work with nature, have fewer negative impacts on the environment, and that simultaneously address societal challenges, are collectively known as *nature-based solutions* (IUCN, 2022b). Not only have they been found to support society's development and ensure human well-being, but they are also acting as superior solutions to hard-engineering alternatives.

1.2.   Problem Statement

Nature-based solutions (NbS) are defined by the IUCN as *"actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"* (IUCN, 2022b). It is a relatively recent term that surfaced in the mid-2000s, but that first appeared in scientific journals in 2015 (Li et al., 2021). The first journal published, called 'Nature-based solutions: New influence for environmental management and research in Europe', provided an overview of what is meant by the term and its associated challenges (Eggermont et al., 2015).

At present, most research on NbS has been focused on modern, economically stabilized democratic countries, even though studies on poorer communities have also taken place. Of all the continents, Europe is leading NbS research, as can be seen in the map in Figure 1. The map visualizes the number of NbS-related publications until 2020, organized by country of publication. Up until then, UK had published the most NbS journals worldwide, followed by the Netherlands and Italy (Li et al., 2021). Other countries, however, were still lagging on NbS research, such as Belgium, Ireland and Malta, all of which had published less than three NbS-related articles each. Every NbS brings the world a step closer to achieving environmental and social wellbeing, but it is only when the barriers preventing NbS implementation are acknowledged and addressed their benefits can truly be realized (Li et al., 2021).
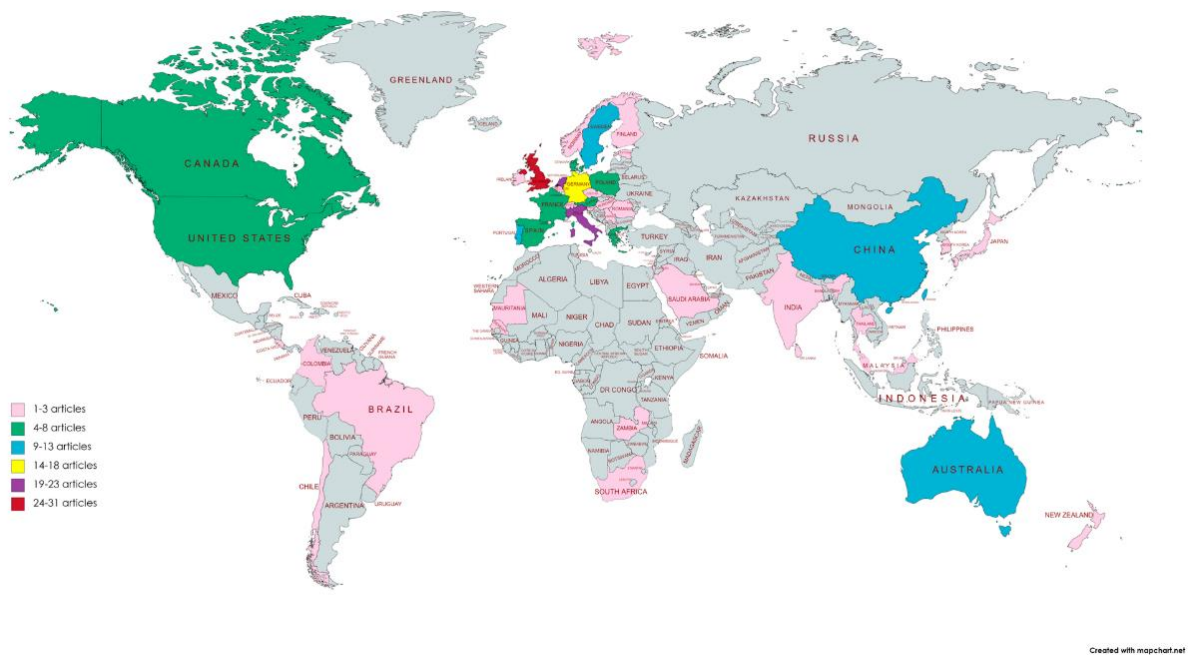
Figure 1 NbS publication by country by 2020 (Li et al., 2021)

1.3.   Research Objective and Research Questions

The increasing number of publications on NbS per year since 2015 indicate that the concept has started to gain traction, not only in literature but also in different communities worldwide. To facilitate this process, one must understand what existing barriers exist within an organizational structure that would obstruct the effective understanding, integration, and implementation of NbS. This study seeks to understand the following research question and sub-questions:

How do existing barriers of central governments organisational structure affect NbS adoption and implementation?

This was done by answering the following research sub-questions:

- How are central government bodies currently implementing NbS?
- How effective is the current implementation of NBS by central governmental bodies?
- What organizational barriers are currently affecting the effectiveness of central governments?

To do so, a foundational understanding of the current perception and uses of NbS by the government first had to be established. This was done by collecting data such as the individual understanding of NbS by government officials, the use of pilot studies on a national scale, and the targeting settlement type for NbS implementation. Primary data was collected from scientific research papers and from existing policies and guidelines, whilst the second level of information was collected through a series of interviews. Information was also collected during an attended inter-ministerial meeting on NbS. The data collected provided an insight on both the effectiveness of the current organizational structure of a central government, as well as on the resulting NbS understanding and implementation. A

theoretical framework was devised, based on existing scientific literature, and then used to structure and analyse the collected information.

Originally, this thesis was meant to fill two particular data gaps identified by Li et al. (2021): the lack of scientific literature on upscaling NbS and the lack of scientific literature on rural NbS. However, during the data collection process, it became evident that such data gaps could be the result of improper understanding of the concept and weak NbS governance practices. The research focus was therefore shifted to study these more urgent concepts, obtain a better understanding of them, and therefore provide information on potential solutions in addressing them. The themes of settlement types and project scales will still be touched down on. However, they will no longer be the focus of the study. Whilst this study acknowledges that different governments are differently structured and therefore face different obstacles, the time, and resources available allowed for only one governmental set-up to be studied in-depth. Ultimately, the country chosen to thoroughly examine the topic and gain a holistic perspective of the research problem was Malta.

1.4.   Relevance of Study

1.4.1. Scientific Relevance

This study addresses a fundamental gap in NbS research, namely how the governance from central government organisations directly impacts the adoption and implementation of NbS. While research has been conducted with regards to the challenges of implementing NbS, such as the paper 'Challenges to realizing the potential of nature-based solutions' by Nelson et al. (2020), and 'Nature-based solutions to climate change adaptation in urban areas: Linkages between science, policy and practice' by Kabisch et al. (2017), these tend to be broad, focusing on multiple potential issues. This study aims to expand on the existing research with a particular focus on governance-specific issues, seeing central government agencies as one of the key stakeholders with the capability to effect change and implement NbS.

By looking at particular organizational traits such as bureaucracy and adaptability, this thesis has considered individual elements of a central government organization. It has considered existing literature on both organizational structure and NbS implementation, as well as identified a framework on NbS implementation, organizational effectiveness and governmental effectiveness. These frameworks were reworked into a new conceptual model on NbS effectiveness, which was tested out during this study. The results will therefore be filling in an existing gap in the scientific knowledge on NbS effectiveness and providing solutions to facilitate the incorporation of innovative concepts and effectively implement them on a national scale.

1.4.2. Societal Relevance

To prevent the world and humanity from undergoing permanent damage, the only seemingly viable solution is to shift towards environmental and social well-being simultaneously since *"social and planetary boundaries are interdependent"* (Raworth, 2012, p. 5). NbS are optimum tools to carry out this transition, whereby they strive to achieve both biodiversity benefits and a good sense of human well-being (Cohen-Shacham et al., 2016). Even though the practicality of NbS continues to be proven by emerging research and successful-project evidence, the tool is not being as readily used would be ideal. There is therefore a need to understand what obstacles NbS are facing such that society can more readily benefit from their use.

This study pays a particular focus on central government bodies since their influence is extensive both in the public sector as well as the private one. It is primarily concerned with its citizens' well-being and has the authority to implement the adequate legislation to push forward NbS as a tool. The increased use of NbS by central governmental bodies is foreseen to provide a variety of social benefits, such as for flood management and water resource protection. This is possible since NbS have the ability to regulate water flow, reduce the risk of flooding, and improve water quality through systems such as wetlands, forests, and other natural systems (Ferreira et al., 2022). NbS have been also shown to improve human health and wellbeing, particularly by providing access to green spaces and natural environments, which in turn have been shown to positively impact people's physical and mental health (Kolokotsa et al., 2020). Additionally, climate change adaptation and mitigation is significantly increased through the wide-spread use of NbS, leading to an increase in resilience of communities and ecosystems to the impacts of climate change (Cortinovis et al., 2022). Other sectors that benefit from the increased use of NbS by the central government include the Economic one, as NbS have shown to bring economic benefits through the creation of green jobs, eco-tourism, and the development of new industries (Kooijman et al., 2021). This includes sustainable agriculture and forestry and has also been linked to the overall decrease of financial threats (Wishart et al., n.d.).

1.5. Thesis Outline

The progression of this research will be documented as follows. Relevant literature on NbS has been documented in the *Literature Review (Chapter 2)*. It lays a foundation on which the thesis builds on, including the theoretical framework and conceptual model. The *Methodology (Chapter 3)* describes the methods used to collect and analyse data, whilst *Chapter 4 provides a Case Description* of Malta, together with additional relevant content on Malta and NbS. The data collected is presented and analysed in *Chapter 5 (Results and Analysis).* Lastly, the *Conclusion (Chapter 6)* summarizes the overall findings, provides a critical reflection of the study, and provides a praxis.

2. Literature Review

This chapter shares the extensive information collected on NbS and related context during the desk study of data collection. It provides the reader with a summary of the relevant theories and available knowledge on NbS as a concept and on the benefits they can provide. Different theories and frameworks are tied into the literature, such as the EKLIPSE framework to assess NbS effectiveness, and Nurdin et al.'s framework on organizational barriers. To conclude the chapter, the conceptual model of this study is presented, devised based on the literature collected, and that would be used later in the study for data operationalization.

2.1. What are NbS?

In the past decades, there has been significant new research related to climate change. The surfacing information required the formation of new terms to explain the newly proposed concepts, such as ecosystem services, green infrastructures and NbS. The latter term was coined sometime in the 2000s but attempts to define it were not made until a few years later. The IUCN has so far been one of the pioneering organisations providing resources on the NbS and defines NbS as:

> *"Actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"* (Cohen-Shacham et al., 2016, p. 4)

Similarly, the European Commission defines NbS to be *"Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience"* (EC, n.d.).

There is no exact definition to what an NbS is, but as can be seen in the above definitions, NbS are solutions that not only address ecological challenges, but also social challenges. Their use would simultaneously reduce the anthropogenic footprint on the Earth as well as contribute towards a better quality of life. The term has only recently featured in scientific publications, and in fact the first publication to include it was published in 2015. Since then, the number of journals getting published on the topic has been on a rapid incline, as can be seen in Figure 2 below.
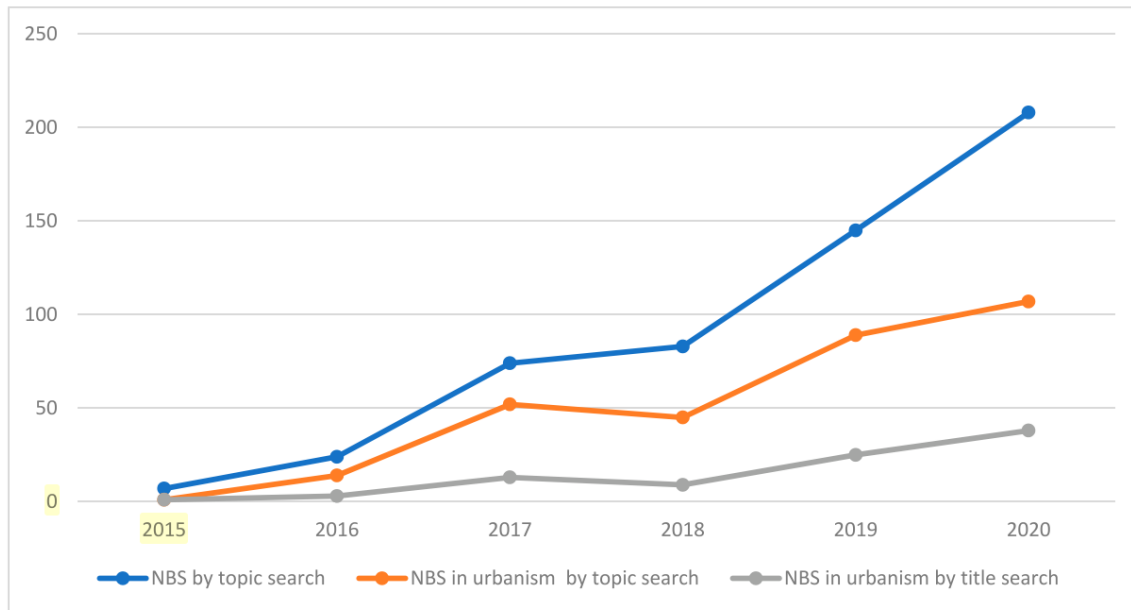
Figure 2 NbS related publications up until October 2020 (Li et al., 2021)

Before delving deeper into NbS, it is crucial to understand what makes them such an attractive opportunity for the private and public sector alike, and why people *should* be looking into them in the first place. There is a rising consensus that when the biodiversity of an area is looked after, so are local communities. For example, when the ecosystems on coral reefs are managed and looked after, nursery grounds for economically important fish species are being provided, species that are used in medicine can be harvested, and jobs can be generated (Spurgeon, 1992). These are only some of the benefits that come out of coral reef protection. More artificial alternatives have been tested out, such as placing concrete balls reinforced with micro cilia at the seabed to increase biodiversity. However, solutions such as this do not come close to a natural healthy coral reef, and do not provide nearly as many social and ecosystem benefits (Rinkevich, 2005). Other examples of NbS are agroforestry to stabilize crop yields in more vulnerable climates and forest restoration in river catchments to protect communities from flooding and secure water supplies (Seddon et al., 2020). The full potential of NbS is still being studied, particularly regarding combating climate change, but they have been established as key solutions to a sustainable future (Cortinovis et al., 2022).

2.2. Uses of NbS

According to the organization, NbS can be considered as an "umbrella concept that covers a whole range of ecosystem-related approaches all of which address societal challenges" (Cohen-Shacham et al., 2016, p. 10). Many approaches can be sought for such purposes but can be grouped into five main categories. These are**: 1) Ecosystem restoration approaches; 2) Issue-specific ecosystem-related approaches; 3) Infrastructure-related approaches; 4) Ecosystem-based management approaches; 5) Ecosystem protection approaches** (Cohen-Shacham et al., 2016). Each NbS addresses a range of societal challenges simultaneously and provides a system of co-solutions. For example, one common societal challenge that different communities worldwide face is water scarcity. This issue keeps worsening every year, and in fact, by 2050 it is estimated that over half of the world's population will be living in a water-stressed region (Schlosser et al., 2014). Hard infrastructural solutions have not been able to mitigate threat, and the results had their own

set of repercussions. These include the altering of the natural flow of rivers and the disconnecting of floodplains from rivers. In contrast, NbS can provide long-term solutions that would benefit the current and future populations whilst safeguarding the natural ecosystem (Lafortezza et al., 2018; Jakubínský et al., 2021).

NbS can be used to address more than just societal challenges, and in fact, one particular publication proposes ten types of benefits that NbS have the potential to achieve. These are *"1) Climate mitigation and adaptation; 2) Water management; 3) Coastal resilience; 4) Green space management (including enhancing/conserving urban biodiversity); 5) Air/ambient quality; 6) Urban regeneration; 7) Participatory planning and governance; 8) Social justice and social cohesion; 9) Public health and well-being; 10) Potential for new economic opportunities and green jobs"* (Raymond, Berry, et al., 2017, p. 4). Each of these challenges interacts with one another on an environmental, economic, and social level, and can be addressed using NbS to bring about **co-benefits** between the different planes. The diagram in Figure 3 shows a visual representation of the dynamic between these different aspects and how methods, indicators and impacts can be used to address the different challenges.
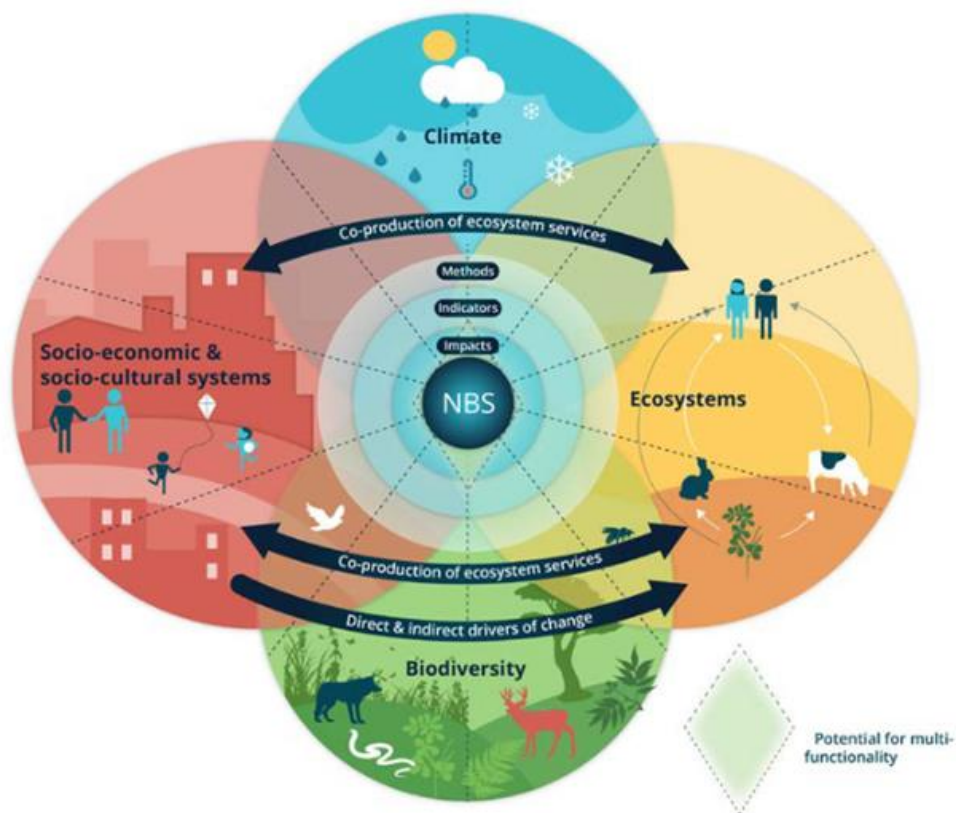
Figure 3 Visual representation of how the ten climate resilient challenges interact on an environmental, economic, and social level, and can be addressed using NbS to bring about co-benefits between them (Raymond, Berry, et al., 2017).

2.3. A framework to assess effective NbS

As of yet, there is no standard framework to assess the effectiveness of implemented NbS (IUCN, 2020). Nevertheless, several authors have proposed their own frameworks, each measuring other different aspects of NbS. Rather than challenging each other, the different frameworks provide different guidance for different purposes. For example, the framework by Watkin et al. (2019) quantitatively measures the benefits of existing NbS. It involves a five-stage process of assessment that identifies important NbS indicators and gives a value to the overall benefit of the NbS based on their performance. Most frameworks, however, tend to offer qualitative assessment of existing or potential NbS, such as the one by Calliari et al. that "is based on an innovative approach that integrates system analysis and backcasting"(Calliari et al., 2019, p. 691).

One particular framework was designed as a guide for cross-sectoral project and policy design and implementation purposes in urban areas (Raymond, Berry, et al., 2017; Raymond, Frantzeskaki, et al., 2017). This framework, that will henceforth be referred to as the EKLIPSE Framework, was developed on request of the European Commission as a qualitative assessment tool and was primarily designed for **professionals and experts in the field** (Connop & Vandergert, 2019). It considers synergies across different ecosystem services provided by NbS as well as additional co-benefits. Particularly, social co-benefits such as socio-cultural and socio-economic benefits.

By the means of a seven-stage process within the EKLIPSE Framework, different benefits of NbS can be identified for policy and project implementation. The stages are the following *"1) identify problem or opportunity; 2) select NbS and related actions; 3) design NbS implementation processes; 4) implement NbS; 5) frequently engage stakeholders and communicate co-benefits; 6) transfer and upscale NbS, and the trans-versal stage of 7) monitor and evaluate co-benefits"* (Raymond, Frantzeskaki, et al., 2017, p. 19). The steps can be completed in different orders, except for the monitoring stage, that needs to be carried out throughout the entire NbS implementation process. A schematic representation of this is represented in Figure 4. On the left of the scheme are the seven stages that could be used to implement a successful NbS project, whilst on the right are additional actions that could further innovate the NbS (Raymond, Frantzeskaki, et al., 2017). The framework emphasizes the importance of each action and how each one relates to the other to deliver an effective NbS. If projects are not planned, delivered and managed properly, there can be critical repercussions to the project and can in fact even cause damages to the ecological and social systems (Connop & Vandergert, 2019).
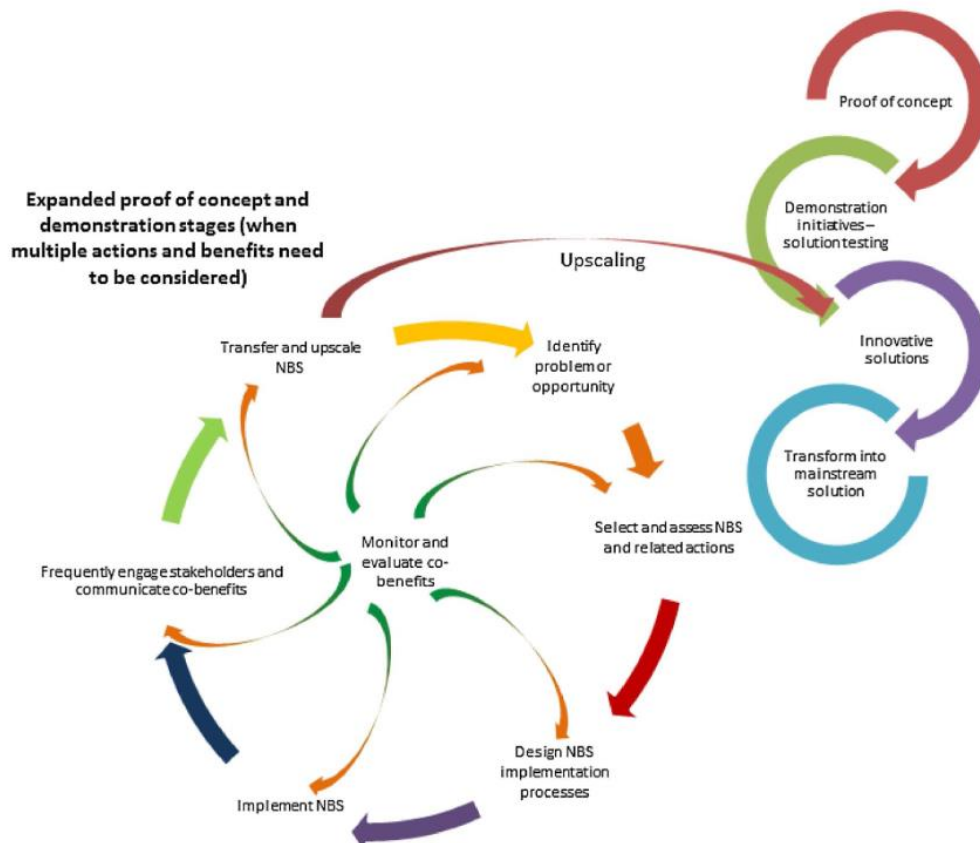
Figure 4 NbS implementation process according to the NbS Framework, with the different steps represented on the left of the scheme and additional steps that could be used for further innovation on the right (Raymond, Frantzeskaki, et al., 2017)

One key element of the framework is the direct inclusion of stakeholders throughout the entire stages of uptake and implementation of NbS. When experts work closely with them, they can ensure that the NbS project generates a multitude of social benefits particularly for the local community, especially since the concept of NbS is founded on the idea that local knowledge is unparalleled and therefore extremely valuable. Different stakeholders are encouraged to come together with practitioners from political, economic, and scientific fields to tailor NbS for city-specific **institutional circumstances** (Ruangpan et al., 2020).

The EKLIPSE framework played a foundational role in this thesis as a standard, or comparative, to the NbS implementation approach used by local governments, as will be seen in Chapter 5 (Results and Analysis). Other projects that made use of this framework were sought for the scientific literature. However, no such publication was identified. Different scientific databases were searched using key words such as "EKLIPSE", "framework", "Raymond", "Nature-based solutions", etc. and over 40 scientific publications were analyzed. The resulting publications would simply refer to the framework as an existing framework and no information was found regarding what projects have actually implemented it. Reviews and proposed modifications to the framework were also scarce to identify. Calliari et al. (2019) considers the framework to be static and criticizes that it does not cater for how NbS will require to be different in a changing future. On the other hand, Sowińska-Świerkosz and García (2021) designed a new framework that built onto the existing EKLIPSE one and on other NbS-assessment tools. It focuses on measuring the effectiveness and efficiency of NbS and considers the viability of indicators as evaluators for NbS. Instead of focusing on the

entire project implementation process like the EKLIPSE framework, it pays particular attention to the evaluation process of NbS projects during the project selection phase.

2.4.   Implementing NbS

2.4.1. The current focus of NbS

The majority of NbS projects seem to be focused on cities and the benefits they can gain by making use of NbS. Considering that over half of the world's population lives in a city (The World Bank, 2020) it would make sense for projects to be focused on these small pockets around the world. Similarly, many policies and frameworks on NbS are designed with cities in mind, including Raymond et al.'s framework (2017) on assessing NbS implementation quality. NGOs and other governing bodies seem to have a similar approach. The IUCN, for example, describes NbS as solutions that *"increase tourism revenues, provide recreational opportunities for citizens, and help lower temperatures and pollution levels in urban areas"* (IUCN, 2022a). We can therefore note that a disproportionate amount of NbS projects are being executed in urban areas rather than rural ones. There are a number of factors that may play a part in this. However, it is likely that a combination of lack of funding for small, rural communities, coupled with the fact that policymakers and researchers tend to live in urban areas, as van Thiel puts it, creating a bias based on their own *"interests and background knowledge. Everyone has their own personal preferences and experiences, which will guide the choice of an interesting research problem"* (van Thiel, 2014, p. 13).

However, agriculture, forestry and other similar practices are responsible for over a quarter of the world's greenhouse gas emissions, contributing towards the planet's degradation (The World Bank, 2022). And yet, agricultural areas, for example, are responsible for providing almost all the world's food supply and have the potential to feed 9.7 billion people by 2050 (The World Bank, 2022). It currently accounts for over 4% of the world GDP and can even account for over 25% of some developing countries' GDP (The World Bank, 2022). This shows how there is a dire need for the application of NbS to spread to rural areas in order to ensure the sustainable generation of human resources.

2.5.   Scales of NbS: Pilot Project to Full-Scale Implementations

There are many benefits to pilot studies, such as ensuring that the chosen research protocols, methods and instruments are adequate to fulfil the aim of the study (van Teijlingen & Hundle, 2001). They have also been used in recent years to test out new practices and organisational forms prior to being applied by a variety of bodies in a variety of contexts (Hughes et al., 2018). In environmental management, pilot studies have gained a lot of traction, particularly since the field itself is relatively recent and has significant future potential (Billé, 2010). This includes the use of pilot *projects*, which have been defined as *"an action undertaken by one or more public and/or private stakeholders in order to test novel practices or technologies"*(Billé, 2010, p. 2).

Once a pilot project has been validated it must be moved on to full-scale implementation in order to have any significant effect as this tends to allow for more co-benefits to be incorporated due to the larger surface area (Ruangpan et al., 2020). A pilot project and a full-scale project are not necessarily the same, and amendments are very common practice during scaling. This is done to increase the effectiveness of the project, and in fact, it can sometimes take several **pilot projects to refine the approach before a full-scale project is implemented** (van Teijlingen & Hundle, 2001). Unfortunately, even though NbS scaling is

the end goal of NbS pilot projects, it does not always result as so. Reasons for this could include that *"they don't easily conform to the longer time scales characteristic of social change and collective action ... [or] that they are extremely sensitive to even small changes in local conditions"* (Billé, 2010, p. 2).

Nature-based solution scaling also has its own set of challenges. This includes how, since NbS require efficient stakeholder communication and involvement, larger scale projects would require the input and the agreement of more individuals Other issues of NbS scaling include the lack of space for large-scale initiatives (Cortinovis et al., 2022) and their lack of credibility due to their novity (Dutch Water Sector, 2021, para. 9). Additionally, scaling a project is not simply a matter of replicating a project to a different scale, but there are additional elements that need to be considered and modified in order maintain NbS effectiveness on a larger scale. This includes changing the "*spatial, temporal, jurisdictional, institutional, and management levels*" (Cortinovis et al., 2022, p. 2). Further Information on NbS scaling areas can be found in Appendix VI: Further Literature.

2.6.   Organisational culture and effectiveness

Central government departments, much like any other organisation, are subject to their own *"beliefs, values and attitudes, and how these influence the behaviour of its employees"* (BDC, n.d., para. 1). This is cumulatively referred to as **Organisational Culture**. Sokro has shown that there is a positive correlation between organisational culture, productivity and motivation (2012). Due to the fact that central governments hold substantial power when it comes to implementing any sort of change, including large-scale NbS, especially on a national level, a deeper understanding of how internal factors affect this process must be gained.

2.6.1. A framework to assess organisational culture and effectiveness

Apart from understanding NbS as a concept and how it can be implemented, it is also foundational to understanding how organisational culture within government departments might be affecting NbS. Effectivity is hard to measure, particularly since it is considered to be objective. Various models have been proposed to gauge the effectiveness of different subjects. Denison (1989) developed an insightful theory on organisational culture and effectiveness that suggests that the effectiveness of an organisation is dependent on four underlying traits. These are involvement, consistency, adaptability, and mission. Their research suggests that organizations with strong elements of these traits have the most effective dynamic and produce results such as comparatively higher return on assets and sale growth (Denison, 1989; Denison & Mishra, 1995).

This framework, seen in Figure 5, particularly emphasizes how effectiveness comes about from the incorporation of internal integration and external adaptation, and from a balance between change and stability (Denison & Mishra, 1995). Internal integration plays a role in aligning the organization's overall interest with its employees' personal interests, whilst external adaptation refers to an organization's ability to adapt accordingly to its external environment (Denison & Mishra, 1995). On the other hand, stability is an expression of an organization's long-term consistency to its mission, whilst flexibility refers to the organization's awareness of an ever-changing environment and its ability to internalize it in such a way as to induce growth (Denison & Mishra, 1995). The traits have been explored in further detail in the separate sub-sections below.
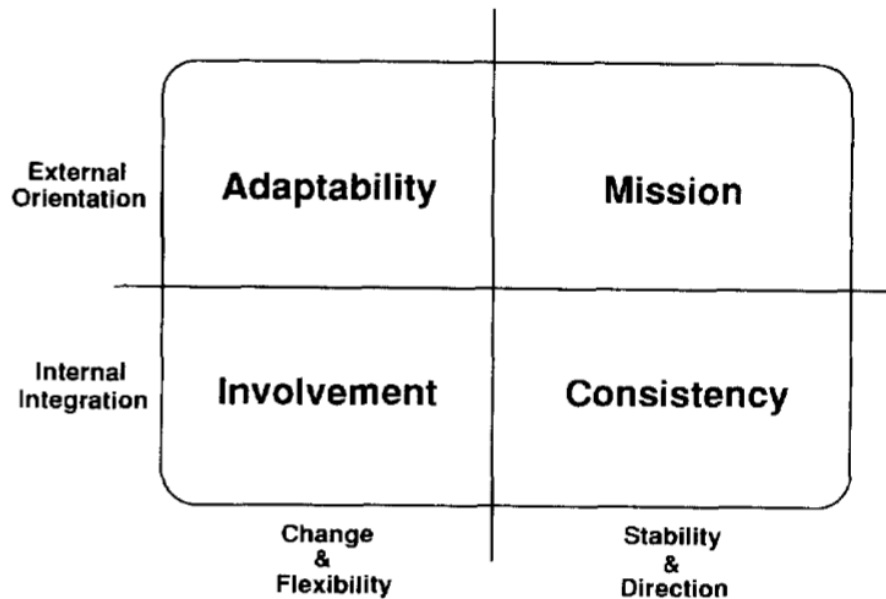
Figure 5 Denison's theoretical model of cultural traits (Denison & Mishra, 1995)

ADAPTABILITY

Adaptability is the ability of an organization to deal with new situations or issues (Denison, 1989). *"When new situations are unlike old, the capacity to unlearn the old code and create a new one becomes a central part of the adaptation process"* (Denison, 1989, p. 169). An organization therefore requires a culture of internalizing new external factors such that it can grow, survive, and thrive (Denison, 1989). This concept can sometimes be referred to as *alloplastic*, which refers to the *"Capacity to change in response to external conditions without abandoning one's underlying character"* (Denison & Mishra, 1995, p. 215). When an organization cannot adapt and is too dependent on stable systems such as rigid bureaucracies, negative repercussions can follow (Denison, 1989).

Together with involvement, adaptability is an indicator of growth (Denison, 1989). It is elementary to an organization's effectiveness. There are three central elements that play a role in adaptability (Denison, 1989). The first is an organization's ability to perceive and respond to external changes. The second is its ability to perceive and respond to changes taking place internally. And lastly, its capacity to restructure itself internally, based on both internal and external changes, that allows it to adapt.

INVOLVEMENT

This trait suggests that when members in an organization are encouraged to be involved, they tend to experience a stronger sense of duty and commitment (Denison, 1989). Denison explains that *"High levels of involvement and participation create a sense of ownership and responsibility"* (1989, p. 168). When individuals feel this sense of responsibility, they are more likely to commit to the tasks at hand and their working capacity increases. Sometimes, the structure of an organization does not allow for high levels of involvement at all the various stages, particularly when the bureaucratic set-up is inhibiting. It renders the organization weak at responding to environmental change, and negatively impacts its overall effectivity (Denison & Mishra, 1995).

MISSION

Another indicator of effectiveness, according to Denison, is its mission, or rather, the *"shared definition of the purpose and direction of an organization and its members"* (Denison, 1989, p. 169). Together with consistency, mission is an indication of vision and direction. It gives meaning and a goal to the work and decisions being taken, not just on an institutional level, but also on an individual one (Denison, 1989). After all, success is more likely when it is goal-oriented (Song & Grabowski, 2006). This can be achieved by a sense of passion or drive towards a common goal instilled in the employees, particularly in larger organizations, as opposed to some generic objective. Back-casting, which works on a similar premise, is in fact one of the most common planning tactics that connects a successful future with the present objectives (Robèrt et al., 2017). By establishing the long-term goals, the adequate measures to arrive to them can be internalized and implemented (Denison, 1989).

CONSISTENCY

Whilst consistency adaptability aids an organization in dealing with new scenarios, consistency is beneficial in dealing with scenarios that have already happened before (Denison, 1989). Different people often have different opinions, and part of ensuring that an organization runs smoothly is ensuring that different individuals can reach compromises. Denison proposes that when different individuals share common interests and values, compromises can be reached faster. He explains that a *"shared system of beliefs, values, and symbols ... has a positive impact on their ability to reach consensus and carry out coordinated actions"* (Denison, 1989, p. 168). In fact, establishing a shared value system internally has proven to be more effective at achieving an organization's coordination, in comparison to rules and regulations imposed from outside or higher levels (Denison, 1989).

Shared values also enforce internal communication and increase the chances that different individuals will react similarly to a new situation. Therefore, this sense of internal consistency facilitates coordination within an organization and equips it better with tools to accomplish its tasks and goals (Denison, 1989).

VARIATIONS TO THE FRAMEWORK

Amongst the studies that have used Denison' framework to assess obstacles that impair an organization from carrying out its functions, one study uses it to understand how different organizational barriers can influence the adoption and implementation of e-government. Although e-government is a different subject to NbS, the barriers within a government system are very similar, even for such different topics. This study, by Nurdin et al. (2011), adjusts Denison's framework such that the consistency pillar is replaced with a new 'bureaucracy pillar', based on a study by Wallach (1983) on the dimension of bureaucracy. *"Bureaucracy refers to the characteristics of an organization with clear lines of responsibility and authority based on control and power"* (Nurdin et al., 2011, p. 19). They argue that although consistency has a significant role in private companies, governmental bodies are typically guided by a set of rules, regulations, and hierarchies that renders consistency less effective (Nurdin et al., 2011).

In bureaucratic organizations, such as local or central government, the explicit rules and hierarchies that manage the system and that might otherwise be informal, are formalized. Protocols and sequences are explicitly stated and standardized into a system of rules. It enables day-to-day management to take place more smoothly and systematically, ensuring

that harmony is maintained at all the different levels (Nurdin et al., 2011). Strongly developed bureaucratic organizations thrive with the standardization of their management. However, weak bureaucracies work counteractively and result in poor coordination that renders the government unsuccessful at initiative implementation (Nurdin et al., 2011).

The framework Nurdin et al. developed can be seen in Figure 6 below. It functions as an assessment tool for barriers to e-government implementation at a local level and includes three of Denison's dimensions and a fourth dimension based on Wallach's study (Nurdin et al., 2011). All four dimensions have been associated with a set of different barriers, such as how the mission dimension encompasses three barriers: visions, goals and strategy.
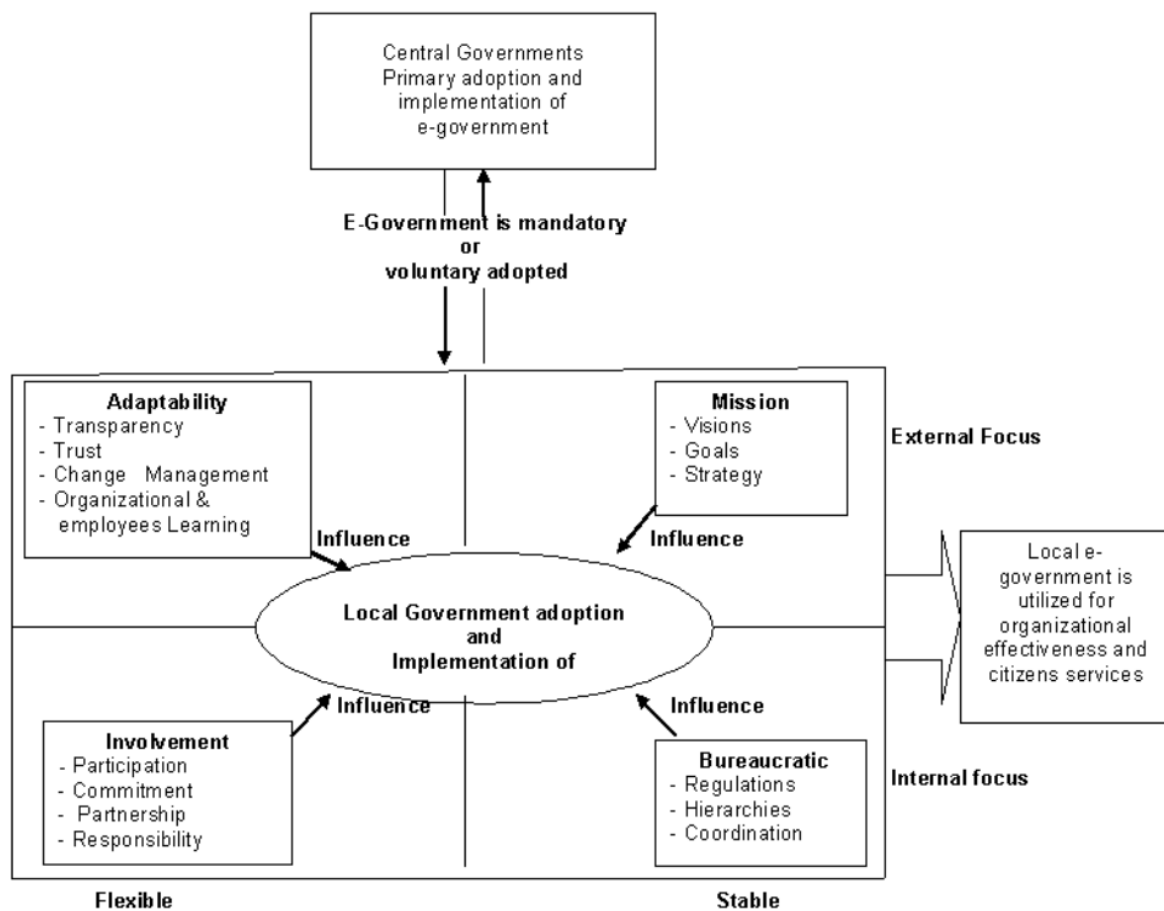
Figure 6 A framework to understanding organizational barriers Influencing e-government adoption and implementation (Nurdin et al., 2011).

2.7. Conceptual Model

As of yet, there are no theoretical models showing the relationship between central government organisational culture and NbS effectiveness. This study has therefore studied the relationship between the two variables and expands on existing theories of organizational structure and NbS adoption and implementation. The conceptual model of this thesis has been heavily adopted from Nurdin's framework on organizational barriers, together with additional literature on NbS. The resulting model seeks to answer the research question and sub-questions by showing the relationship between different organizational barriers and the

effectiveness of NbS adoption and implementation within the central government. Particular attention has been paid to **adaptability, mission, involvement,** and **bureaucracy** as variables in organizational structure. The model theorizes that when these four variables are strongly present in the central government organisation, the adoption and implementation of NbS is effective. Identifying barriers to the variables would therefore provide information on how to increase such effectivity in the wide-spread use of NbS by governmental organisations.

As explained in the previous sub-chapter, Nurdin's framework (2011) is based on an additional framework by Denison (1989). The difference between Denison and Nurdin's frameworks is that the latter was tailored to study governmental organization by featuring bureaucracy instead of consistency. Ultimately, since this research focuses specifically on organisational culture within the governmental structure, Nurdin's framework was preferred over Denison's. It was a consideration to combine the two frameworks and include both bureaucracy and consistency. However, this would have unnecessarily complicated the thesis, and therefore consistency was excluded. The resulting conceptualized model, seen in Figure 7, was the foundation on which this entire thesis was developed. Later on, in Chapter 3.3.1 (Data Operationalization), one can find further information on how the model was used to develop an operizational table that guided both data collection as well as data analysis.
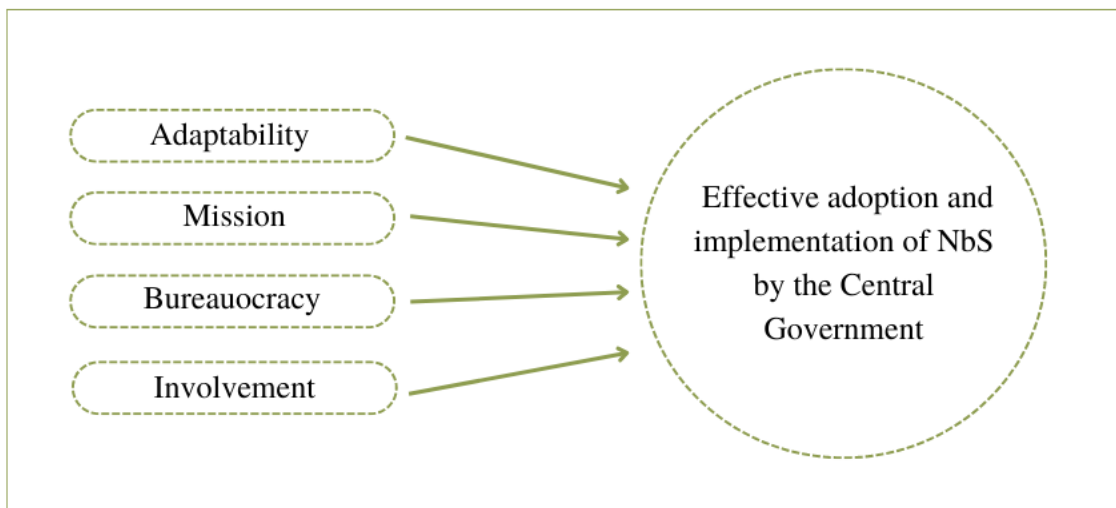
Figure 7 Conceptual framework showing the influence of adaptability, mission, bureaucracy, and involvement, on the effectiveness of the adoption and implementation of NbS by the central government

3. Methodology

This section delves into how the research has been carried out. The details provided allow future research of a similar nature to be replicated whilst ensuring that the results are valid and reliable. This is possible since the information provided encompasses details on what data has been collected, how, and from where, as well as how it has been analysed.

The overall approach used to design the study is that of an **explanative, deductive, qualitative study, grounded in a constructivist paradigm**. Data was initially collected during the **desk study** and then used to develop an **interview guide with a deductive approach. Open-ended questions** were opted for. **Purposeful** sampling was used to identify individuals to partake in the study. Additional information was collected during an inter-ministerial meeting on NbS, that the researcher was able to attend.

3.1.   Research Design

Designing a study can be very intricate, whereby several characteristics need to be decided on simultaneously and in tandem with one another. The research subject of this thesis primarily had to be decided on; in this case, it is the effectiveness of the central's government to adopt and implement NbS initiatives. Such a subject is very subjective and cannot be measured by numerical means. An exclusively qualitative research approach was, therefore, opted for to allow for adequate analysis and understanding of the different factors at play.

A qualitative approach allowed for an in-depth understanding and description of the underlying phenomena influencing the research problem. Concepts that were dealt with in this study, such as governance, stakeholder involvement and political systems could not have been described in numerical terms as this would not have given insightful results in the form of artificial experiments. The type of data that was required included a perception of NbS concepts, an assessment of the overall effectiveness of NbS implementation, as well as an understanding of existing organizational barriers. These topics, together with others, are all types of information that could have only been collected by verbal communication, as will be discussed further on in the data collection section. This qualitative element has not only guided the research design, strategy and data collection type, but it can also be noticed influencing other elements of the study, such as the research philosophy in which this research is grounded.

Another important element of a study is its overall approach, sometimes referred to as the *overall aim*. It identifies how the problem will be addressed. Since this study seeks to **understand** potential obstacles NbS implementation is facing, an **explanative approach** was deemed to be the most fitting aim. This type of approach is useful when there is already an existing theory, or theories, to explain why a problem exists, and the cause for these problems can be tested out using those theories. Explanatory studies aim to determine the factors that are bringing about a particular situation. In this study, four unique factors are theorized to be significantly impacting the use of NbS, and these are adaptability, bureaucracy, involvement and mission. These factors were identified in existing scientific literature and were tested out in the study by means of interviews, as will be explained in detail Chapter 3.2.1, Data Collection.

RESEARCH PHILOSOPHY

The research philosophy refers to the research paradigm, the set of beliefs around which theories in a study revolve around. Guba and Licoln define a paradigm as *"a set of basic beliefs that deals with ultimates or first principles"* (1994, p. 107). It is crucial for a researcher to understand the paradigm structure for their research as it determines the ideal methodology appropriate to answer the research questions. A **constructivist paradigm** was deemed the most fitting to reflect the qualitative nature of the research, whereby it deals with intangible knowledge associated with everyone's own individual opinion. The chosen paradigm allowed for the necessary freedom to understand the social matters in the study. It also supported the necessary methodology and data collection techniques required to derive the conclusion to the research problem, as is discussed further on.

In this school of thought, reality is all relative and is a mental construct that can differ between one individual to another. Due to this, when data is grounded in this philosophy, it is of a subjective nature and is usually obtained through dialectical means (Guba & Licoln, 1994). This reality cannot be measured but experienced as an interaction between the researcher and respondents. For this reason, this study favoured interviews as the primary method of data collection.

3.2. Research Methods

Solely qualitative research methods were used to collect the relevant data to answer the research question and sub-questions. A deductive approach called for theories and frameworks to be first identified in scientific literature during a desk-study, and then to prove or reject them, which in this case, was done by a set of interviews. The subject of this research, which is understanding why NbS are not readily implemented by government initiatives, is still very broad, particularly since there are different governmental structures worldwide. It was therefore decided, due to the scale of this study as well as time constraints, that only one country's central government organization and barriers would be studied in this thesis. Malta was chosen as the country of assessment and was used to test out the theories to delve deeper into understanding the underlying issue of NbS implementation. More information on Malta's central government structure can be found in Chapter 4, Case Description.

3.2.1. Data collection
DESK STUDY

Just like any other study, the most important foundation of a thesis is established from an extensive understanding of the existing literature available. This allows for the identification of knowledge gaps and creates an opportunity for researchers to bridge them. During the desk study, extensive time was allocated to understanding NbS as a concept, as well as its importance to science and society. This included information such as how it is perceived by governmental organisations and the value of identifying barriers that it is currently facing in implementation. The desk study facilitated the identification of the research problem, as well as provided theories to explain the existing barriers to NbS implementation.

Numerous scientific papers, newspaper articles, NGO publications and other sources of information were conceptualized by the researcher to understand the research problem. The problem identified was that NbS is currently facing obstacles in organizational structures in terms of being understood and properly implemented. Additional scientific literature, from sources such as Google Scholar, RUQuest and Radboud Repository, was then used to identify

the potential causes of such obstacles, with the aim of understanding them and eventually overcoming them. The most relevant theory identified was that by Denison on organisational theory, which was further developed by Nurdin et al.

INTERVIEWS WITH GOVERNMENTAL OFFICIALS

The second part of the information was gathered through a series of open-ended interviews. This allowed the theories collected during the desk study to be accepted, rejected, or modified. Although open-ended interviews are expected to obtain varying results, particularly due to their subjectivity, they are an ideal tool in qualitative studies. They facilitate the collection of data that is descriptive in nature, expressed by words and that can only be perceived (Guba & Licoln, 1994). The interview guide, which has been submitted under Appendix 1, was designed with a deductive research approach to answer both the research question and sub-questions. The interview was organized into four separate sections, which were:

1) **Understanding of NbS and the interviewee's job relation to NbS projects in Malta**
2) **Guidelines and steps of NbS implementation**
3) **Different scales of NbS implementation**
4) **Rural vs urban NbS emphasis debate**

The first section was designed to ease the interviewees into the interview, for them to introduce their role within the government, as well as to gauge their level of understanding of NbS as a concept. In the other three sections, existing theories were strategically interlaced in the interview questions such that they could be proven or rejected based on the interviewees' answers. The EKLIPSE Framework, which is an assessment tool to determine the effectiveness of NbS, was used to model the questions in Section 2 of the Interview Guide. By comparing the existing strategies being utilized by the central government to those proposed in the EKLIPSE framework, the researcher could determine the overall effectiveness of the government's NbS implementation.

As has already been mentioned in the Introduction, this thesis was originally meant to study why rural NbS and upscaled NbS are still less common than urban NbS and small-scale NbS projects. These two themes were not eliminated entirely from the study as they provided a relatable topic for interviewees to communicate about. They were therefore used as themes for Section 3 and 4. By understanding the reasons behind the choices for project scales and settlement type, the researcher could gather further insight into the interviewee's understanding of NbS, the overall effectiveness of NbS implementation, as well as on the existing governmental barriers.

It is also important to note that the researcher took an active-participation approach in the interviews and engaged with the interviewees during the session. The interview script was drafted in English. However, the interviews were offered to be carried out in either English or Maltese, based on the interviewees' preferences[1].

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[1] When Maltese was opted for, the interviewer translated the questions on the spot. An additional interview guide was not required.

Understanding what will be studied in a qualitative study is not enough. *Who* will be providing the data is also important, and this is determined within the sampling strategy of the study. Qualitative studies benefit from the use of non-probability sampling techniques. This study deemed that **purposeful sampling** was the most appropriate. Purposeful sampling, also known as judgement sampling, is a technique used to gather the most productive participants to partake in the study. Since this research focuses on issues that hinder the application of NbS within governmental initiatives, **governmental officials working closely on project design and implementation were identified as the ideal target participants**. A total of eight governmental officials were contacted and all eight accepted to participate in the study.

To identify participants for the study, the researcher first identified the different Maltese governmental departments that were responsible for project design and implementation. These departments have been elaborated on in Chapter 4, Case Description. Next, the particular individuals that lead projects within each department were identified. Some individuals were already known to the researcher due to her past experience working within the governmental sector. The rest of the participants were obtained by word-of-mouth. This means that the researcher asked interview participants or past colleagues for information on the names and contact of the relevant individuals in each department. All participants were contacted on their work email with general information on the thesis topic and invited to participate in an interview. The information shared prior to the interview was left vague. This was done to guarantee an authentic response regarding the participants' knowledge of the NbS topic as well as a more authentic reply to their opinions on the governmental strategies at play. For this same reason, the interview guide was not shared with the participants prior to the interview. A total of eight individuals were surveyed as part of this study. A list of these individuals as well as information on their individual role within the governmental sector can be found in Table 1. The table also categorizes the individuals into three arising categories. These are **Work Implementation**, **Policy Enforcement**, and **Higher Education Institution**. These categories show the difference in the type of governmental institution the employees work in. Later in Chapter 5, Results, trends in the different perceptions and knowledge of the interviewees will be compared based on the type of governmental institution they work in to determine any contrasting differences.

Objectively, eight interviewees can seem like a small sample size. However, the number of individuals within the entire population that have knowledge on this particular topic is very exclusive. In cases as such, a small sample size is beneficials. After all*, "an appropriate sample size for a qualitative study is one that adequately answers the research question"* (Marshall, 1996, p. 523). The common practice within qualitative literature is to conduct as many interviews as necessary until data saturation is reached, whereby new data after that point produces little or no new information (Guest et al., 2006). The saturation point for this study was reached after the sixth interview. Additional interviews continued to be conducted after this point to ensure that each department and different governmental sectors were adequately represented in the study. The issue with this approach is that the number of subjects can only be determined during data analysis. Prior to the commencement of data collection, a sample size of eight subjects was set as a target. Additional subjects were identified during the data collection when a clearer understanding of the governmental set-up on projects was obtained during data collection itself. A study by Morgan et al. (2002) has

also confirmed that over 80% of the relevant concepts are discovered within the first ten interviews of a study, validating that eight interviews were a good sample size for this study.

Table 1 Table showing the list of Interviewees as referenced, their main role within the government, its degree of relation to NbS, as well as the main role of the department each interviewee represents.

Interviewee Reference	Interviewee's Main Role	Role ties to NbS	Interviewee's Department's Main role
I1	Agricultural Officer; Manages projects related to rural area management and sustainability;	Direct	Work implementation
I2	Civil Engineer; Manages projects related to topics such as stormwater management	Indirect	Work implementation
I5	Chief Architect and Civil Engineer; Oversees several teams, such as on GIs, NbS, coastal management, climate management, stormwater management, GIS and energy efficiency.	Direct	Work implementation
I6	Chief Scientific Officer; Leads a team on project development, implementation and monitoring in terrestrial and marine Natura 2000 sites;	Direct	Work implementation
I3	Environment policy enforcer; Oversees environmental-related projects;	Indirect	Policy Enforcement
I4	Energy and water policy enforcer; Manages projects related to water quality monitoring;	Indirect	Policy Enforcement
I7	Energy and water policy enforcer; Monitors water quality, particularly groundwater quality; Manages several water-related pilot projects;	Indirect	Policy Enforcement
I8	Senior Lecturer; Local NbS Expert; Coordinates projects related to ecology and environmental sciences;	Direct	Higher Education institution

All interviews were carried out over the virtual communication platform called Microsoft Teams. Face-to-face interviews have benefits over virtual meetings, such as that they cannot be disrupted by issues such as bad internet connection or background noise. However, due to time and financial constraints, an online meeting was deemed ideal, particularly since the interviewees are individuals of high importance and were assumed to have tight schedules. Each interviewee was recorded using the record function on MicrosoftTeams and downloaded locally as an MPEG-4 video file (.mp4). The interviews were expected to take between half an hour to an hour to complete, and in fact, the average interview time was 40 minutes. The duration of the interview depended on the interviewee's knowledge of the

subject, whereby the maximum interview time was 50 minutes, and the shortest interview time was 30 minutes.

For data protection purposes, individuals who partook in the study were requested to sign a consent form prior to the interviews. A consent form template can be found in Appendix II (Consent Form Template). The filled-in consent forms have not been annexed to this thesis to keep the names of the participants anonymous. Should the signed consent forms be required, the author of this thesis can be contacted to provide them.

OBSERVATION OF AN NBS INTER-DEPARTMENTAL MEETING

During one particular interview with a governmental official, the researcher was invited to attend an inter-ministerial meeting to discuss an upcoming project on NbS initiatives in Malta. The researcher was invited *solely* as an observer. By attending this meeting, the researcher could observe the communication between different individuals and different departments to understand the direction that the government was taking in using NbS measures. This experience allowed for a raw observation of the perception of NbS by governmental officials and to understand how NbS was perceived as a tool in the great scheme of governance.

Since attendance at this meeting was very last-minute, there were time constraints in distributing and collecting back signed consent forms from all the attendees of the meetings. A recording of the meeting, which would have been ideal, could not have been collected, and instead, meeting notes were taken. These can be found in Appendix III (Meeting notes – NbS inter-departmental meeting). Additionally, for data protection purposes, none of the entities were directly referenced in the study. Instead, Table 2 below was created to provide a reference system for the entities that took part of the meeting. Microsoft Teams was once again the virtual communication platform used to host the meeting.

Table 2 Referencing system to the entities that attended the NBS inter-departmental meeting

Entity Reference	Entity Responsibilities
E1	National matters related to energy, environment and enterprise
E2	Environmental policymaking
E3	Create and coordinate water and energy policies of a national scale
E4	Manage and look after areas of high biodiversity importance in the country
E5	Implement the major capital national projects

3.3. Data technique

Technique refers to the approach adopted to analyse the data collected. The semi-structured interviews that were conducted, as well as the observation of the inter-departmental meeting, provided an in-depth perspective on the government's understanding of NbS as well as the influencing variables on its implementation. The interviews, which were saved locally on a computer in MPEG-4 video file format (.mp4) were manually transcribed as Microsoft Word Documents (.docx). Regardless of the language used during the interviews, all transcriptions

were generated in English to complement the language of this research, as well as to facilitate coding. Once all the transcriptions were created, all versions of the recorded interviews were deleted. The transcripts with the governmental officials were too long to include in the thesis or in the Appendices and were instead archived.

3.3.1. Data operationalization

In order to obtain measurable observations from the abstract information collected during the interviews, *operationalization* was required. Without specific operational definitions, identifying trends and arriving at reliable conclusions would have been challenging. Not only so, but without operationalization, the reliability of the study would have been decreased due to additional elements of subjectivity. In Chapter 2.7, Conceptual Model, four dimensions were identified as variables that would be affecting the subject of the study. These are adaptability, bureaucracy, involvement and mission. To operationalize these concepts, they were further divided into sub-concepts, or rather, indicators, as can be seen in Table 3. These indicators would facilitate linking the text collected during the interviews and the meeting with the dimensions identified during the desk-study.

Table 3 Operationalization of NbS adoption and implementation by the central government based on (Nurdin et al., 2011)

Variable	Dimension	Indicator
Effectiveness of Organizational structure of central government	Concept understanding	Complete
		Incomplete
		Misguided
	EKLIPSE Framework Proof of Concept	Problem Identification
		Design
		Implementation
		Monitoring
		Solution Selection
		Stakeholder Involvement
		Upscaling
	EKLIPSE Framework Upscaling Ability	Pilot and Full-Scale
		Pilot
		Full-Scale
	Settlement focus	Mixed
		Rural
		Urban
Adaptability	N/A	Change management
		Transparency
		Trust
		Organizational learning
Mission	N/A	Vision
		Goal
		Strategy
Bureaucracy	N/A	Hierarchy
		Regulation
		Coordination
Involvement	N/A	Participation
		Commitment
		Partnership
		Responsibility

3.3.2. Coding

The indicators determined during operationalization were used as codes to thoroughly analyse the information collected during the interviews. To facilitate the process, the software program ATLAS.ti 22, version 22.1.5.0 was used to do so. The interviews were uploaded into the program in such a way that the name of the interviewee was replaced by a number to provide anonymity. Next, the pre-determined codes were added to the program, and were manually assigned to the qualitative data. This is known as deductive coding and is a common method of organising data around a specific research question (Saldaña, 2013). To ensure that no additional information was missed out, a second round of analysis was carried out using inductive coding. The Coding Scheme for the interviews can be found in Appendix IV.

3.4. Quality Control

3.4.1. Research Reliability

Reliability refers to how replicable a study is, or rather, the probability of concluding the same results when replicating a study. *"Reliability estimates are used to evaluate (1) the stability of measures administered at different times to the same individuals or using the same standard (test–retest reliability)"* (Kimberlin & Winterstein, 2008, p. 2277). In qualitative research, this can be a little bit hard to guarantee, and therefore instead, reliability is considered to be more of an indication of the stability of responses to multiple coders of data sets(van Thiel, 2014). The replicability of this research was maximized by documenting the data collection process as extensively as possible and ensuring that the process of interpreting the data was consistent and transparent. This included providing the Interview Guide used to structure the interviews and thorough description of the coding process of data analysis. Additionally, since the interviewees' replies are known to be highly susceptible to environmental factors, the interviewees were invited to share their preferred time slot for the interviews so that they could schedule them at a time they would be most at-ease.

Should this thesis be replicated, it is expected to generate the same results. However, should it be replicated for a different country, the results are expected to differ, even though they could still be transferable. This is largely because different countries have different governmental structures. Not only does this mean that they might have different obstacles and approaches, but it might also mean that they have different resources with which to address NbS(Frantzeskaki, 2019). Additionally, although efforts were made to ensure confirmability in the study, the deductive nature of the study might have affected the semi-structuring of the interviews. One approach which could have been used to make sure this was not the case, would have been to conduct the same study with different question formulations but with the same context (van Thiel, 2014). Due to time constraints as well as due the limitation of individuals who have enough knowledge to participate in the interviews, this was not done.

3.4.2. Research Validity

INTERNAL VALIDITY

The internal validity guarantees that the variables influencing the subjects are indeed the only ones influencing the subject of the study, i.e., establishes a strong cause-and-effect principle (van Thiel, 2014). There are different elements that can be used in the study's design to increase its internal validity. Blinding, for example, was used to avoid the participants from providing biased answers in the interviews (Slack & Jolaine R. Draugalis Jr., 2001).

Interviewees were only informed that the study was related to the understanding of NbS within the government, and they were not provided with the interview guide prior to the interviews. A strict protocol was also used to guarantee that all interviews were carried out in the same manner, such as designating only one individual to conduct all the interviews.

The biggest threat to the internal validity of this study is experimental bias. Since the researcher was using the interviews to accept or reject the theorized factors influencing NbS implementation within the government, prompts were sometimes used in the interviews, and these can be interpreted as bias traits. This was the trade-off to conducting a deductive explanatory study.

EXTERNAL VALIDITY

Whilst internal validity is an indication of how well different elements tie in together within the study, external validity is an indication of how effectively its results can be generalized to other situations or contexts (van Thiel, 2014). For a qualitative study to express external validity, it is ideally **transferable**, which means that its results would be valid for contexts of similar characteristics (van Thiel, 2014). For this reason, extensive information about Malta, NbS within the country and its governmental structure have been provided in Chapter 4. **Replication** of the study would have been beneficial to compare the different variables influencing NbS in different governments, such as in different countries. Due to limited resources and time constraints, this was not possible. A **field experiment** is another factor that boosts external validity. The inter-departmental meeting that the researcher attended can be considered as such, as it allowed the researcher to observe governmental officials in a natural setting debate and discuss a collaborative national NbS project.

3.4.3. Research Triangulation

Considering that qualitative research generates data that is very subjective, triangulation is one method that compensates for the vastness of the findings. It makes up for the irregularities in the results and is a *"tested means of enhancing reliability and validity"* (van Thiel, 2014, p. 52). In essence, it is the use of different angles to confirm the same conclusion. **Data triangulation** was used in this study by collecting data from three different sources. The first source was literature, the second was from the interviews, and the third was observations during the governmental meeting attended. Whilst the literature provided an apparent problem and its causes, the data collected during the interviews and the meeting were used to confirm or reject the literature.

4. Case Description

This study has taken a look at the organisational culture within the central government set-up that inhibits the use and implementation of NbS within a country. It goes without saying that the central government (how it is structured and how it operates) plays a key role in the study and therefore needs to be adequately understood. This thesis has focused on the central government of just one country: Malta. This was done for multiple reasons. First of all, a qualitative study such as this one paired up with the time constraints made it unrealistic to study more than one central government system in depth. Malta's small size was considered favourable, as it allowed for a more thorough study of the country's NbS situation and its central government system. Additionally, up till recently, Malta was still lagging behind on NbS publications, especially in comparison to other EU countries (Li et al., 2021). Search Engines such as Google Scholar show a limited range of relevant scientific publications, whereby less than ten publications are directly focused on NbS in the Maltese Islands. This made Malta an optimum case for this study to understand the relevant barriers in NbS implementation.

This chapter has provided relevant information on Malta, its government, and its NbS initiatives to date.

4.1. Geography

Malta is an archipelago of islands found approximately in the middle of the Mediterranean Basin, as can be seen in Figure 8. With a total surface area of only 316 km^2, the country is considered the tenth smallest in the world (Galdies et al., 2016). Its weather temperatures paired with the rainfall trends render Malta a water-scarce country, even more so since its islands essentially do not have surface waters (Hartfiel et al., 2020). Residents rely on the depleting groundwater levels for naturally-sourced fresh water, that are becoming increasingly more saline with chloride levels exceeding 2000 mg/L (Hartfiel et al., 2020). This poses a threat to the agricultural sector, the overall biodiversity of the country as well its ecosystem quality. The rest of the Malta's fresh water is sourced from Reverse Osmosis desalination plants. While this alleviates the demand for groundwater, it requires high demands of electricity to be operated, meaning that the country not only currently has a water scarcity problem, but also a food and energy security challenge (Hartfiel et al., 2020).

4.2. Urbanisation

Malta may be a republic, but it can be more accurately considered as one capital city-state (European Communities, 2004, p. 20). This is due to its extreme urbanization pressures. In fact, with a density of 1380 per km^2, the country is currently classified as the densest in the European Union (Eurostat, 2017) and 9th densest in the world (Eurostat, 2017; Worldometer, 2022). Whilst a significant 52% of the land is classified as agriculture, only 18.3% is considered to be natural or semi-natural (Azzopardi, 2022). These statistics strengthen the cause of why Malta should be more urgently turning towards NbS. Not only could it apply such measures on land, but it could also implement them on its extensive territorial water zone that extends out to 12 nautical miles, (Territorial Waters and Contiguous Zone Act, 1971). The high population density and the severe urbanisation calls for careful consideration of spatial planning and for sustainable management practices in order to maintain a high standard of living for all its inhabitants.
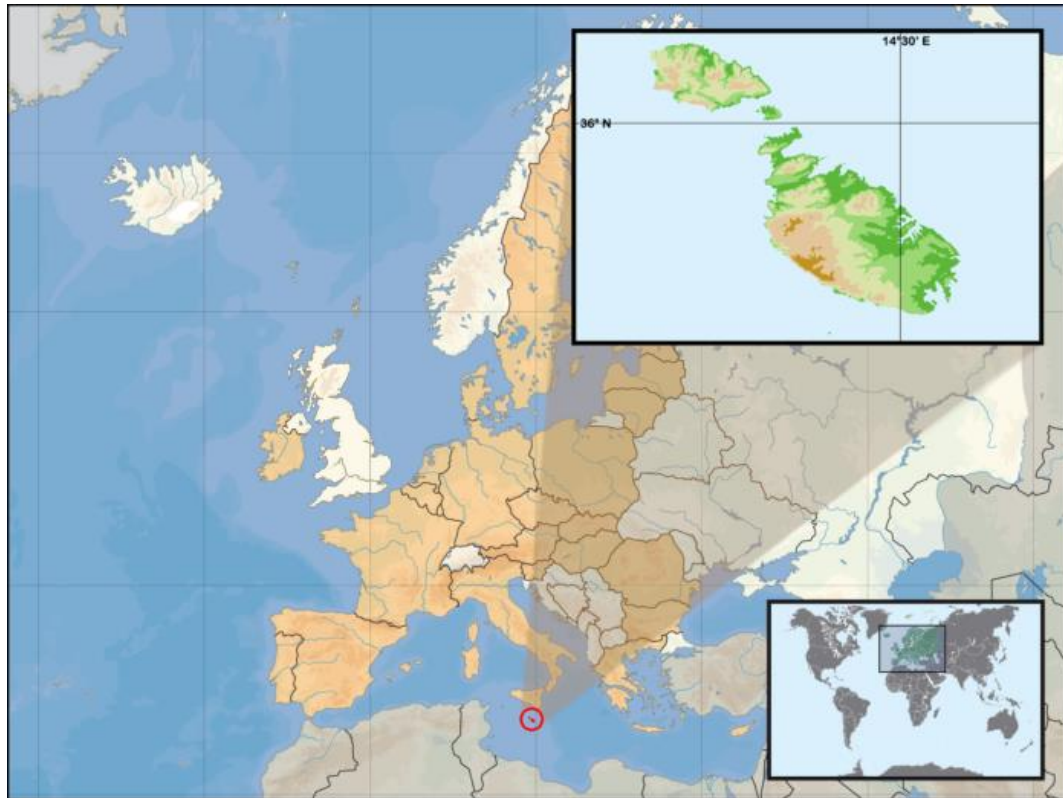
Figure 8 Location of Malta within Europe and on a global map (CIIA, n.d.)

4.3. NbS in Malta

As mentioned in the literature review, NbS initiatives are hard to quantify since the term is relatively recent, and therefore initiatives that are nature-based have not always been identified as so. Recent measures have been put forward in an attempt to gather such concepts, such as in the *Oppla* database. This is an EU repository for NbS that aims at providing information on how to collect and disseminate knowledge on better environmental management (Oppla, 2022). In this database, Malta rendered three NbS projects, which are listed in Table 4. Another existing repository, Urban Nature Atlas (UNA), rendered zero results for NbS in Malta (NATURVATION, 2022).

The most significant research on NbS in Malta was done within the ReNature initiative. This is an EU-funded toolkit designed for researchers, planners, and other stakeholders to identify the best nature-based solutions for specific environmental challenges such as water supply, urbanization, and wildlife preservation (European Commission, 2022; Malta College of Arts, 2021b). The toolkit was designed to provide solutions to such challenges, whilst simultaneously supporting communities, and promoting public health access to nature, cultural identity, and social cohesion (European Commission, 2022; Malta College of Arts, 2021a). A compendium was also created under this action, developed based on NbS case studies within the Mediterranean region, including Malta (European Commission, 2022; Malta College of Arts, 2021b). It allows users to identify different NbS that could be adopted to address a particular problem (Balzan et al., 2022). Each suggested NbS would also be accompanied by additional information on the social, environmental, and economic co-benefits that it would provide (European Commission, 2022; Malta College of Arts, 2021b).

Table 4 List of NbS Initiatives in Malta according to the Oppla database (Oppla, 2022)

Database Source	Project Location	Project Title
Oppla	Malta	Assessing and mapping ecosystem services in the mosaic landscapes of the Maltese Islands
Oppla	Malta	Assessing urban recreation ecosystem services through the use of geocache visitation and preference data: a case-study from an urbanised island environment
Oppla	Malta	An assessment of green infrastructure and ecosystem services in the Valletta urban area: a case-study for sustainable urban planning

One particular study published through the ReNature project sought to understand the status of NbS implementation in Malta and identified the strength, weaknesses, opportunities, and threats (SWOT) of NbS implementation in the country. The study identified *"several barriers [that] limit the effective implementation of NbS at local scales and hinder uptake by policymakers and businesses".* These include barriers such as institutional, infrastructural and perception weaknesses. The study acknowledged issues such as a lack of awareness of NbS alternatives and the lack of institutional capacity to facilitate the uptake and implementation of the new concept. Other issues include the lack of ongoing compliance monitoring, the lack of existing cost estimates, as well as the lack of understanding of NbS's non-monitory benefits. By overcoming these barriers in a country like Malta, with its dense urbanization and semi-arid climate, the major societal challenges Maltese citizens are currently experiencing could potentially be remediated. These include challenges such as drought, heat risk, low biodiversity knowledge, biodiversity loss and low GI availability (Balzan et al., 2022).

Balzan's paper has similar themes to those featured in this thesis. The information in his research was collected in a similar fashion, whereby it was primarily collected qualitatively through a set of semi-structured interviews with stakeholders from the policy and business sectors. The questions focused on the definitions people used to define NbS, the supposed NbS projects that the organization implemented, and the challenges and benefits that arose. Another interesting finding the study made was that one major issue with NbS implementation in Malta was the conflicting land use rights by private landowners paired with the lack of local public knowledge on NbS. In fact, Balzan says *"The limited understanding and awareness of NbS represent a key barrier to NbS implementation"* (Balzan et al., 2022, p. 10).

4.4.   Relevant policies

None of the current national policies and regulations mention the term NbS specifically. However, indirect references to such a concept exist. The National Environmental Policy, for example, promoted measures such as eco-innovation to green the economy in both the business and public sectors. This would be achieved by using measures such as allowing bidders in procurement to *"express innovation and creativity with respect to how results can be achieved"* (Ministry for Tourism the Environment and Culture, 2012, p. 29). Another document, the National Biodiversity Strategy and Action Plan 2012–2020, acknowledged that *"Many sectors, such as agriculture and fisheries, are ultimately dependent on biodiversity for*

their sustained productivity" (Ministry for Tourism the Environment and Culture, n.d., p. 4). Theme 14 of this strategy, related to research and development, correlated the importance of stakeholder involvement with ecological, social, and economic well-being. Similarly, the Strategic Plan for the Environment and Development provided a development plan for the Maltese Islands that encompassed both strategic spatial planning and overall better social well-being. The document shared a vision of national improvement, by stating that the *"Maltese Islands shall raise their potential for social and economic growth in the core sectors for development [such that] they may improve the quality of life and wellbeing, particularly for vulnerable groups"*(The Planning Authority, 2015, p. 6). Whilst such policies and action plans show a correlation between a healthy environment and a healthy society, the inter-relationship is still left rather vague.

In terms of regional policies, NbS have been more directly incorporated. For example, in the EU's Biodiversity Strategy for 2030, NbS have been specifically identified as solutions to combat emission reduction and climate adaptation. They have also been mentioned as solutions to increase urban greening and society's mental and social well-being. In fact, NbS were deemed important enough that the Strategy designated 25% of the EU budget to climate action on biodiversity and NbS (European Commission, 2020). Additionally, it stated that research and innovation would be directed towards the testing and development of NbS and their prioritization. Stakeholders have also been mentioned in the document, such as how farmers need to be supported and incentivized to transition to fully sustainable practices (European Commission, 2020).

RELEVANT PUBLIC ADMINISTRATION

As a democratic country, Malta's public administration relies on several ministries, departments, agencies, and other government entities that make up the Public Administration sector. This serves to provide advice to the cabinet, as well as implement the government's policies and decisions (Government of Malta, n.d.-a). In order to understand the organizational barriers within the government system of Malta, it was necessary to identify the governmental bodies with maximum potential in using NbS and to understand the barriers within them. Brief information on the relevant public administration bodies has been compiled in Table 5.

(The Energy and Water Agency, n.d.) (Environment and Resource Authority, n.d.) (Public Works Department, n.d.)
(Government of Malta, n.d.-b) (Government of Malta, 2021) (Infrastructure Malta, n.d.) (L-Università ta' Malta, n.d.)
        (MCAST, 2021)

Table 5 Relevant public administration bodies in the central government of Malta to NbS, and their Interview Reference (if applicable)

Public Body	Ministry	Responsibilities of the department	Department's Main role	Interviewee Reference
Energy and Water Agency (EWA)	Ministry for the Environment, Energy and Enterprise	- Create and coordinate water and energy policies on a national scale (The Energy and Water Agency, n.d.). - Collect relevant data for better policy development and better water and energy management (The Energy and Water Agency, n.d.).	Policy enforcement	I4, I7
Environment and Resource Authority (ERA)	Ministry for the Environment, Energy and Enterprise	- Create national environmental policies and negotiate international environmental matters (Environment and Resource Authority, n.d.). - Issue environmental permits and conduct national environmental monitoring (Environment and Resource Authority, n.d.).	Policy enforcement	I3
Public Works Department (PWD)	Ministry for Public Works and Planning	- Undertake the major capital national projects (Public Works Department, n.d.). - Involved with both planning and implementing projects that are responsible for the overall public well-being (Public Works Department, n.d.).	Work implementation	I2, I5
PARKS Malta (PM)	Ministry for the Environment, Energy and Enterprise	- The upkeep of Malta's national parks and gardens (Government of Malta, n.d.-b). - Management and upkeep of the rural valleys of the country (Government of Malta, n.d.-b).	Work implementation	N/A
Ambjent Malta (AM)	Ministry for the Environment, Energy and Enterprise	- Management of areas of high biodiversity value (including coastal, marine and natural landscapes) (Government of Malta, 2021). - Implementation of projects that improve the country's natural capital and biodiversity (Government of Malta, 2021).	Work implementation	I1, I6
Infrastructure Malta (IM)	Ministry for Transport, Infrastructure and Capital Projects	- Management of the road network and public infrastructure in Malta, including their development and upkeep (Infrastructure Malta, n.d.).	Work implementation	N/A
The Malta College of Arts, Science & Technology (MCAST)	Ministry of Education	- Provide education at a different range of levels, including tertiary and higher levels, as well as courses related to trade learning (MCAST, 2021).	Higher education institution	I8
University of Malta (UM)	Ministry of Education	- Provide higher education to enrolled students (L-Università ta' Malta, n.d.). - Biggest source of academic research in the country (L-Università ta' Malta, n.d.).	Higher education institution	N/A

5. Results and analysis

This chapter presents the results collected during the semi-structured interviews and the NbS government meeting and compares them to those collected during the desk study. Since the information is sourced from three separate sets of information, one can note the use of data triangulation. The data collected was analysed using the conceptual model presented in the Literature Review, Chapter 2. The quality of effectiveness within the central government was gauged by comparing existing approaches in the government to those theorized in the desk study. Additionally, the quality of the four organizational traits identified during the desk study were gauged. This chapter determines the cause-and-effect of the organizational culture and NbS implementation and determines the status of governmental effectiveness.

Direct quotes from the transcripts are referenced through this chapter based on the Interview Reference of Table 1, presented earlier in Chapter 3.2.1 (Data Collection). All quotations are in English, abstracted directly from the transcripts.

5.1. Effectiveness

To determine how effective NbS implementation was within the central government of Malta, different indicators were identified through the desk study and then observed during the interviews. First, the conceptual understanding of NbS of each interviewee was noted. Next, an understanding of any existing frameworks and guidelines was determined and compared to the EKLIPSE framework. The scale of NbS implementation and the interviewee's opinion on the most effective scale, as well as the settlement focus and the interviewee's opinion on the most important NbS settlement type, were also determined.

5.1.1. Conceptual understanding

Most individuals interviewed had an incomplete understanding of the NbS concept. This means that, whilst they had an idea of certain elements that played a role in the concept, they were unable to communicate important traits such as the equal importance of addressing social and environmental challenges. The results collected showed how the lack of understanding sometimes lead to the incorrect use of different terms interchangeable, such green infrastructure and NbS, as was done in the NbS project meeting

Individuals were often misguided by the term *nature* in NbS, as this led them to believe that the concept is referring to the use of nature as a solution. Part of I3's definition of NbS included the following:

> *"The term can refer to when nature is used, so you are using systems of nature, ecosystems dynamics, to solve a problem" I3, Line 12*

Similarly, I5, I6 and I7's conceptual understanding of NbS was the use of natural systems or nature to achieve a set of goals. I4 had a similar but slightly different understanding of the concept. They interpreted NbS as the use of environmentally friendly solutions and tried to define them by saying:

> *"If we are going to use concrete for roads, we are going to try and apply it in as much of an environmentally friendly way as possible. If we would like to build a rubble wall, we are going to try to use nature-based solutions, in the same way manner done in Chadwick Lakes. So instead of using rubble walls we used faschinas." (I4, Line 24)*

Few interviewees were able to communicate additional traits of NbS. I1, for example, did not give a concrete definition of NbS. However, they acknowledged the more holistic purpose of NbS, as well as the existing misconception of the term:

"I think there was recently a misconception on the term NbS, whereby people think that NbS and for example, green walls, are synonymous. But NbS is something more holistic" (I1, Line 17)

Only one interviewee showed an extensive understanding of the concept. I8 was able to communicate the importance of natural systems to tackle challenges in nature and society. They used important keywords such as biodiversity and communities, that further indicated the profound understanding of the concept:

"My understanding ... of nature-based solutions, is very much in line with the definitions of the European Commission. Which is basically, that you're using nature, or you're being inspired by nature, to tackle specific challenges while giving rise to benefits both to nature itself, to biodiversity, and also to communities" (I8, Line 18)

Additionally, only one out of eight interviewees showed a very limited understanding of NbS. I2 was unable to identify any important elements that tie into the concept, and instead had a misguided understanding that the concept was tied to the size of a project usually related to water management.

It is important to note that whilst it is common for individuals to use examples from their work to explain concepts such as NbS, the inability to communicate some or all the keywords shows the unfamiliarity of the interviewees with the concept.

Table 6 below shows a summary of the different understandings of NbS by the interviewees. It shows the different conceptual understandings grouped based on the role of the department that each interviewee is representing. Interviewees working in both Works Implementation Sectors as well as Policy Enforcement sectors showed an incomplete understanding of NbS, whilst the individual working in the Higher Education Institution showed a complete understanding. This could indicate that whilst Higher Education Institutions keep up with arising concepts and information, there is a gap that limits the transfer of knowledge to other sectors, indicating a lack of effectiveness.

Table 6 Summary of the understanding of NbS by different employees of the public sector

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Conceptual understanding of NbS	Extensive Understanding								✓
	Limited Understanding	✓		✓	✓	✓	✓	✓	
	Misguided Understanding		✓						
Comments		Showed exposure to NbS, but were unable to define the type of results NbS is meant to accomplish				Showed exposure to NbS, but were unable to define the type of results NbS is meant to accomplish			Provided an accurate definition to NbS

5.1.2. Frameworks and guidelines

Since the EKLIPSE framework, explained in Chapter 3, is a qualitative assessment tool, it has been used to determine how effective the approach adopted for project implementation within the central government is. NbS are still not widely adopted by the Maltese government, so the subject was widened to include environmental projects in general, rather than just NbS projects specifically. No existing framework was identified to guide the development of strategies for NbS or similar fields. This was confirmed during both the interviews as well as the NbS project meeting. During the latter, the lack of guidelines was specifically discussed and instead, NbS were referred to as tools for mitigation and adaptation. Additionally, almost none of the employees were familiar with the EKLIPSE Framework The only interviewee who was, described the framework by saying:

> *"It's okay, and there's nothing wrong with it, but I think since then a lot of new things have happened and a lot of new frameworks have been developed and a lot of indicators have been developed for monitoring nature-based solutions ... I think it's okay, and no particular concerns" (I8, Line 102).*

The concern behind this statement is that, whilst the framework has been refined and updated since its publishing, Malta's government employees are not only unaware of such updates but are unaware of this tool's existence entirely. This shows low effectiveness, as it indicates the inability of the system to keep up with new knowledge, concepts and their implementation. Strategies, that tie closely to guidelines, have been further analysed in Chapter 5.5.2, Strategy.

Since the EKLIPSE framework could not be compared to any similar tool within the central government of Malta, the interviewees were asked questions to determine which of the EKLIPSE traits were (unofficially) being adopted.

PROBLEM IDENTIFICATION

All interviewees mentioned the use of problem identification as the first step in project creation, such as by stating that:

> *"[We] identify the problem and figure out the best way to solve it in the*
> *most environmentally favourable way possible" (I1, Line 93)*

I6 also shared a new initiative within their department whereby the problems were brought forward by local stakeholders, including local councils. *"These proposals are mediated and implemented accordingly" (I6, Line 38)*

As is elaborated in further on in this chapter, there is a lack of stakeholder involvement during the design and implementation of projects. This initiative is, therefore, a sign of positive change from a top-down approach to a bottom-up approach, which has been proven to be far more effective in creating sustainable societies.

SOLUTION SELECTION, DESIGN, AND IMPLEMENTATION

No information was relayed related to project design, apart from the fact that ultimately the design is dependent on the available funding and that environment-related projects tend to be screened by the Policy Enforcement Sector:

> *"We try to figure out how to solve [the problem]. And then the budget*
> *follows the natural course of things. But then there is the limitation of the*
> *budget" (I1, Line 85)*

No comments were made on project implementation or solution selection, indicating no specific process for them, or any acknowledged issues with them.

STAKEHOLDER INVOLVEMENT

Stakeholder involvement was the most popular theme throughout the interviews with 30 mentions. In recent years, stakeholder involvement gained traction with the central government of Malta. Through the interviews, it became apparent that this is primarily due to two reasons. The first is that stakeholder involvement is a necessity for EU-Fund eligibility, as explained in comments such as described by I4.

The second, as revealed by I3, is that national legislation has started to make stakeholder involvement mandatory in particular situations (I3, Line 141). On paper, this might seem like active stakeholder involvement. However, I8 shines light on the real issue with this system:

> *"But the question is, how are stakeholders engaged? Are they asked to*
> *participate when the project is already identified, or is more about*
> *ownership of the community?" (I8, Line 116)*

Their comment suggests that whilst government employees might think that they're practicing stakeholder involvement, it is not being properly carried out. The process is meant to involve individuals who would be affected by a certain decision not only in the implementing phase but in every part of the decision process. However, current stakeholder obligation *"does not specify the exact details of how it needs to be done, but it is specifically required in some form or another. It is requested that a stakeholder consultation is included" (I3, Line 145).*

The interviewees were therefore asked to clarify what kind of stakeholder involvement their department carries out. Different replies were shared. I3 commented that their department's use of stakeholder involvement was mostly based on legal requirements, while another shared

a more holistic approach, by saying stakeholder involvement is practiced *"Normally in the beginning to ensure that stakeholders are engaged, and, along the line, you can gain their feedback and their support"* (I4, Line 92).

Similar replies were provided by different individuals from other departments, reiterating the fact that stakeholder involvement is an essential part of the process, yet I8 was determined that *"stakeholder engagement and participation [are] very, very weak"* (I8, Line 108). This is because inter-departmental (or inter-ministerial) coordination is being mistaken for stakeholder involvement. Individual stakeholders, such as residents of an areas, that are arguably the most important stakeholders, are not being included in project development. This was confirmed by statements such as the following:

> *"The most common case where [stakeholders] are consulted is at a local council level. Because they represent the wider community. But again, the council, how it works and what it receives and what are prioritized, it could filter out certain values or concerns that [the wider community] might have about their community"* (I5, Line 90).

> *"A lot of the engagement is top-down, rather than actually the community is identifying what intervention is needed and participating in the design. And that's not happening"* (I8, Line 116)

Overall, the interviews felt that the introduction of stakeholder involvement by governmental departments is a step in the right direction, indicating adaptation and partnership traits. However, stakeholder engagement by the central government of Malta requires further refining before it can generate the full set of benefits it is renowned for. Efforts need to be made to include individual stakeholders throughout the entire process of a project, especially the designing phase. Additional results and analysis on stakeholder involvement not directly relevant to this research have been submitted in Appendix V.

Upscale and transfer

Discussing upscaling also provided new insight. There is an awareness of the benefits of upscaling, such as how I6 stated that *"The larger the surface area involved, the more effective the project"* (I6 Line 34). Positive project scale trends were noted, such as how the Policy Enforcement and Higher Education Institution organisations indicated higher trends of pilot-oriented projects, whilst the Works Implementations indicated more trends of full-scale projects. These results have been organized in Table 7 below. Such a practice is a good sign of coordination, both between different departments as well as between different officers within the same department. This in turn ensures that organisational resources are being optimised, allowing for both information-collection and works implementation.

Additional insight on project scale was related to the uncertainty of whether innovative project designs (such as of NbS) will be successful. This makes officials hesitant in implementing them at large scales. One interviewee stated that:

> *"[NbS are] still in their early stages. It's safe to say that most of the projects ... are still in the experimental phase. These projects need at least three to five years for anyone to start rendering results"* (I1, Line 115)

This confirms Seddon et al.'s research (2020) that states that investing in innovative concepts such as NbS faces a lot of hesitation, particularly due to the uncertainty on cost-effectiveness. Time and studies are therefore prioritized to provide a form of guarantee that projects such as NbS can provide a reliable cost-effectiveness value.

I3 (line 229) admitted that they are hesitant to upscale, because complications arise at small scales or pilot studies and governmental officials feel that, should they upscale the project, these issues would be even greater.

An example of these complications was land-ownership rights. Since Malta is so small, land parcels also reflect this. To implement a large-scale project would therefore require the collaboration of several owners, and often gives rise to disagreement. Over half of the interviewees spoke about land-ownership issues and how it is one of the biggest problems the government faces in upscaling projects.

This confirms Cortinovis et al.'s research (2022) that states that one major barrier to project upscaling is related to the larger number of individuals that would be affected by the project. When this happens, Cortinovis et al. have shown that it is harder for all the individuals to approve of such a project, and this can lead to further complications.

Similarly, there are issues with transfer of projects, particularly from one country to another. Government officials feel that they cannot rely on the results of NbS projects in different countries, regardless of how similar their climate or societal structure might be. This is because they feel that these kinds of projects are tailored to a specific area.

> *"You'll get replies such as 'yeah they worked but in Sweden where there are different conditions'. You can't blame them, can you. You can't just copy a project that was carried out abroad. We have to find projects to model after in countries that are more similar to our own" (I3, Line 237)*

On the other hand, there is a good sense of coordination between the different departments, whereby the Policy Enforcement departments focus on collecting data through pilot studies and the Works Implementation upscale the projects based on the results. It indicates an ability to explore complex and technical demands, confirming the study by Hughes (2018). This study suggests that by studying pilot projects and successfully upscaling them, learning and adaptation of an organization is being promoted.

Whilst larger projects demand interaction with a bigger group of people, and indicates a lack of trust and capacity, the ability to learn and upscale from pilot projects is a good sign of adaptive governance, as suggested by Schultz et al. (2015).

MONITORING

Concerns were raised about the current monitoring situation. Whilst most interviewees shared their awareness of the importance of monitoring, they also shared that it often does not happen. For example, they stated that *"Once a project is installed, there is an issue of lack of proper monitoring"* (I1, Line 41) and that *"The general trend is that it is not possible to monitor every single project all throughout"* (I3, Line 153).

That said, most interviewees showed a keen interest in increasing monitoring within their department. Even though monitoring is not mandatory, multiple interviewees indicated that it

is slowly being introduced, by stating comments such as *"we installed a people counter in order to have stats on how many people visit that area in say, a year"* (I4, Line 144).

The information discussed in Chapter 5.1.2, that identified how effective the current NbS implementation in Malta is, based on the EKLIPSE Framework, has been summarized in Table 7 below.

Table 7 Summary of the results collected on NbS Effectiveness in Malta, based on the EKLIPSE Framework.

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
EKLIPSE Framework	**Are aware about the EKLIPSE Framework**	X	X	X	X	X	X	X	✓
	Problem identification — Make use of problem identification for project selection	✓	Unk	✓	✓	Ukn	✓	Unk	Unk
	NBS Selection								
	NBS Design								
	NBS Implementation								
	Stakeholder involvement — Feel that they practice stakeholder involvement	✓	✓	✓	✓	✓	✓	✓	✓
	Practice a limited form of stakeholder involvement	X	✓	✓	X	✓	✓	✓	X
	Upscaling — Carry out pilot projects	✓			✓	✓	✓	✓	✓
	Upscale projects	✓	✓	✓	✓				
	Monitoring — Acknowledge the importance of monitoring	✓	X	✓	✓	✓	✓	✓	✓
	Make use of monitoring and/or are trying to increase it	✓	X	X	✓	X	✓	✓	✓
Comments		Were mostly knowledgeable on stakeholder involvement and project implementation				Were mostly knowledgeable on pilot study initiatives and monitoring			Showed an outside perspective to governmental effectiveness

5.1.3. Settlement Focus

As explained in the Literature Review of Chapter 2, the scientific community features more publications on NbS and rural areas, rather than urban. Settlement type was therefore discussed during the interviews to determine whether this was purposeful, or whether there were underling organizational trends that influenced the matter. Interviewees representing Works Implementation departments and the Higher Education Institution tended to

acknowledge the importance of implementing NbS in different settlement types. They made comments such as: *"You asked me, in urban or rural? But I say, it should be something that should be holistic that connects the rural with the urban"* (I5, Line 180). On the other hand, those representing Policy Enforcement showed more interest in investing in rural areas, due to reasons such as higher ecological value. All the interviewees shared their theories to why rural projects might be receiving more funding and focus but were unable to confirm whether or not this is actually the case (I1, Line 201).

The most valuable knowledge that came out of discussing settlement focus on NbS was that the prioritization of one over the other was linked to the lack of capacity within the central government. I8 acknowledged that both urban and rural have their own challenges that need to be addressed by NbS. However, without the capacity to do so, central government organisations were forced to have to prioritize between the two:

> "I think it's an issue of capacity. You don't have to prioritize one thing over the other. If we have a good agricultural department, which involves communities and so on, and a good planning sector, and a good number of opportunities for stake holders to propose projects. You don't have to prioritize anything. You just have to support his sector which is becoming more and more important" (I8, Line 182).

Further information on Capacity can be found in Chapter 5.3.1.

Table 8 below summarizes the opinion on the Interviewees on their opinion on the importance of settlement type and NbS, as well as the suggestions they proposed as to why urban NbS might be taking priority over rural NbS.

Table 8 Summary of the collected information on settlement focus of NbS by different employees of the public sector

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Settlement focus of NbS	Feel NbS should be equally implemented in both urban and rural areas	✓	X	✓	✓	X	X	✓	✓
Suggested reasons to trends		Urban spaces have more urgent problems in comparison to rural spaces	N/A	N/A	N/A	Rural areas have a higher ecological value than urban areas; Urban areas have a higher political priority over rural areas	Urban project can be more easily economized	Urban areas directly affect more individuals than rural areas	Prioritizing one settlement type over the other indicates a lack of capacity; Rural NbS have a lower tendency to be officially called NbS

5.2. Adaptability

5.2.1. Change management

Change management is a systematic approach that allows an organisation to transition in such a manner that allows it to effectively carry out its function and achieve its goals. The term

was not directly referred to during the interviews. However, during the data analysis, a total of ten statements were linked to this concept.

Only I1 indicated that the employees in their department underwent some form of mandatory regular training.

The ability to internalize new concepts indicates a high sense of adaptability, as suggested by Denison and Mishra (1995). Most interviewees failed to indicate some form of ongoing educational program within their department. In fact, one suggested that the lack of awareness on emerging concepts such as NbS stemmed from *the lack* of continuous education within the organization, as they said that:

> *"We need to make it clearer what a nature-based solution is, and we need to put it out there so that people can understand it. Designers, architects, businesspersons. Because, once these people can understand it, then they can use it. They cannot use something they are not even aware of, after all"*
> *(I4, Line 240)*

Nonetheless, all interviewees showed a keen interest in obtaining new knowledge and making use of more effective systems to better enable them to carry out their goals.

Whilst project coordinators and policy enforcers within the public sector show a desire for growth and change, the systems in place to facilitate this are still in the early stages of being set up, and therefore, not yet adequate.

> *"[New sustainable initiatives by the government] are a step in the right direction, but of course, more innovation from the people implementing these projects could have led to more benefits, rather than for example, just having trees growing along the streets" (I8, Line 108)*

I8 additionally tied this lack of change management to the lack of capacity within the government.

Whilst there are early signs of adaptive governance, particularly by I1 and I6, there are also high indicators that there is a lack of growth within the central government. There is a lack of ability to obtain new knowledge and effectively internalize it and make use of it, suggesting a lack of effectiveness, according to Denison (1989). Table 9 below sums up the major findings on change management identified during each interview and organized according to the three department roles identified.

Table 9 Summary of the collected information on change management within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Change Management	Showed keen interest in new knowledge and concepts	✓	✓	✓	✓	✓	✓	✓	✓
	Undergo regular mandatory training	✓	X	X	X	X	X	X	X
	Feel there is a system to guarantee growth and adaptation	X	X	X	X	X	X	X	X
Comments		**Are looking into innovative solutions by working with stakeholders.**				**Are looking into innovative solutions by working with other departments and other governments**			**Believes the lack of change and innovation is a cause of a lack of capacity within the central government**

5.2.2. Organisational Learning

Whilst change management refers to the system that facilitates the adaptation towards a more efficient organisation, organizational learning refers to the process that allows an organisation to collect relevant information to do so. Strong organizational learning practices would require the organization to continuously collect new information and transfer it to the rest of the organisation. A total of sixteen statements from the interviews were linked to the concept of organisational learning.

Through the interviews, it became evident that the central government had indeed organized activities to promote learning on NbS. This includes workshops as well as conferences.

> *"We used to attend organized sessions [of the ReNature Project]. Apart from this, we are also exposed to different conferences. Recently, for example, I attended a youth conference that was organized by our Ministry. Here, there were a number of experts present where we can be exposed to new ideas by youths, in this case, ... systems, which are studied by both local experts as well as foreign experts that came from abroad to teach us"*
> *(I1, Line 37).*

Not all attendees of such workshops shared the same sentiment on their benefits, finding the workshops unnecessary, and not all the central government sectors were offered the opportunity to participate to begin with.

I3 and I6 have taken it upon themselves to educate themselves and their unit about emerging concepts by looking at projects being implemented abroad. Whilst it is ideal that countries look towards each other for inspiration, each central government organisation requires an independent system to guarantee the continuous education of its staff.

"You can't just copy a project that was carried out abroad. We have to find projects to model after in countries that are more similar to our own…This is how nature-based solutions should be carried out. Guided by other projects that have had a successful result within the Mediterranean region"
(I3, Line 237-241)

Overall, most of the interviewees expressed that, even though there have been initiatives to educate employees about new concepts such as NbS, there is still a lack of ongoing education throughout the central government, and therefore, a lack of understanding of NbS. Quotes from the interviewees that indicate the lack of understanding include:

"But their level of knowledge or their level of awareness – and when I say awareness, I don't just mean the understanding of the term, but also getting into the social, economic and ecological benefits of NbS, as we've been discussing…. It is - it is very lacking. In that sense, you won't really find who goes into a project with that kind of insight. Apart from the fact that they don't have the time to do any research" (I5, Line 74)

Once again, this shows a lack of ability to respond to the changes taking place outside of the organisation, and a lack of ability to restructure the organisation based on those changes. According to Mishra (1989) this is a high indication of ineffectiveness. In Table 10, the major findings on organisational learning identified were summarized and organized according to the three department roles identified.

Table 10 Summary of the collected information on organisational learning within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		**I1**	**I2**	**I5**	**I6**	**I3**	**I4**	**I7**	**I8**
Organisational learning	Attended some form of NbS training	✓	✓	Unk	✓	Unk	X	X	✓
	Feel there are enough ongoing opportunities for NbS education within the government sectors	X	X	X	X	X	X	Unk	X
	Feel there is a sufficient understanding of NbS in the governmental sectors	X	X	X	X	X	X	Unk	X
Comments		Feel there is a lack of education and awareness on NbS. Received NbS training				Feel there is a lack of education and awareness on NbS Did not receive NbS training			Apart from receiving NbS training, I8 was also part of an initiative to educate other departments on NbS

5.2.3. Transparency

Transparency in this context refers to the available information governmental officials and citizens have that allows them to understand the decisions being taken on sustainable topics such as NbS. The information relayed was related to the lack of trust Maltese citizens seem to have in the Maltese government, even though the latter has made significant efforts to become more sustainable over the past years. Citizens feel that they are not adequately informed of the decisions being made and the information being collected internally (Informal communication, 2022). I4 actually confirmed this by admitting that some reports are intentionally kept out of the public domain (Line 140)

Another interviewee shared their struggle in adequately communicating information with the general public, such as when they were discussing the modification of rural roads, explaining that the public may have their own concerns which cause bias (I1, Line, 57)

However, the need for transparency between the government and citizens is understood, and efforts have been made to bridge this gap. Several sustainability reports and strategies have been publicly published, such as the National Biodiversity Strategy and Action Plan 2012–2020 mentioned in the Case Description (Chapter 4). Additionally, attempts have been made to publish documents related to ecological restoration projects, such as associated restoration reports for the general public. One interviewee stated *"you can even look it up. It's public, this Restoration plan" (I3, Line 108)* when they discussed a particular ecological restoration project in a valley known as Wied Għollieqa. They further elaborated that the Restoration Report for this project had been published online with information such as Conditions of Work, Justification and Aim of the project, as well as a Brief Project Outline. Whether the general public knows about these reports and where to access them is still uncertain. However, it is important to note the efforts being made towards establishing a stronger sense of transparency.

Of course, transparency also refers to that within the different departments and sectors of the central government itself. Most governmental officials indicated a lack of coordination between the different sectors, or within a department itself, and therefore a lack of awareness of the work and goals of the organization. I1 (Line 49) laments how less than 20% of civil servants working on a project actually understand the full scope, also showing a lack of coordination that will be elaborated on in Chapter 5.3.2 (Coordination).

> *"Don't ask me how a decision is taken haha – it does not fall within our ministry's remit. I have no idea" (I2, Line 195)*

Table 11 below sums up the major findings on transparency identified during each interview and organized according to the three department roles identified.

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Table 11 Summary of the collected information on transparency within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Transparency	Feel there is a lack of transparency between the different departments within the central government	✓	✓	✓	✓	✓	✓	✓	✓
	Feel there is a lack of transparency between the central government and the general public	✓	Unk	Unk	Unk	Unk	✓	Unk	Unk
	Shared examples of efforts to increase transparency between the central government and the general public	✓	X	X	X	✓	✓	X	X
Comments		Acknowledge the need for more transparency between their department and other departments, as well as with the general public				Acknowledge the need for more transparency between their department and other departments, as well as with the general public			Acknowledge the need for more transparency between their department and other departments, as well as with the general public

5.2.4. Trust

Once again, trust in the context of this thesis refers to both the confidence of the general public in the central government, as well as the confidence different governmental officials have in other departments within the central government itself. A total of nine statements were linked to the code Trust.

Locals seemingly have a good relationship with their local council (local government) and tend to work hand in hand together. However, the link between local councils and the central government is not that strong, and neither is that between citizens and the central government. This lack of transparency, which has already been discussed, leads to a lack of trust, and resistance to the initiatives being set up. One interviewee stated that *"We have individuals that tolerate [our projects], and other individuals who do not" (I1, Line 106)* and that:

> *"People usually already have faith in their local council members. They*
> *can say, "at least we are working with individuals we know and not those*
> *that we don't"... And this is why there are projects that I would say have*
> *gotten vandalized or were damaged by these individuals " (I1, Line 111)*

The lack of transparency identified in Chapter 5.2.3 has also been linked to a lack of trust by citizens in the government, as suggested by Frantzeskaki (2019). The lack of information

accessible to the general public renders them clueless to the works and decisions being taken at a central government level. I3 notes that *"People are sceptic"* (Line 233) especially due to a lack of previous success stories.

Another reason linked with a decreased sense of trust is the use of Greenwashing. The unnecessary use of green terms could have led locals to expect certain benefits or results that were not met.

> *"I fear that there is always a risk that a new term is picked up, like the term nature-based solutions, because it is good coinage in the political sphere to gain milage with. It is used as a label, for branding, but ultimately when you try to find the qualities of the project, and you carry out an in-depth sustainability check, you will find that … when you assess it, it won't score so many points if you had to use a standard sustainability audit framework" (I5, Line 199)*

In terms of trust within the central government itself, there seems to be a lack of it between one department and another as a result of the lack of coordination between departments, as will be discussed later on. It leads to governmental officials questioning the projects of other departments and the methods they adopt to carry out their goals. I2, in fact, shared their frustration and doubts about projects being run by another department (Line 203).

Table 12 below sums up the major findings on trust identified during each interview and is organized according to the three department roles identified.

Table 12 Summary of the collected information on trust within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Trust	Are confident in the methods adopted by other departments	X	Unk	X	Unk	X	Unk	✓	X
	Feel there is a good sense of trust by the general public in the central government	Unk	X	Unk	Unk	X	Unk	Unk	X
Comments		**Lack of trust in the methods being adopted by other governmental departments**				**Acknowledge the inhibitions a lack of trust causes**			**Lack of trust in the methods being adopted by other governmental departments**

5.3. Bureaucracy

5.3.1. Capacity

In an organization, capacity refers to its ability to carry out the necessary work for it to function. It ensures that all the required resources are available, whether they are of a fiscal, human or otherwise. Although capacity was rarely mentioned directly during the interviews, the extent of its effects was observed indirectly all throughout. This indicates that central

government employees have not yet acknowledged the extent of its effects, even though it is significantly affecting them.

I8 was the only interviewee who directly spoke about capacity, several times, in fact. They suggested that the shortcomings of the different elements of organizational effectiveness were partially due to the central government's lack of capacity. *"I think that the government has low capacity ... and it's not investing enough in new things and it's understaffed and when it comes to policy making, you're always following not leading" (I8, Line 54).* A weak capacity would entail that employees continuously need to prioritise tasks and focus on keeping up with mandatory goals, rather than exploring new concepts (Line 54), also commenting on a *"lack of capacity of research"* (Line 71)

Interviewees discussed capacity in terms of the other variables, such as settlement type for NbS implementation and adaptation. I8 believed that, for example, there shouldn't be a need to prioritize between a settlement focus for NbS and that both urban and rural areas can provide significant benefits. They stated that *"I think it's an issue of capacity. You don't have to prioritize one thing over the other ... You just have to support the sector which is becoming more and more important" (I8, Line 182).*

Other interviewees referenced a lack of human resource capacity. For example, one interviewee explained that the architects and engineers within the department lacked the time to research emerging concepts related to their field, by stating that:

> *"Their level of knowledge or their level of awareness ... is very lacking. In that sense, you won't really find who goes into a project with that kind of insight. Apart from the fact that they don't have the time to do any research."*

Table 13 below sums up the major findings on capacity identified during each interview and organized according to the three department roles identified.

Table 13 Summary of the collected information on capacity within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Capacity	Indicated a lack of resources to carry out their tasks	✓	✓	✓	X	X	✓	✓	X
Comments		N/A				N/A			Suggest the lack of capacity is the biggest cause of ineffective NbS uptake and implementation

5.3.2. Coordination

Similar to capacity, coordination proved to have a significant role in organizational effectiveness, and therefore in the use of NbS by the central government in Malta. Coordination refers to the organization of different elements, particularly in complex systems, to ensure that they work together in an efficient manner. In the context of this thesis, it primarily refers to the coordination of central government bodies to ensure that NbS is understood and implemented effectively and as necessary.

Coordination was a popular topic, with some interviewees expressing positive sentiments, such as by acknowledging their role and responsibilities as representatives of their department to coordinate (I7, Line 62), while others facilitated coordination within their department by instating their own initiatives, such as *"the implementation of a team of people whose job it is to monitor projects." (I6, Line 480)* and by organizing boards to represent different individuals from different backgrounds (I1, Line 65).

This is a good sign of bureaucracy, as it indicates a standardizes system of management. This work approach allows individuals within an organization to clearly determine their role and their expected goals and allows them to efficiently carry them out, confirming the research by Nurdin on understanding organizational barriers (2011).

Conversely, most interviewees expressed a feeling of frustration at the lack of coordination between the different departments. Employees were not always aware of what the full set of responsibilities of their department was, creating uncertainties about whose remit they fall under. This situation gives rise to two main issues. The first is that certain tasks are not carried out by a department because *"It's difficult speaking to everyone" (I1, Line 139)*. The second is that two or more departments would be simultaneously (but unknowingly) working on the same tasks or issues.

Comments such as these indicate bad bureaucracy, that is managed by a lack of coordination and an inability to implement effective work or concepts such as NbS (Nurdin, 2011). Employees acknowledged that *"the problem is that Malta is very fragmented. In regard to a lot of different things. ... This fragmentation even reaches the local council level." (I1, Line 135).* They also acknowledged that, in general, governmental employees have a very individualistic mentality and are not proficient at working in a group dynamic. The same interviewee continued to say that *"there is this disconnection, whereby everyone is working individually. I don't think this is the way things should be. We need to 'connect the chain'" (I1, Line 197).* This was further discussed by I8, who expressed that the severe sense of fragmentation within the country was due to people's inability to collaborate.

They later went on to explain that the lack of coordination was not just negatively impacting NbS in the country, but other fields related to its development. Interviewees voiced their desire for better communication within the central government so that they could not only share ideas but also better coordinate their roles and goals:

> *"There needs to be more collaboration and more discussions. I'm talking about inter-ministerial discussions" (I3, Line 301). "This includes internal discussions at all levels on all subjects" (I3, Line 189)*

The lack of coordination (and the resulting fragmentation), together with a lack of capacity, were identified as the biggest issues in organizational structure that were inhibiting the

effective uptake and implementation of NbS within the central government. They caused the biggest sense of frustration among the interviewees, and elements of the two traits were interlaced throughout the entire set of interviews.

Apart from a lack of coordination, there was also evidence of a lack of communication between departments, particularly evident in the NbS project meeting. For example, during the meeting, different individuals from different departments asked each other several questions on what projects each department was conducting, to determine the available resources to conduct the project. Table 14 below sums up the major findings on coordination identified during each interview and organized according to the three department roles identified.

Table 14 Summary of the collected information on coordination within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Coordination	Provided examples of good coordination practices within their department	✓	X	X	✓	X	X	X	X
	Feel there is a good sense of coordination within the central government	X	X	X	X	X	X	X	X
Comments		Acknowledge the lack of coordination between the departments but have shown strong indications of coordination within their own department				Acknowledge the lack of coordination between the departments and suggest that internal communication needs to be significantly increased			Acknowledge the strong element of fragmentation within the central government and the high sense of individualism in the workplace

5.3.3. Hierarchy

Hierarchy refers to a system whereby different individuals in an organization have different levels of authority based on their rank. In terms of NbS, it would refer to the hierarchy of power that affects the decisions on the use of NbS within the central government. During data analysis, a total of nine quotes were associated with hierarchy.

Whilst top-down and bottom-up management strategies each have their advantages and disadvantages, the full benefits of NbS can only be experienced when a bottom-up approach is adopted. This is because NbS functions best when there is room for innovative ideas and a platform for full stakeholder involvement.

> *"I think everything is top-down, and I think that is one of the reasons that we are not innovative, because we are not challenged, and we are not going out of the normal way of working" (I8, Line 132)*

The ideal use of NbS entails the identification of a challenge followed by a brainstorming process with all the stakeholders to determine the best (and potentially innovative) approach to address it. This is not currently a common practice within the central government in Malta. Instead, projects are determined by individuals high up the hierarchy and passed on to different units or individuals for their implementation. Many interviewees commented on this hierarchy, insisting that most projects are just handed down from higher-ups.

> *"There is this need because a project is generally designed on request or after a particular decision. It is designed, implemented, and very often it is handed over to the local council or whomever it is that will be managing it" (I5, Line 110)*

This information confirms the lack of stakeholder involvement discussed in Chapter 5.1.2. Additionally, it indicates a sense of frustration in governmental employees, particularly when it makes them feel like they lack a sense of authority. Good bureaucracy is meant to create a sense of standardized management. However, as Nurdin (2011) explains in their research on organisational barriers, bad bureaucracy renders employees feeling a lack of authority to carry out their tasks, and therefore suggests ineffectiveness in the organisation.

> *"It feels at times useless to plan certain projects when you know that at any point, a ministry consultant can go up to the minister and ask if it would be fine to place the drains here and there, randomly" (I6, Line 126)*

A hierarchal system does not necessarily imply that stakeholders are not involved. In fact, a strong management approach still includes the consideration of all the different levels within the hierarchy. I1 used slow streets as an example of a bottom-up approach, stating that *"It is the people that requested this. They brought our attention to the fact that there is a need for a focus on the central areas" (Line 148)*

Situations like these indicate a lack of flexibility, and therefore a lack of adaptation (Seddon et al., 2020), as discussed in Chapter 5.2. Table 15 below sums up the major findings on hierarchy identified during each interview and organized according to the three department roles identified.

Table 15 Summary of the collected information on hierarchy within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Hierarchy	Expressed frustration with the management of the current central governmental hierarchal system	X	✓	✓	✓	X	X	X	✓
Comments		**Confirm that they implement projects handed to them from higher hierarchies, rather than based on the feedback of individuals from lower levels of the hierarchy**				**N/A**			**Links the lack of innovation to the top-down management approach currently in use for NbS-related fields**

5.3.4. Regulation

Regulation in the context of this thesis refers to a system of rules that guide the application and management of NbS in Malta. During the Literature Review, no local regulations or frameworks were identified in such a context. The Interviewees confirmed that the closest existing regulations were on topics such as afforestation or ecology. Regulation was therefore discussed in terms of such documentswith mentions of specific guidelines (I3, Line 80 and I7, Line 122).

The hard regulations are enforced by the policy enforcement departments, as confirmed by I3: *"Yes, our priority is to make sure is that the national policies are being followed" (Line 76).* However, it became evident that most existing documents on sustainability, ecology and similar topics are *"not really mandatory. They can be considered more as soft legislation – they are a policy, but they are not regulations"* (I3, Line 88). This was later confirmed by I6 (Line 61).

Additionally, comments were made regarding how applicable these regulations are to day-to-day use.

> *"Theory and practice are a little different. In theory, there are quite a lot of guidelines such as frameworks, that I'm sure work very well in theory. But I'm not sure how translatable they are to real-life scenarios and how suer-friendly they are" (I3, Line 94)*

Whilst local regulations should provide room for innovation and creativity, structure is necessary to obtain realistic goals and visions. The lack of regulations and guidance documents leaves individuals from the Work Implementation sectors uncertain about the approaches they adopt to implement existing measures and decreases the coordination of the works being implemented by different units and departments. This lack of guidance documents and regulation suggests that a vision in terms of sustainability and therefore of concepts such as NbS is lacking. Without setting a goal and identifying the best approaches to implement it, reaching the goal becomes almost unattainable.

Table 16 below sums up the major findings on regulation identified during each interview and organized according to the three department roles identified.

Table 16 Summary of the collected information on regulation within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Regulation	Know of existing local regulations on NbS	X	X	X	X	X	X	X	X
	Feel that local regulation on NbS-related topics provides adequate guidance	X	X	X	X	X	X	X	X
Comments		N/A				N/A			N/A

5.4.   Involvement

5.4.1. Commitment

In contrast to most of the other organizational traits, commitment was strongly present throughout all eight interviews. It refers to how dedicated each employee is to their work and to accomplishing or exceeding what is expected of them. In terms of this thesis, it also refers to how enthusiastic each employee is to learn about and incorporate new concepts such as NbS.

There were different indicators of commitment in the interviews. The first indication each interviewee provided was their enthusiasm to take part in these interviews, to share the fruits of their labour and to contribute towards science. All the individuals approached to take part in the study happily agreed, and no one declined.

Another indication was the voluntary interest employees displayed to attend courses for their own knowledge and education on matters related to their fieldwork. For example, one interviewee stated: *"We within the department need to attend courses and sessions so that we can interact with other individuals working in this field" (I1, Line 25).* Others showed an enthusiastic interest in collaborating with other individuals or departments in hopes of raising overall awareness on topics such as NbS and increasing the overall coordination and capacity for its implementation. *"We need to make it clearer what a nature-based solution is, and we need to put it out there so that people can understand it"* (I4, Line 240)

> *"We are discussing how we can make the existing connection better" (I3, Line 56)*

Care also seems to be taken in carrying out their individual roles. Interviewees spoke about their projects with a sense of pride and meticulousness, once again indicating a strong sense of commitment. This is in fact what commitment is meant to instigate; a sense of enthusiasm towards something increases the overall effort that is put into it and ensures it is completed as well as possible. The comments made by the interviewees certainly indicate this, such as:

> *"It is definitely being implemented. We are being very careful that everything that is requested by law is actually carried out" (I3, Line 149)*

There is also a desire to learn more and to be able to take better-informed decisions, once again, showing a high sense of dedication towards their role. One interviewee shared this desire by expressing an interest in understanding certain processes better, by saying: *"I think the consultation process… We need to understand it better" (I7, Line 181).* Another expressed their sense of interest by admitting that their department hired experts to provide a perspective on particular projects they were carrying out: *"There were a number of experts and advisors, that have even told us sometimes ... that certain projects… would look really, really small." (I1, Line 119).*

It is worth mentioning that although all of the interviewees showed a strong sense of commitment, there is no guarantee that other central government employees share the same enthusiasm. The conversations carried out during the interviews indicated a high level of commitment from all employees working in the environment and sustainability sectors. However, no comments were made to indicate the commitment of employees in other sectors, which ultimately still affect NbS implementation.

Table 17 below sums up the major findings on commitment identified during each interview and organized according to the three department roles identified.

Table 17 Summary of the collected information on commitment within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Commitment	Emotionally committed to their department's objectives	✓	✓	✓	✓	✓	✓	✓	✓
	Voluntary initiatives to share and learn information related to their field of work	✓	X	✓	✓	✓	✓	✓	✓
	Enthusiastic about the work they carry out	✓	X	✓	✓	✓	✓	✓	✓
Comments		**Highly enthusiastic about their work role and excited to share it with others**				**Highly enthusiastic about their work role and excited to share it with others**			**Highly enthusiastic about their work role and excited to share it with others**

5.4.2. Participation

Participation refers to the involvement of employees and stakeholders in NbS-related decisions. It is important as it creates a platform for the sharing of knowledge. During the

interviews, there were a total of six statements that were linked to the concept of organizational participation. Little information was shared on internal participation. However, the interviews suggested that participation within the central government itself is relatively high. This could potentially tie into the low human resource capacity that has already been discussed, as employees would be required to actively participate in the different ongoing projects within the central government to make up for the lack of staff. However, it also contributed to the increased sense of involvement, which is reflected in the high sense of commitment that the interviews brought out. This is a positive sign of involvement and therefore of effectiveness, according to Denison and Mishra (1995).

Participation also refers to that of stakeholders. I1 and I6, both employees of Ambjent Malta, showed a positive effort in involving stakeholders in their projects and their work. This can be seen from I1 (Line 17) and the following statement:

> *"This project will help provide the locals with tools to assist them further by, for example, providing them with larger spaces to grow their own vegetables" (I6, Line 20)*

On the other hand, individuals from the Policy Enforcement acknowledged the difficulties of stakeholder participation. They explained that the documents being submitted by governmental authorities are not always user-friendly, and therefore do not encourage stakeholders to make use of them. Another interviewee made a reference to feedback sessions on governmental projects. However, once again, these are not always accessible or applicable and do not always encourage participation.

> *"In theory, there are quite a lot of guidelines such as frameworks, that I'm sure work very well in theory. But I'm not sure how translatable they are to real-life scenarios and how suer-friendly they are" (I3, Line 94)*

Overall, the interviews indicated a strong sense of organisational participation. This is beneficial as participation encourages individuals to commit and invest in projects or initiatives and increases their overall success rate. Table 18 below sums up the major findings on participation identified during each interview and organized according to the three department roles identified.

Table 18 Summary of the collected information on participation within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Participation	Indicated a strong sense of employee involvement within their unit/department	✓	✓	✓	✓	✓	✓	✓	Unk
	Indicated a strong sense of stakeholder involvement within their unit/department	✓	X	X	✓	X	X	X	X
Comments		**Creating initiatives to promote stakeholder participation in their department**				**Struggling to incorporate stakeholder participation in their department**			**N/A**

5.4.3. Partnership

In this research, partnership refers to the collaborating ability of different individuals to share resources and management responsibilities. This would apply to individuals within the same department, as well as individuals representing different departments or groups. Throughout the interviews, a total of 21 statements were correlated to the code 'partnership'. During the interviews, two main types of partnership initiatives by the central government became apparent. The first is between units or departments of the central government, and local councils, as confirmed by I1 and I6.

> *"We speak to local councils to see what they want for their locality. So, we*
> *give them the chance to collect feedback from the residents to apply for*
> *projects using the scheme we set up using their own ideas" (I1, Line 31)*

The second partnership identified was between departments of the central government. The NbS project meeting, for example, showed a positive initiative for different ministries and departments to partner up and share resources to carry out a large-scale national project. This was further confirmed through the interviews. For example, the interviewee representing ERA stated that they tend to partner up on projects with Ambjent Malta, and a representative from EWA commented on their interest in partnering up with ERA:

> *"We usually have an idea and then partner up with bodies like Ambjent*
> *Malta. We share our idea with them and ask if they would be willing to take*
> *it up" (I3, Line 72)*

One issue did arise when I4's organisation *"tried to include ERA from the first day ... But the issue, ... was that we ended up taking two months to agree on the way forward" (I4, 116)*. From the different interviews, it became clear that the concept of a partnership between different departments is still new. It is therefore expected that this still being refined, and that there are still issues that need to be ironed out before they can be considered efficient. In fact, two interviewees commented on how, even though partnerships are increasing between the

different departments, employees still have a very individualistic mentality and a limited ability to work with others.

> *"There's a lot of individualism, but there's a lot of this concept of fragmentation. Of people not knowing what's happening in the same organisation. The fragmentation is certainly caused, at least a bit, by the institution. But also certainly, there's an element of how the people are working and who they are working with and how open they are for collaborations" (I8, Line 247)*

Additional partnerships that were mentioned were with stakeholders such as NGOs, as was explained by I1, when they said: *"A lot of time we were speaking to NGO's who would communicate directly with us" (I1, Line 33).* All of these observations on partnerships have been summarized in Table 19 below, organized according to the three department roles identified.

Table 19 Summary of the collected information on partnership within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Partnership	Partnership with local councils	✓	X	X	✓	X	✓	✓	X
	Partnerships with other central governmental bodies	✓	✓	✓	X	✓	✓	✓	✓
Comments		Partnering up with both other ministries/departments, as well as with local stakeholders				Primarily partnering up with other ministries or departments			Primarily partnering up with other ministries or departments

5.4.4. Responsibility

Responsibility refers to the obligations bestowed upon each employee at their workplace. It is both a duty, as well as a right, as it provides employees with the power to carry out different tasks. Not only so, but employees with higher responsibilities tend to be more invested (and therefore more committed) to their work such as to ensure that the goals of the organization are achieved, as determined by Denison and Mishra (1995).

Only six statements mentioned responsibilities during the Analysis of the Interviews. Mixed results were collected, and therefore the overall responsibility value remains undetermined. Some interviewees indicated high levels of authority and therefore high levels of responsibility. I1, for example, communicated how they received information from local councils and from local farmers, and had the authority to include them in the project development process. They continued to say that:

"I think even when people feel that they are being heard and when they feel they can help out or be productive, I think something like this would even help keep them motivated in the future to continue being involved, and not feeling like no one is hearing them or that their efforts are pointless" (I1, 239)

Another interviewee stated that they *"have looked at how the Public Works can become more relevant" (I5, Line 13)* and were granted the authority and responsibility to reform it as they saw fit.

Other interviewees shared their opinion on how they feel their department could be improved. It remained undetermined whether they were granted any form or responsibility in carrying out such a change. However, there were also instances where the interviewees expressed their frustration at a situation, whereby they felt that they did not have the authority (or responsibility) to take action in particular scenarios. Statements such as the following communicated the feeling of expiration and lack of granted responsibility:

"By protecting the water course, you've basically protected nothing. It's not enough. But there's so much resistance that we've had to accept that it's either this or nothing. And the way it is now is better than nothing" (I3, Line 265)

The mixed results indicate that whilst the central government of Malta employees feel a good sense of responsibility, there is still room for improvement. The bad bureaucracy being practiced (determined in Chapter 5.3.3.) is contributing to a lack of involvement, and therefore a lack of effectiveness. A possible explanation for the mixed results would be that whilst responsibility is well distributed, the shortcomings of the other organizational traits are negatively affecting the sense of responsibility amongst the employees. Improving the other traits would therefore indirectly increase the sense of responsibility within the organization. Table 20 below sums up the major findings on responsibility identified during each interview and organized according to the three department roles identified.

Table 20 Summary of the collected information on responsibility within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Responsibility	Indicated high levels of responsibility within their department	✓	✓	✓	✓	✓	✓	✓	✓
	Indicated a desire for more authority in matters they felt responsible for	X	Unk	X	X	✓	✓	✓	Unk
Comments		**Indicated high sense of responsibility and the authority to carry it out**				**Indicated a good sense of responsibility but not enough authority ensure it was all being carried out**			**N/A**

5.5. Mission

5.5.1. Goal

Organisational goals refer to the set of objectives the organisation determines to define the expected outcomes and to guide the works carried out. This section of the study identifies what goals of the central government of Malta are related to NbS or similar fields. Additionally, it assesses the quality of the overall goals currently in place. A total of ten quotations were coded to 'goal'.

The first observation was that, as of yet, there are no goals set for NbS, particularly due to *"the issue of a lack of a proper understanding of the term NbS" (I1, Line 25).* There are goals set for similar concepts, such as sustainability. However, most goals seem to be absorbed from EU targets and regulations, and since the EU has not set any goals for NbS, neither has Malta:

> *"I think one reason you are not finding projects labelled as nature-based solutions is because, one requirement by the EU, when drafting a project, does not include a categorization of whether the project is nature-based or not" (I4, Line 32).*

Comments were also made that indicated that the goals at work are not always clear. Employees sometimes struggle to see the bigger picture or the goal they should be working towards. Instead, they find themselves asking *"What is our aim? What is our problem?" (I6, Line 126)*.

The employees are given short-term goals to work towards, without understanding what their long-term effect will provide. Whilst it is understandable that it is impossible to disclose all

the information to all employees, the absence of a proper goal can leave them feeling unmotivated or unsure of what they are meant to accomplish, confirming the research conducted by Denison and Mishra (1995) on organisational barriers. For example, one interviewee mentioned that their unit was responsible for creating reports. However, there was no active plan to use such documents, and they often felt like they were carrying out work without a purpose:

> *"Sometimes there are other types of projects, such as Interreg, that are more focused on producing a report. And sometimes, when the report is published and perhaps published on a website that doesn't get that many views or placed on a shelf – I would say it's a waste of money" (I4, Line 140)*

Another example was the acknowledgement that greening initiatives were carried out without an aim or a purpose:

> *"We are doing greening, but greening for what reason? Aesthetics in many cases, uhm and that's okay. But I think the link – the challenges are often weak" (I8, Line 30)*

Comments like these show that the goals currently present in the central government of Malta are primarily short-term ones, lacking a bigger Vision (as will be discussed in Chapter 5.5.3). The interviewees showed a desire for clearer goals and an acknowledgement that investing in them would increase the overall quality of the results rendered by their department. This can be observed in statements such as the following:

> *"When we come to carry out a project, ideally, we define the project needs well ahead and with a certain clarity. And those project needs are evidence-based, so this means that some form of research was done. To me, it is not enough that a local council member comes up to me and asks for a playing field" (I5, Line 90)*

The inability to work towards a common vision or direction brings about a lack of success, such as lack of ability to implement NbS. This further backs up the research conducted by Denison and Mishra (1995). Additionally, the NbS project meeting showed that even though goals are sometimes present, they are not always properly communicated to the rest of the employees within a department . This often resulted in the uncertainty of the goal of the works being carried out and the approached that would be required to obtain it. Table 21 below sums up the major findings on goals identified during each interview and organized according to the three department roles identified.

Table 21 Summary of the collected information on goals within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Goals	Work on short-term goals	✓	✓	✓	✓	✓	✓	✓	✓
	Work on long-term goals	✓	Unk	✓	✓	X	X	X	✓
	Desire more structured goals to work towards	✓	X	X	X	✓	✓	X	✓
Comments		Feel a sense of lack of long-term goals but create their own long-term goals to work towards				Feel a sense of lack of long-term goals and would like to be provided with them			Feel a sense of lack of long-term goals but create their own long-term goals to work towards

5.5.2. Strategy

A strategy is a long-term plan set in place to guide its users in accomplishing its overall aim, or vision. Considering that employees within the central government of Malta feel uncertain about the vision they should be working towards (discussed in Chapter 5.5.3.), it makes sense that the findings from the interview also indicate a weak sense of strategy within the central government. In fact, the lack of guidelines was a recurring theme in the interviews that almost every interviewee mentioned. A total of twenty-eight quotations were associated with the theme *strategy*, making it one of the most discussed themes during the interviews. One interviewee mentioned that strategy (or lack thereof) is also a topic highly discussed at the place of work, as they said:

> *"This element of lack of guidelines or lack direction, so to speak... I think it has been something which a lot of different people mentioned, which... made such a difference in this topic specifically. But it's a recurring theme which keeps coming up" (I7, Line 164)*

During the interviews, individuals from the Policy Enforcement sectors spoke more positively about guidelines and existing strategies. They were successfully able to mention specific strategies or guidance documents and used them as examples of strategies within the central government of Malta.

Even though Policy Implementing representatives acknowledged the existing strategies, they also acknowledged that the existing guidelines are not currently as informative or user-friendly as they should ideally be. Policy Implementing representatives still acknowledged that *"There should be some sort of guidance or initiatives such that project developers will go over and above the bare minimum" (I3, Line 193)* and that *"there's no framework guiding this…" (I7, Line 67)*

In contrast, all four interviewees representing the Works Implementation department expressed that they did not find the existing strategy and guidance documents informative enough. This applies to all environmental-related fields, but also to NbS specifically.

> *"Guidelines … guidelines don't exist" (I5, Line 78), "the guidelines need to be more holistic and intuitive on how NbS is understood and worked out, and then the principles can be adopted. It's not just about copying out details" (I5, Line 82)*

The result of this lack of guidelines is uncoordinated work and efforts, as discussed in Section 5.3.2. And whilst individuality and creativity are beneficial, uncoordinated efforts tend to generate insufficient results.

> *"The current guidelines are a limitation. I think this is another example of what I was mentioning before: the lack of capacity primarily, the lack of guidelines, the lack of tools and guidelines to work at a local stage" (I8, Line 71)*

Table 22 below sums up the major findings on strategy identified during each interview and organized according to the three department roles identified.

Table 22 Summary of the collected information on strategy within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Strategy	Feel that the available strategy and guidance documents are insufficient	✓	✓	✓	✓	✓	X	✓	✓
	Carry out their work based on a personal interpretation of existing documents	✓	✓	X	✓	X	X	X	Unk
Comments		Acknowledge the lack of guidelines and show a strong desire for clearer and more guided strategy documents with which to implement their work				Feel that the existing guidelines are sufficient, but can be improved			Acknowledge the lack of guidelines and suggest it is due to a lack of capacity and coordination

5.5.3. Vision

Whilst goals are set milestones created to achieve specific results, vision refers to the result that is visualized before it is achieved. The results collected and determined for this section are closely related to those in Section 5.5.1 on *goals*. The same quotes that determined the results for *goals* were also used to provide insight into the status of NbS Vision with the central government of Malta. An additional five quotations were coded to *vision*.

In the same way that, as of yet, there are no goals set to incorporate the use of NbS, there is also no set *vision* that specifically uses the term NbS. Additionally, there is a lack of overall vision within the central government, which causes most of the goals to be set for a short-term period or that is isolated from the bigger cause. This work etiquette leaves employees wondering what the purpose of their work and effort was for, as can be seen in comments such as the following:

> *"Sometimes I think we carry out projects that, once they are over, or perhaps two years down the line, we look back and think, what did we actually gain from this?" (I4, Line 148)*

Once again, the interviewees communicated a desire for more structure in the organization of their work, such as by having a clearer vision in terms of what their department is meant to achieve in the long term. The lack of vision indicates a lack of mission, as well as a lack of success, according to Denison and Mishra (1995). One interviewee suggested that a solution to this would be the following:

> *"I believe that for a plan of NbS to be effective, it needs to consider everyone and please everyone. So there needs to be an action plan of five*

years, ten years, that builds on good consultation approaches with all these individuals" (I1, Line 185)

Out of all the interviews, only one individual was confident enough to speak about the visions of their department and guided the interviewer to the online website where the objectives of the department were listed down. They shared that the vision of their department builds on *"The Mission Statement [that describes] the idea of emerging challenges of climate change in the sustainable development goals" (I5, Line 31).*

The lack of vision also came to light during the NbS project meeting attended. Participants showed high levels of uncertainty of what the end-goals of the project was, and unable to understand the overall results they would be working towards. Table 23 below sums up the major findings on vision identified during each interview and organized according to the three department roles identified.

Table 23 Summary of the collected information on vision within the Maltese central government

Department Role		Work Implementation				Policy Enforcement			Higher Education Institution
Interviewee Reference		I1	I2	I5	I6	I3	I4	I7	I8
Vision	Are confident and aware of their department's vision	✓	Unk	✓	✓	X	X	X	✓
	Feel there is a lack of vision within the central government	✓	Unk	✓	Unk	✓	✓	✓	✓
Comments		Feel a sense of lack of vision but created their own vision to work towards				Feel a sense of lack of vision and would like to be given one			Feel a sense of lack of vision but created their own vision to work towards

5.6.   Additional findings

Apart from the conceptualized concepts that were pre-determined prior to data collection and analysis, other emerging themes prevailed during the interviews. Interviewees showed a high sense of enthusiasm in their workplace, but also a sense of frustration in the lack of authority to carry it out. This was already discussed at several instances throughout the rest of the data collection. Employees feel a lack of authority in their role when they feel that they cannot conduct their work properly, or when they feel other people are working on projects related to their field without directly communicating with them. This can be seen in comments such as the following, whereby the interviewee questions the approaches being adopted by other governmental departments:

"You can see how they are being fixed, if you can call it so... In my opinion they are not being improved, but anyway…. They are being covered in

> *concrete; they are being covered in a whole layer so that they can be*
> *beneficial for whoever is working there" (I1, Line 49)*

The frustration is allocated to a misdirected sense of bureaucracy, that leads to a lack of authority and participation, as well as a sense of demotivation in employees. Once again, this can be seen in comments such as:

> *"It feels at times useless to plan certain projects when you know that at any*
> *point, a ministry consultant can go up to the minister and ask if it would be*
> *fine to place the drains here and there, randomly." (I6, Line 126)*

Another emerging theme that was briefly touched down on is the large resistance that governmental projects receive from landowners. This has already been linked to the lack of trust in the government. However, it creates a negative loop whereby governmental officials receive significant resistance in projects, particularly large ones. Comments made during interviews that indicated so include:

> *"A big project involves more stakeholder. More landowners... whilst if you*
> *are working with a smaller scaled project, there would have been less*
> *stakeholder involved. Less implementation time. Scale does make a*
> *difference. I would say the biggest challenge would be to achieve the*
> *approval of all stakeholders" (I2, Line 131)*

6. Discussion and conclusion

This final chapter ties in the collected results to the objectives of the thesis and answers the research questions provided in Chapter 1, Introduction. Each sub-question will be addressed separately and then tied to the main research question. In this chapter, reflections are presented upon related theories that were discussed earlier in Chapter 2, Literature Review and the possibility of further develop these theories is discussed. The chapter is finally concluded by the provided recommendations to remedy existing barriers in NbS effectiveness, and suggested studied to address the study's limitations.

6.1. Findings of the study

6.1.1. Current implementation of NbS by central governments

To understand the effect of organizational structure on NBS effectiveness, the first step was to gain a deep understanding of how NbS is currently being implemented. This section shall therefore be dedicated to answer the first thesis sub-question:

How are central government bodies currently implementing NbS?

This thesis has focused on how central government organisations, specifically that of Malta, are currently using and implementing NbS. The desk study did not identify many initiatives directly labelled as NbS in Malta. However, it identified several initiatives with NbS properties such as the *'Assessment of urban recreation ecosystem services through the use of geocache visitations'* identified in the Oppla NbS Database. This database, along with others such as the UNA and the ReNature Compendium, identified projects in Malta with NbS traits, and showed that NbS are being implemented; they are just not being called so.

The findings of this study confirmed that initiatives with NbS traits are indeed being implemented, such as through the use of valleys as sustainable urban drainage systems to address stormwater flooding in urban and rural areas. Public authorities responsible for these works do not refer to them as NbS as they do not feel confident in the topic. Additionally, Malta's development does not have a formal structure in the sense of official policies, frameworks, or guidelines that directly mention the use of NbS. However, regional policies, such as the EU's Biodiversity strategy for 2030, recommends the use of NbS as innovative development tools that can be used to address societal and environmental issues such as emissions and climate change. This was confirmed both through both the desk study as well as during data collection of the study.

The lack of guidelines on NbS show that their implementation is dependent on the conceptual understanding of NbS by those implementing it. The findings of this study reveal that the Work Implementation sector of the Maltese central government have a limited understanding of NbS or a misguided understanding of the concept. This implies that NbS initiatives carried out by the central government risk not being implemented effectively due to the lack of a proper conceptual understanding. However, the Higher education Institution of the government displayed an extensive understanding of NbS. Whilst this confirms that there is existing knowledge on NbS in the central government of Malta, it also indicated that it is not being effectively transferred to those who need to implement it.

6.1.2. Effectiveness of NbS implementation by central governments

The EKLIPE Framework was identified as a practical tool to determine effectiveness of NbS implementation. This study has focused on determining the effectiveness of the central

government of Malta, and therefore made use of the tool to determine the overall NbS implementation effectiveness in the country. This section will be answering the second sub-question of the thesis:

How effective is the current implementation of NBS by central governmental bodies?

According to the EKLIPSE framework, there are seven detrimental stages to effective NbS implementation. These are *"1) identify problem or opportunity; 2) select NbS and related actions; 3) design NbS implementation processes; 4) implement NbS; 5) frequently engage stakeholders and communicate co-benefits; 6) transfer and upscale NbS, and the trans-versal stage of 7) monitor and evaluate co-benefits"*.

This study finds that the problem identification analysis was used as a first step in project selection. Additional influencers that were mentioned to influence the process were available funding and political priority. The overall result indicated a high level of effectiveness in problem identification. No substantial information, however, was relayed on NbS selection, design and implementation, indicating neither positive nor negative signs of NbS practices.

Stakeholder involvement was a common theme discussed during the interviews, and the data collected highlighted how it is in fact a legal requirement in many Maltese projects. This is particularly so since national legislation has started to include stakeholder involvement as a mandatory requirement. However, the legislation does not specify how stakeholder engagement needs to be carried out, and the results collected suggest that a limited form of stakeholder engagement is in fact taking place. At present, stakeholder involvement is being taken to refer to coordination with different governmental entities, whilst in fact, it should refer to the involvement of all those affected by the decisions, including citizens. Whilst 'stakeholders' are being invited to share their ideas on the project design and to take part in the implementation, the current approach being adopted indicates a top-down approach, rather than bottom-up, as should be the case. The lack of inclusive stakeholder involvement indicates a low sense of effectiveness NbS implementation.

On the other hand, upscaling initiatives in the central government indicated a high sense of effectiveness. The results of this study show how pilot studies are being utilized as a tool to collect any necessary information prior to carrying out full scale projects. The Policy Enforcement sector as well as the Higher Education Institution showed to be primarily responsible for implementing them. This shows a positive sign of coordination in the central government, as it is these two sectors that should be primarily responsible for collecting new information and disseminating their findings to the Work Implementation sectors for upscaling. The results also showed that the Work Implementation sector did not carry out pilot projects as commonly, but instead focused on carrying out full-scale projects.

Mixed results on NbS effectiveness were collected in relation to monitoring. Although this study shows how governmental employees are aware about the importance of monitoring, it is not always carried out. The two main causes for this were the lack of guidelines on monitoring procedures and the lack of capacity to effectively monitor every NbS project.

In summary, the current effectiveness of NbS implementation in Malta by central government bodies is relatively good. For Malta to display full effective NbS implementation, it would

require focused improvements in the approaches being adopted for stakeholder engagement and monitoring initiatives.

6.1.3. Organisational barriers in central government organisations

The third goal of this thesis was to identify barriers in organisational culture, and once again this was studied in the context of Malta's central government. The next section shall therefore answer the third and final research sub-question:

What organizational barriers are currently affecting the effectiveness of central governments?

Four potential organizational barriers were explored during the study. These four traits were foundational pillars to the conceptual framework, which was designed off other existing studies and frameworks. All four barriers showed a significant influence on the effectiveness of the central government of Malta.

The first barrier was adaptability, as the results indicated there was a severe lack of it within the central government organisation. There were no apparent systems in place to promote change management or organisational learning related to emerging concepts such as sustainability and NbS. The research showed that there is a lack of learning initiatives within governmental departments and a lack of systems to bring about growth and change. Even though there have been positive related initiatives, such as NbS awareness workshops, governmental employees still struggle to understand the fundamental meaning of NbS. Lacking signs of adaptability were also indicated by the lack of transparency within the central government. This can be particularly noticed in the lack of awareness in governmental employees in the works being carried out by different departments. The lack of transparency was closely linked to a lack of coordination, which itself generated a sense of distrust between different sectors of the central government.

The second barrier observed in organizational culture was the lack of good bureaucracy. The results indicated that this trait was the most prominent barrier in effective governance, particularly due to the lack of capacity. In fact, the central government of Malta has a lack of staff, policies, monitoring initiatives, guidance documents and so much more. This limited capacity entailed that governmental initiatives constantly need to be prioritized and therefore not enough resources are being invested in the growth and effectiveness of the central government. Coordination was also lacking, particularly that between different bodies of the central government, causing employees to feel severely frustrated with their work. It caused a sense of uncertainty of the tasks and remits the departments (and therefore its employees) were responsible for. Fragmentation was also apparent, as the study showed how the different bodies of the central government are often working in-silos. Another indicator of bureaucracy is hierarchy, that played in important role in the management approach adopted in the government (top-down or bottom-up). Bad practices were also noted for hierarchy, such as creating a sense of lack of authority amongst the employees. Although they are often aware of the required techniques required for project implementation, they do not always have the authority to carry them out. Finally, the last indicator on bureaucracy is regulation, which once again, was lacking. The study showed how Malta currently has a lack of regulations and guidelines, and in fact one even went so far as described the existing regulations as soft legislation rather than mandatory requirements.

The third trait proven to influence organizational effectiveness is involvement. Although the link between the two was evident from the data collected, the latter suggests that involvement is not currently an active barrier within the central government of Malta. This is because the results indicate an overall high sense of involvement and a positive organizational culture. Employees are often committed, enthusiastic and proud of the work they carry out. This has been linked to the high degree of participation in the undergoing works within their department, as well as the high levels of responsibility allocated to the employees. The only shortcomings of this organizational trait in the context of Malta, was in terms of partnerships. Although the data collected indicated an insufficient use of partnerships by central governmental bodies, it also showed signs of significant increase over the last few years.

Finally, the fourth trait tied to organisational effectiveness is mission. The central government of Malta showed weak signs of goals and vision, which are two important indicators of the trait. The results collected showed that the works within the central government of Malta are more focused on the short-term goals and achievement rather than the long0-term ones. The overarching aim and vision of the department is often unclear, creating a sense of uncertainty and lack of coordination in its employees. In fact, the study shows how there is a current lack of local guiding strategies, and that the existing strategies tend to be regional ones. Although these are informative, they are not detailed enough to provide sufficient information for work implementing bodies on a local scale.

In essence, this study confirms that adaptability, bureaucracy, involvement and effectiveness are four pillars in ensuring the effectiveness of central government organisations. It also deduced that in Malta, the central government is currently facing obstacles due the shortcoming in its adaptability, bureaucracy and mission traits.

6.1.4. The effect of organisational barriers on NBS implementation

By answering the first and second research sub-questions, this study has identified how familiar central government officials are with NbS, and the effectiveness of NbS implementation. The main research question ties these results to the third sub-question to determine:

How do existing barriers of central governments organisational structure affect NbS adoption and implementation?

A direct correlation was discovered between the organisational barriers mentioned in 6.1.3. and the effectiveness of NbS implementation by central government bodies. These barriers would need to be addressed in order to move forward and create meaningful progress in the NbS space.

The predominant barrier was arguably the most detrimental one. In an ever-changing world, government resources are spread thin, leading to a lack of capacity to deal with new, innovative ideas such as NbS. This then brings with it a new set of challenges. Without the right capacity, there will be no education on NbS, and no resources to invest in setting up systems to learn and share info on NbS. Time and money also need to be allocated to create new policies and guidance documents which at present are not being prioritized. Lack of funding, and therefore lack of human resource capacity, also effects one of the most important traits of NbS, monitoring, with organisations not being able to manage the logistics of such a task. Better coordination could be a solution, as it allows for more efficient division

of labour whereby people can be divided into collecting information and others tasked with sharing it, however this alone will not solve the issue entirely. As it stands the system has been being to as fragmented, displaying a severe lack of coordination, coupled with a low level of inter-departmental transparency has led to numerous inefficiencies as well as caused confusion amongst workers.

The next barrier was in the ability of central governmental organizations to incorporate new concepts, such as NbS. It could be argued that this is mainly a side-effect of the lack of resources mentioned above. Without a mechanism in place for continuously updating knowledge and understanding of scientific advancements, these organizations risk ineffective implementation of NbS. Currently, organizations with limited adaptability are struggling to fully grasp the potential of NbS and lack the necessary confidence to implement them. For successful implementation of NbS, a system must be established that efficiently integrates new information and facilitates its dissemination to employees, ensuring that they are able to confidently and accurately utilize it. Without such a system in place, NbS risk being implemented incorrectly, resulting in a failure to achieve the intended benefits. Additionally, a lack of transparency in the information dissemination process may further impede the ability of employees to effectively understand and utilize NbS. This, in turn, must be backed up by policymakers creating effective guidelines and frameworks, backed up by scientific research, involving NbS, something which is currently lacking.

It was also discovered that Involvement is not being implemented to its full potential. Projects are usually discussed at higher levels, leaving out a key group of individuals, the citizens who will be directly or indirectly interacting with the project on a daily basis. This is important because NbS is founded on a system of collaboration, partnerships and bringing together ideas from different people and sectors and finding the best overall solution. Additionally, it contributes to people's enthusiasm and willing to collaborate, and means that people will invest more of their time and resources to help ensure the success of a project, as well as gaining the trust of all parties involved through full transparency. Involvement also entrusts a certain level of responsibility on everyone, making them feel directly responsible for the success of the project. NbS projects are therefore more successful when there are good indicators of involvement practiced.

The fourth and final organizational barrier that influences the effective implementation of NbS is a lack of a clear mission and goals. A mission is an organization's ability to envision a goal for itself and create objectives to achieve that goal, which is crucial for NbS implementation. This is because NbS require the collaborative efforts of multiple stakeholders, including government agencies, private sector organizations, and local communities. A clear mission and set of goals provide a framework for coordinating and aligning the efforts of these stakeholders, allowing them to work towards a common objective. Additionally, a clear mission can also help organizations secure funding and resources for NbS projects. Furthermore, it could also be a way to ensure that the NbS implementation is aligned with the overall goals of the organisation, and the country as a whole.

All these factors play hand in hand to create an environment that is far from ideal for the successful and effective implementation of NbS. Still, despite all this a notable attempt is being made by central government organisations to work on NbS to the best of their abilities,

and so far, they have had some success. It is good to note that in any new space there will always be room for growth and improvement which will naturally happen as time goes by, but hopefully, thanks to the findings of this study, the existing barriers may be brought to light and worked on in the near future.

6.2. Theoretical reflection and contribution

This research has expanded on the current literature on NbS implementation by providing a new framework to correlate the effects of central government organizational structure with the effectiveness of NbS implementation. Although there are existing studies on NbS and organizational structure, their relationship had not yet been studied, as was shown in the Literature Review. The EKLIPSE Framework, for example, provided a tool for project managers and policymakers to measure the effectiveness of the nature of the NbS initiative being implemented. Denison's theory, on the other hand, linked the overall effectiveness of an organisation to underlying organizational cultural traits. Similarly, Nurdin et al.'s framework showed the relationship in governmental organizations between underlying cultural traits and e-government adoption and implementation. Yet there is no existing framework to link how organizational structure affects NbS implementation.

A new framework was therefore created to fill this data gap and build on the existing knowledge of the three different theories mentioned. The proposed framework was tested out within this thesis and indeed confirmed the link between effective NbS implementation and four organizational traits: adaptability, bureaucracy, involvement and mission. Malta, the country used to test out this theory, showed a lack of organizational structure as well as a lack of effective NbS adoption and implementation. Although it was desired to test out the new framework in a global context, this was not possible, both due to a lack of resources as well as a lack of time. In fact, the research questions were answered in the context of Malta, rather than in a generic context, as would have been ideal. Additional studies will therefore be required to confirm the transferability of the results to other central government organizations. However, this study has successfully enriched the NbS discourse by shining a light on the importance of organizational variables that evidently affect the quality of NbS implementation.

6.3. Recommendation for praxis

Every year, more scientific studies are being published on NbS, increasing their credibility as solutions to challenges in both the public and private sectors. However, for them to be more readily implemented by central government bodies, a number of changes will be required to be carried out. In the case of Malta, one of the greatest barriers to NbS was identified as the lack of resources to learn about it and effectively make use of it. It became apparent that the central government does not have enough employees focused on keeping up with scientific findings and infesting them in policies or data collection (including monitoring). Employees are therefore constantly required to prioritize their tasks, leaving these still-significant tasks incomplete. By employing more individuals with a management and scientific background, the government will be able to more effectively intake new information and distribute it to the rest of its employees.

Additionally, the central government showed clear signs of requiring a reform to make it more organized. There was not a clear division of labour between the different departments, and an unclear set of goals and visions. To obtain a strong organizational culture, the

government needs to consider creating a more structured system whereby there's more clear division of roles between the different department, and with a more concrete set of policies, guidelines and frameworks to guide the works being carried out. With more knowledgeable staff, the primary focus would be to reform and organize the structure, such that it would allow for the practice of good bureaucracy.

An additional suggestion is for the government to include training courses or emerging concepts for its employees working in similar fields. At present, the government makes some courses mandatory for its employees, but mostly related to things like tendering or procurement. One solutions being proposed is that the new research being collected is disseminated to the relevant staff every couple of months so that they can keep up with the new info being published without needing to do the research themselves.

And lastly, the government needs to consider shifting to a bottom up approach, particularly since a lot of scientific evidence is showing that stakeholders can provide a lot of value and insight to a project. There therefore needs to be a shift to include them in the overall works, such as by holding more engaging activities with local residents to explain existing problems and to provide a space where they can share their ideas on how to solve them.

6.4.   Limitations and future studies

Prior to collecting data, intensive research was done on the ideal data collection methods that would provide optimal results for this qualitative study. Whilst the methods used for data collection were purposeful, they had their own sets of limitations. Although eight different individuals were interviewed and data saturation was reached, not all of the Maltese central governmental departments were represented in the sample, as would have been ideal. Another issue with the interviews was that they were done online. Whilst online meetings had their own benefits, such as allowing the interviewees to schedule them at their favoured time and place, issues such as talking over each other or glitching during the interviews was experienced. To remedy this, the interviewer or the interviewee repeated when necessary to ensure that all the information was properly being communicated.

Another issue encountered during the study was the mixed results collected regarding stakeholder engagement. Whilst stakeholder involvement appears to be a common practice within the central government of Malta, it is uncertain whether it is being adequately carried out. Questionaries could have been sent out to the general public and private organisations to determine stakeholder perception on their involvement with central government initiatives. Due to time constraints, this was not done. It is strongly recommended that future studies investigate how stakeholder engagement is currently taking place through direct research at all levels and understand whether this is an effective form of stakeholder engagement.

The final and most significant limitation of the study was that only one central government structure was used to test organizational structure and its effect on NbS implementation. Ideally, the study collected data from different central governments and compared the effect of different organizational structures on NbS implementation. However, considering that over half a year was required to study, collect and analyse the data of one central government, this was not possible. Future studies should therefore replicate this research using the central government of different countries as a case reference and compare how different organizational structures influence NbS implementation. This would allow for the new

framework of this study to be further developed to show how NbS can be effectively implemented and adopted.

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Appendix I: Interview Guide

1) Understanding of NbS and their job relation to NbS projects in Malta

    a. Please give a short description of your role within the department and examples of projects that you have worked on.

    b. Have you heard of the term NbS and is so, what does this concept mean to you?

(Correct or confirm the definition of NbS)

    c. With this new understanding of NbS, do you feel your past or current projects would fall under this category?

    d. Do you think other governmental projects and initiatives could be classified as NbS?

    e. How do you feel Maltese governmental projects in general relate to this theme of NbS? Is there a significant awareness about it?

    f. Do you think there is a lack of NbS or a lack of 'labeling' projects as so?

2) Guidelines and steps of NbS implementation

The following questions aim to understand the process by which projects, ideally NbS related however not exclusive to, are implemented at a governmental level.

    a. On what basis are (NbS) projects chosen? Is it to address an identified problem/opportunity, or are there other reasons?

    b. On what aspect are different solutions assessed and compared?

    c. At what levels of project uptake and implementation are stakeholders involved, and how?

    d. What determines whether a project is implemented at full scale or at a pilot level first?

    e. What degree of monitoring and evaluation is practiced during and after the project is implemented?

Explain that these steps are part of the EKLIPSE framework of Implementation and explain the framework briefly

    f. Do you feel that there are additional steps that would be required for an NbS implementation guide?

    g. Would you say there are any differences between the steps to implementing a project at an urban level and a rural level?

    h.   Are there currently any guidelines or systematic approaches that are used to guide project implementation in governmental departments, including your own?

3) Different scales of NbS implementation

There seems to be a tendency, at least according to available project information, for NbS to be implemented at small scales.

    a.   Would you say this is because NbS projects in general are still being implemented at pilot study levels, or do you think there might be some benefit to implementing NbS in smaller scales?

    b.   What benefits do you think small scale projects have over larger-scale projects?

    c.   What benefits do you think large-scale projects have over smaller-scale projects?

    d.   Have there been any issues of decreased efficiency when small-scale projects (or pilot projects) have been increased to larger scales? *Prompt:*

        i.   Lack of space for large projects
       ii.   Increase in stakeholders
      iii.   Higher risk factor/hesitation

    e.   Would you say that NbS projects would be more effective at a smaller scale or larger scale, from your experience?

4) Rural vs urban NbS emphasis debate

In available literature there seems to be a higher focus on NbS in urban areas rather than in rural areas.

    a.   With your current understanding of NbS, do you think there is actually a focus on NbS implementation in urban areas or could this be an issue of projects lacking the 'NbS label'?

    b.   What issues do you think contribute to a higher focus on NbS project implementation at an urban level? *Prompt*

        i.   More social issues in cities
       ii.   Higher population densities in cities
      iii.   A lot of projects already happening in urban areas
      iv.   More conflicting stakeholders at rural areas
       v.   Misconception of NbS as green infrastructure rather than projects targeting social and environmental challenges
      vi.   More governmental departments focused on urban areas

    c. Do you think rural and urban NbS should be equally prioritized or do you think that one is more important than the other?

    d. What possible solutions do you think could address this discrepancy?

Debrief important key points that came out during the interview.

    e. Do you have any additional comments you would like to add in regard to NbS implementation in Malta and the way forward to more effective NbS project implementation?

Appendix II: Consent form template

RESEARCH PROJECT TITLE: Nature-based solution management: Understanding the gap between the implementation of urban and rural nature-based solutions

RESEARCH PURPOSE: Master Thesis

RESEARCH INVESTIGATOR: Adiel Cuschieri

Thank you for agreeing to be interviewed as part of the above research project. Ethical procedures for academic research require that interviewees explicitly agree to being interviewed and how the information contained in their interview will be used. This consent form is necessary to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. By signing this form, you are agreeing that you have read this information sheet and approve the following:

- The interview will be recorded, and a transcript will be produced
- The transcript of the interview will be analysed by Adiel Cuschieri as the study's research investigator
- Access to the interview transcript will be limited to Adiel Cuschieri and her thesis supervisor with who she might discuss the interview as part of the research process
- The actual recording will be destroyed
- Any variation of the conditions above will only occur with your further explicit approval.
- Unless agreed on, direct quotations from the interview will be anonymized so that you cannot be identified

Do you approve to be directly quoted in this study, by reference to the transcript? **Yes / No**

Participant's Name   Researcher's Name

Participant's Signature: Researcher's Signature:

Date: Date:

Contact Information

This research has been reviewed and approved by Radboud University. If you have any further questions or concerns about this study, please contact:

Adiel Cuschieri
adiel.cuschieri@ru.nl *or* adiel.cuschieri@gov.mt

You can also contact Adiel's Supervisor:

Ary Samsura
ary.samsura@ru.nl

Appendix III: Meeting notes – NbS inter-departmental meeting

Hosted by: E1

Date: 8th July 2022

Time: 12:30

Present Entities:

- E1
- E2
- E3
- E4
- E5

The Anonymous referencing system to the entities that attended the NBS inter-departmental meeting can be found in Table 2 in Chapter 3.2.1 Data Collection.

Meeting points:

- The aim of the meeting was to discuss the roles and budget for CSIP, and to discuss any elements the present entities thought would be important to include.
- E1 envision creating a project that is innovative, cost-effective but more importantly, applicable to Malta. This means that a certain level of research would need to be carried out as well as a proof of concept.
- E1 state that they currently envision the way forward to be mapping out the ideal locations that would benefit from an NBS project
- However, the way E1 communicate all this information is very difficult to understand. They ask for the different entities to share their opinion, although of what remains a little unclear. They asked "what is your understanding of what do you see with your work in relation to others? And how can this project be built with the different actors present?"
- The E5 representative in fact sounded unsure of the project process, and instead goes to give examples of other projects the E5 has carried out. He says things such as "Are you familiar with the application, and how to fill it up?" He also goes to suggest that the first step should be to create a national policy, and to include the different actors in carrying it out
- E1 clarify that the project was developed based on the Low Carbon Development Strategy (LCDS) that was published in 2021. The CSIP would be carrying out several of the measures that were put forward in the LCDS, and that a way forward to fund the remaining measures needed to be thought up. "Ultimately, we are doing everything to ensure, or to remove hurdles form the full implementation of the LCDS"
- E1 explain that the LCDS does not mention the word nature-based solutions, because the document was drafted when NBS were still gaining traction and when there was still very limited information on it. However, the LCDS mentions the use of "tools for mitigation and adaptation" to achieve its goals, which are basically interchangeable with NBS.
- E5 requests whether there is any information on "some actions on which we can easily identify, and focus on?"

- E1 clarify that the overarching goal of the LCDS is to create "co-benefits between biodiversity and climate change, society and ultimately, that is the same goal of NBS"
- The E5 request clarification on the settlement type that the LCDS addresses. E1 clarify that "the focus of the project is urban adaptation and mitigation"
- E1 ask the present entities how they feel like they can contribute to the CSIP
- E5 offer their experience working on embellishment in urban areas and offer their in-house architect and engineers to work on the project
- E4 state they tend to focus on Natura 2000 sites and the implementation of management plans created by E2. They also stated that they work with local councils to create innovative ideas together such as green walls, green roofs, garden and generic greening.
- E2 state that they are responsible for technical and political strategies, and that they could contribute particularly on carrying out research and studies on Green Infrastructure
- E1 ask the actors whether they have the capacity for mapping out the locations they mentioned earlier, or whether it is just E2 who does so.
- E4 do not feel that creating this map would be as easy as E1 were making it sound, as "the data sources we need or will need, are scattered between a lot of different entities". Additionally, E4 are of the impression that there had already been a push for NBS locally through a project called Horizon.
- E4 know that works to create the map cannot be sub-contracted, however they share that "Apart from the fact that mapping is a very technical process, it requires a lot of resources that no, we do not have. Especially if this would mean starting the mapping process from scratch and completing it, particularly in regard to data collection." The only approach they think would allow them to create this map in the near future would be with a huge recruitment initiative.
- E4 go on to say that it does not make sense to create a new map when a lot of the information is already there. Instead, the way forward could be creating a common pool of resources, and then just collect that data that does not already exist.
- E1 ask how long do they think this would all take?
- E4 reply that "this depends on what Actions we decide to carry out. We could pick the themes of climate mitigation, enhancing biodiversity, reducing flood risk assessment, which are in vogue not only locally but also internationally in terms of NBS. It is only then that we can branch out to determine the Problems and Actions that we will be tackling".
- E1 clarify that the focus is cost-effectiveness and impactfulness, but ultimately it also depends on the feasibility in Malta.
- E2 agree that the first priority should actually be to create guidelines and say that the Horizon could be a good first step towards creating them. They ask E4 if they have any further information on the initiative.
- E4 share information on Horizon, how the ReNature initiative might have also been part of it, as well as Esmeralda and mapping of biodiversity initiatives linked to green infrastructure. They also share that the University of Malta have a pilot project on NBS
- E4 express that the person working on the Horizon initiative should have been included in the current meeting.

- E1 clarify that the individual responsible for it does not have his own company and is just a freelancer. Partnering up with a single individual in this EU projects is difficult, if not impossible. E1 are aware about this individual, however, and they are aware that he is the individual with the most technical expertise on NBS locally.
- E4 counteract that by saying that collaborations with private bodies are actually beneficial for Life Projects.
- E1 are of the impression that individuals do not count as private bodies, but that they will look into it just in case.
- E1 acknowledge that no one can work in a vacuum, particularly not in this regard. They share that a couple of the Actions are about communication and dissemination, and they will be targeting the different sectors of the project. "Capacity building is intended to be a part of this". "We will be looking at what gaps can be filled in the public sector"
- E1 state the cross-cutting Action was currently under discussion between them and other governmental entities.
- E5 express that their hope for this project is to provide a strategy on a national level for the different Actions. They are frustrated that there is such a lack of communication between the different entities. They say "what we have missing is some sort of national strategy for the different Actions. We have a lot of stakeholder and actors, nobody knows what the others are doing, individuals are picking a site and implementing a project, by different ministries or even the same ministry just different entities… Somehow all these factors need to come together in one vision."
- E5 is also concerned about creating a common pool of shared resources. "The data is scattered among different entities, and the different entities don't always ensure that it's of a good quality, as we have experienced recently when we were trying to collect coastal data. Different entities were providing us with data, which they thought was of a good quality, but when we tried to open it and integrate it with other data it just didn't fit." "These are huge issues in terms of mapping and modelling, even when you have your own GIS or mapping team as we do."
- E5 express that gathering existing data could be an option but collecting it all from scratch is one too. It all depends on what the data is going to be used for.
- E5 say: "Something that is important that should be included in this project is some sort of institutional scan, including stakeholders, listing the functions and roles of all of us, and then seeing how we can act coherently, and not to each their own. I don't like being so critical but it's like a cow-by economy. People are just picking projects, other people have no idea about, and we've even had situations where the same site was being developed for a project by two different entities at the same time."
- E5 say: "something that this project can significantly contribute to is to bring about the generation of some form of strategy or basis for action that would be owned by everyone and created by all of the different entities together"
- E1 steer the meeting back to it's focus: to determine what scoping needs to be done, and the development of a strategy. E1 once again ask "how long do the different entities think it would take to carry out the scoping"
- E5 reply by saying that E1's hope to complete the scoping in two months is a little unrealistic. E5 say that it is very hard to estimate how long these things take, but

usually they tend to take several months, sometimes more than a year. Besides, "everyone is building their own data set but it's not necessarily compatible"

- E2 offer to share the data they already have, but they are aware that it has several gaps that would take some time to fill. E2 acknowledge that "there needs to be a collaboration between the mapping entities"
- E1 finish off the meeting by acknowledging that the way forward would be to speak to local NBS experts and get them on board on this project.

Appendix IV: Code List

Organizational dimensions influencing NbS adoption and implementation	Adaptability	Change Management
		Organisational Learning
		Transparency
		Trust
	Bureaucracy	Capacity
		Coordinator
		Hierarchy
		Regulation
	Involvement	Commitment
		Participation
		Partnership
		Responsibility
	Mission	Goal
		Strategy
		Vision
Effective Governance indicators	NbS Concept Understanding	Complete
		Incomplete
		Misguided
	EKLIPSE Framework	Problem Identification
		Design
		Implementation
		Monitoring
		Solution Selection
		Stakeholder Involvement
		Upscaling
	Settlement Focus	Mixed
		Rural
		Urban
	Other	Frustration
		Landownership
		Arising issues

Appendix V: Additional Results and Analysis on Stakeholder Involvement

Stakeholders are slowly being included to take part in the design and implementation of projects. One particular department, for example, started stakeholder engagement initiatives whereby they *"speak to local councils to see what [people] want for their locality. So, we give them the chance to collect feedback from the residents to apply for projects using the scheme we set up using their own ideas"* (I1, Line 131)

They were also aiming to educate the general public and individual stakeholders, by having *"organized submission meetings for them so that we can meet them, listen to what they have to say, and explain to them the concept of NBS in this regard"* (I1, Line 29).

Departments such as this one acknowledge that working with stakeholders can provide ample benefits, and in fact admit that they *"sometimes find it easier to work with local council members. Because they usually have a general idea of the different individuals in the locality"* (I1, Line 107).

However, another interviewee suggested that this type of stakeholder engagement is still not the ideal form of engagement, and that people *"need to distinguish between providing support to access financial tools, which is happening here. The government, through an agency or department, whatever, is providing support to another government entity or individual to apply for funds. That's not participation. That's supporting an entity to access a financial tool"* (I8, Line 120).

Other examples of stakeholder involvement are less accessible to the general public. For example, development works in Malta are preceded by a contesting period, whereby stakeholders are given the opportunity to oppose or comment on the plans. Whilst such a platform allows citizens to view and comment on planned works, the system tends to be highly saturated with projects and data, making it impossible for citizens to determine which of the content is relevant to them. This was discussed in the following context:

"A note is published when an application is submitted, and a paper is just stuck with the application information at the place where the works are going to take place. So that whoever wants to comment has around 3 weeks to send their comments. Generally these NGOs send comments because they have some individuals working full time on doing so. It is even a paid job" (I2, Line 123)

Appendix VI: Further literature

The following section is collected information during the desk study on the current focus of NbS, Untapped NbS potential and Scales of NbS. During the desk-study, extensive information was collected on NbS scaling and settlement. When the objectives of the thesis shifted from understanding these concepts to understanding the organizational barriers, a lot of information became irrelevant. This information was therefore omitted from the Literature Review, Chapter 2. The information has been submitted as an Annex to provide additional information to the reader on the topics, should they be interested.

THE CURRENT FOCUS OF NbS

The majority of NbS projects seem to be focused on cities and the benefits they can gain by making use of NbS. Considering that over half of the world's population lives in a city (The World Bank, 2020) it would make sense for projects to be focused on these small pockets around the world. Targeting cities automatically guarantees beneficial attributes to a large quantity of people simultaneously. When running a search on Google Scholar using the keywords "urban" and "NbS", a total of 50,800 results were generated. On the other hand, when the same search was run using the keyword "rural" instead of "urban", a total of only 39,500 results were generated. Generic searches for NbS also tend to render results specifically related to cities or urban areas. In fact, during the desk study for this research, whilst searching for generic documents on NbS, several of the suggested publications were city-based. This includes the research by Cortinovis et al. (2022) on *Scaling up nature-based solutions for climate-change adaptation* and the study by Langergraber et al. (2020) on *Implementing nature-based solutions for creating a resourceful circular city*.

Similarly, many policies and frameworks on NbS are designed with cities in mind, including Raymond et al.'s framework (2017) on assessing NbS implementation quality. NGOs and other governing bodies seem to have a similar approach. The IUCN, for example, describes NbS as solutions that "increase tourism revenues, provide recreational opportunities for citizens, and help lower temperatures and pollution levels in urban areas" (IUCN, 2022). Case studies also tend to be related to urban areas, possibly since the majority of NbS pilot studies have been developed in such areas. When running a search for "case study nature based solutions" on Google Scholar, the first publication suggested is called *Assessment of biophysical and ecological services provided by urban nature-based solutions: a review*. It is a document report on deliverable set by an EU project called Naturvation that aims to assess ecosystem services that green and blue infrastructure in urban areas provide (Hanson et al., 2017). This heavy focus on urban projects poses the question, *are there more benefits to urban NbS or are there organizational barriers inhibiting the required distribution of NbS?*

UNTAPPED NbS POTENTIAL

For years on end, many first-world countries have invested billions in creating cities that are almost isolated from nature. These countries have become more apt at providing their citizens with better access to healthcare as well as food and water security. However, it would seem that in their quest to solve such challenges, new ones have arisen. What's almost comical is that many of these challenges can in fact be addressed by turning back to nature and working with it rather than separate from it. The search to address the new social challenges began, and it started to become evident how the solution lies in addressing the environmental threat.

One solution for a better future is in fact tied to environmental protection and is known as *convivial conservation*. As the term suggests, it is a form of environmental conservation focused on an integrated approach to major ecological, social, and political-economic challenges. Like NbS, convivial conservation is promoted as a lifestyle whereby cities and nature can be integrated into a form of utopia. Considering that such concepts are being advertised as solutions to cities, it would make sense that most projects are being taken up at an urban level. A possible reason for this kind of promotion would be to reach individuals with the most power, such as political representatives and entrepreneurs, who often live in cities. By gaining the support of such societal figures, NbS could gain enough traction and enough funding to properly be invested in.

NbS is slowly being considered a viable option around the world, however, there are still a number of factors that are hindering their widespread adoption as a primary tool for sustainable development. Seddon et al. (2020) describe three significant barriers that NbS must overcome. These are "challenges in measuring or predicting the effectiveness of NbS lead to high uncertainty about their cost-effectiveness compared to alternatives", "poor financial models and flawed approaches to economic appraisal lead to under-investment in NbS", and "inflexible and highly sectionalized forms of governance hinder uptake of NbS, with grey, engineered interventions still being the default approach for many climate adaptations and mitigation barriers" (2020, p. 9).

We can also note that a disproportionate amount of NbS projects are being executed in urban areas rather than rural ones. There are a number of factors that may play a part in this, however, it is likely that a combination of lack of funding for small, rural communities, coupled with the fact that policymakers and researchers tend to live in urban areas, as van Thiel puts it, creating a bias based on their own "interests and background knowledge. Everyone has their own personal preferences and experiences, which will guide the choice of an interesting research problem" (van Thiel, 2014, p. 13). We must also consider that most of the global population lives in urban areas, and so stand the most to gain directly from urban NbS projects. Due to the fact that nature takes time to change some NbS projects may not show any real-world benefits for decades, making it more difficult for stakeholders to see their viability, especially when searching for more immediate solutions.

Regardless of whatever the reasons for the settlement discrepancy of NbS focus, the fact still remains that rural areas are equally susceptible to climate change as urban areas. Even though fewer people are directly affected by the phenomena, indirect effects can be experienced by all the individuals on the planet. Agricultural areas, for example, are responsible for providing almost all the world's food supply and have the potential to feed 9.7 billion people by 2050 (The World Bank, 2022). It currently accounts for over 4% of the world GDP and can even account for over 25% of some developing countries' GDP (The World Bank, 2022). Unfortunately, agriculture, forestry and other similar practices are responsible for over a quarter of the world's greenhouse gas emissions, contributing towards the planet's degradation (The World Bank, 2022). At present, food producers are amongst the highest users of the world's land and water resources; without sustainable practices, they risk harming or depleting them.

Seddon et al. note that even though we are well aware of the environmental and economic threats posed by climate change, "less than 5% of climate finance goes towards dealing with

climate impacts, and less than 1% goes to coastal protection, infrastructure and disaster risk management including NbS" (2020, p. 8). This takes place even though doing so has proven to be effective in restoring natural habitats which in turn "provide major economic benefits in the form of avoided losses from climate change-related disasters, as well as supporting ecosystems services worth an estimated $125 trillion annually" (2020, p. 8).

While it is clear that implementing NbS in urban areas is far simpler than doing so in rural ones, it is fair to say that these rural communities could see the greatest benefits from such projects. The International Fund for Agricultural Development (IFAD) claims that there are four main ways in which NbS will benefit rural areas and communities: "They help impoverished rural dwellers achieve food security and access nutritious food", "They limit the impact of natural disasters on communities and their environments", "They reduce the social and economic impacts of climate change on rural dwellers", and "They validate small-scale rural producers and indigenous peoples as guardians of the natural environment", all while promoting biodiversity and sustainability (IFAD, 2021). These benefits can already be seen by analysing multiple case studies, for example, the integration of a water management system and reforestation around the Village of Douar Elmoudaa in the High Atlas Mountains in Toubkal National Park (Morocco), or Indigenous community-led reforestation and agroforestry projects in the Southern Amazon (NbS Initiative, 2022).

Scales of NbS

There are three scales at which NbS can be implemented: micro, meso and macro level (Raymond, Berry, et al., 2017). There is no exact definition of each of the three scales, so categorizing NbS can be subjective (Langergraber et al., 2020) and literature studying the meso/macro scales of NbS is limited. In fact, searches with the keywords "micro", "meso", "macro", "nature-based solutions" and "NbS" on platforms such as Web of Science, RU Quest and Google Scholar did not render extensive results. Li et al. in fact, identified "The assessment and research at a different scale from micro-scale to macro-scale" (2021, p. 26) as a data gap in current literature and suggests that future research addresses.

There seem to be a general consensus in the published literature that the three scales refer to local/personal, regional and continental/global dimensions (Raymond, Berry, et al., 2017). A local problem could refer to small-scale issues such as a private home overheating in summer whilst regional problems would take place on a larger scale, such as river flooding in a city. The third level, the macro, could be a continental or global problem, such as world deforestation or ocean (Sowińska-Świerkosz & García, 2022). The terms seem to be inspired from the different ecological scales of biomes and from the different scales of institutional perspectives (Raymond, Berry, et al., 2017). This would complement further the fact that NbS are the encapsulation of ecological and social issues, and the three identified levels of scale of implementation put the two aspects on a singular plane. For the purpose of this research, the micro level will refer to personal property, such as NbS at home or in private land. Meso level will refer to small projects such as using NbS in a small neighbourhood, and macro level will refer to solutions that affects a large area or a large portion of society (a region, large city, or greater).

Projects are being implemented at all these scales on an international level, such as how green roofs are being installed on private houses (micro level) and how dunes restoration is gaining traction (meso or macro levels). But since NbS is still in its early stages, it is expected that the

majority of the NbS projects implemented are still at a pilot study phase, which means they are typically organised at a micro or meso scale.

The importance of pilot studies

There are many benefits to pilot studies, such as ensuring that the chosen research protocols, methods and instruments are adequate to fulfil the aim of the study (van Teijlingen & Hundle, 2001). They have also been used in recent years to test out new practices and organisational forms prior to being applied by a variety of bodied in a variety of contexts (Hughes et al., 2018). Pilot studies give these innovations a space to be understood and refined before being deemed viable (van Teijlingen & Hundle, 2001). In environmental management, pilot studies have gained a lot of traction, particularly since the field itself is relatively recent and has significant future potential (Billé, 2010). This includes the use of pilot *projects*, which have been defined as "an action undertaken by one or more public and/or private stakeholders in order to test novel practices or technologies"(Billé, 2010, p. 2). One such example, is the use of pilot studies to develop New York City's 2012 Green Infrastructure Plan. Several stormwater-retrofit pilot projects, such as bioretention systems, blue and green roofs as well as sub-surface infiltration systems were studied in an adaptive management approach (AWRA, 2012). The Plan made use of the pilots' findings to better manage the city's water resources.

Pilot projects also pave the way for the development of new environmental policies and programs (Hughes et al., 2018). Their purpose runs parallel to the environmental solutions since the latter require innovative policy approaches to have a chance at overcoming their underlying issues. The complexity, politics, and new technical demands of new policies can therefore be explored and managed at a smaller scale before being implemented on a national one (Hughes et al., 2018). Pilot projects can even be considered as a form of adaptive governance, whereby decision-processes are based on dynamic learning-based collaborations aimed at improving social and ecological systems (Schultz et al., 2015). These policies, however, will only have an aggregate impact if the pilot project is scaled or coordinated in some way outside of the test boundaries, as this tends to allow for more co-benefits to be incorporated due to the larger surface area (Ruangpan et al., 2020). This would mean that the project can be feasibly scaled to a meso or macro scale. A pilot project and a full-scale project are not necessarily the same, and amendments are very a very common practice during scaling. This is done to increase the effectiveness of the project, and in fact, it can sometimes take several pilot projects to refine the approach before a full-scale project is implemented (van Teijlingen & Hundle, 2001).

The scale of a project can be increased using two approaches, *scaled up* or *scaled out.* When it is scaled up, it means it is increased in size such that it is more widely used within the same areas. On the other hand, when it is scaled out it means that it is repeated again in new areas such as in different jurisdictions or in different countries (Hughes et al., 2018). Out of the two, scaling out has so far proven to be the most important and yet the most volatile out of the two, since areas with different jurisdictions are more prone to physical or societal differences that could tamper with the efficiency of the project (Hughes et al., 2018). In terms of NbS, Connop and Vandergert (2019) have coined the term nature-based solution scaling, which can refer to both scaling up as well as scaling out. Unfortunately, even though nature-

based solution scaling is the end goal of NbS pilot projects, it does not always result as so. Reasons for this could include that "they don't easily conform to the longer time scales characteristic of social change and collective action … [or] that they are extremely sensitive to even small changes in local conditions" (Billé, 2010, p. 2). It is important that these obstacles to NbS scaling are acknowledged and understood such that they can be overcome and give way to large-scale NbS that is so desperately required on a global level.

Risks to NbS scaling

A challenging aspect of *nature-based solution scaling* is that, since NbS require efficient stakeholder communication and involvement, larger scale projects would require the input and the agreement of more individuals. Connop and Vandergert came up with a guidebook to aid stakeholder involvement during the process of upscaling NbS in cities. It considers tools such as "develop[ing] a shared vision" and "explor[ing] drivers and barriers" (2019, p. 4) as requirements for the process. These tools and others can be used to create a shared vision between different stakeholders and invest in NbS to bring about different benefits and co-benefits in cities. According to this guidebook, there are four necessary steps to bring about NbS scaling: 1) interview process; 2) synthesis report; 3) debrief meeting; 4) updating and sharing the synthesis report (Connop & Vandergert, 2019). Once again, there is the recurring emphasis on stakeholder involvement that are keystones to the success of any NbS project.

Another study by Cortinovis et al. considers the lack of space as an influential factor hindering large-scale NbS initiatives, particularly since the majority of NbS projects are designed for cities. Most urban areas have dense infrastructure that is more challenging to change than unoccupied land. Implementing large-scale projects would therefore require major infrastructural changes that are both costly and that would cause inconvenient disruptions to residents. The study also shines light on how solution scaling is not simply a matter of replicating a project to a different scale, but there are additional elements that need to be considered and modified in order maintain NbS effectiveness on a larger scale. This includes changing the "spatial, temporal, jurisdictional, institutional, and management levels" (Cortinovis et al., 2022, p. 2).

Expanding projects to new areas also has its share of challenges. For example, each city is built with different infrastructure, has a different cultural diversity and different functions. A successful NbS project in one city would therefore not necessarily mean its success in another city. Which leads us to the question 'What potential do different NbS have when scaled up in different cities?' A risk will need to be taken when translating an NbS project, whether from one scale to another or one location to another, simply due to the individualization required for each one. The study by Cortinovis et al. considered different NbS strategies such as desealing parking areas and installing extensive green roofs and then assessed how they affected different city issues such as heat mitigation and stormwater regulation. It concluded that the success of NbS scaling in cities depends on the "existing opportunities to integrate NbS in the urban fabric of the cities, and [on] the capacity of each NbS type to deliver benefits in specific conditions" (Cortinovis et al., 2022, p. 11).

Regardless of how promising NbS seem to be, their novity also decreases their credibility, and this can be considered too risky, particularly since larger projects also have a higher price

tag. The International Institute for Sustainable Development (IISD) reported that for the world to successfully tackle climate change, biodiversity loss and other planetary issues by 2050, the private and public sector would have to spend a total of 8.1 trillion USD on NbS (Bechauf, 2021). Funding projects at the present moment is not an issue, but should the NbS initiatives launched now fail, future funding might be hard to secure. Van Wesenbeeck says "I do not see the funding itself as a problem. But more how to use the funding in a good way and stop the incentives that push us in the wrong direction'(Dutch Water Sector, 2021, para. 9). It is therefore crucial for NbS to be perfected at smaller scales, so that when they are implemented at larger scales their success rate can be guaranteed.

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