

Scaling up Nature-based Solutions: the need to integrate stakeholders. Case study: Madrid

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TABLE OF CONTENTS

LIST OF FIGURES	4
LIST OF TABLES	4
LIST OF ABBREVIATIONS	5
ABSTRACT	6
ACKNOWLEDGEMENTS	7
DECLARATION	8
INDIVIDUAL PROPERTY STATEMENT.....	9
1. INTRODUCTION	10
1.1. BACKGROUND	10
1.2. SCOPE OF THE STUDY.....	11
1.3. AIMS AND OBJECTIVES.....	12
1.4. STRUCTURE OF THE RESEARCH.....	12
2. LITERATURE REVIEW.....	14
2.1. INTRODUCTION	14
2.2. THE FOUNDATIONS OF NATURE-BASED SOLUTIONS.....	14
2.2.1. Ecosystem Services.....	14
2.2.2. Green Infrastructure.....	15
2.3. THE CONCEPT OF NATURE-BASED SOLUTIONS.....	15
2.3.1. Defining Nature-based Solutions: a look into existing debates.....	15
2.3.2. Nature-based Solutions: clarifying their added value	16
2.4. THE STATE OF THE ART IN NATURE-BASED SOLUTIONS IMPLEMENTATION.....	17
2.5. THE NEED TO FORGE EFFECTIVE COLLABORATION NETWORKS.....	20
2.5.1. Path dependence.....	20
2.5.1.1. Barriers	21
2.5.1.2. Enablers.....	21
2.5.2. Silo-thinking.....	22
2.5.2.1. Barriers	22
2.5.2.2. Enablers.....	22

2.5.3.	Training.....	23
2.5.3.1.	Barriers.....	23
2.5.3.2.	Enablers.....	23
2.5.4.	Communication.....	24
2.5.4.1.	Barriers.....	24
2.5.4.2.	Enablers.....	25
2.6.	SUMMARY.....	25
3.	METHODOLOGY.....	27
3.1.	INTRODUCTION.....	27
3.2.	RESEARCH FRAMEWORK.....	27
3.3.	RESEARCH DESIGN.....	29
3.4.	STUDY AREA.....	30
3.5.	PRIMARY DATA COLLECTION.....	31
3.5.1.	Selection of participants.....	31
3.5.2.	Interviews.....	31
3.6.	PRIMARY DATA ANALYSIS.....	33
3.7.	ETHICAL ISSUES.....	34
3.8.	SUMMARY.....	34
4.	RESULTS.....	35
4.1.	INTRODUCTION.....	35
4.2.	LACK OF CONSENSUS ON WHAT NBS MEAN AND ARE FOR.....	35
4.3.	LEGAL TOOLS: WELL-DESIGNED, BUT APPLIED TO THEIR MINIMUM EXTENT.....	39
4.4.	COLLABORATION IN MADRID: PRACTITIONERS' INSIGHTS ON ITS STATE AND EFFECTIVENESS.....	41
4.4.1.	First insight into the study area - Madrid's society authors: looking for their own interest.....	41
4.4.2.	Madrid city council: a giant ruled by traditional thinking and manners.....	43
4.4.3.	Training to understand Madrid and mediate collaboration.....	44
4.4.4.	Madrid: too big and complex to communicate.....	45

4.5. SUMMARY	47
5. DISCUSSION	49
5.1. INTRODUCTION	49
5.2. WHAT DO STAKEHOLDERS UNDERSTAND BY NBS IN TERMS OF: AIMS, OBJECTIVES, ADDED VALUE, RISK, AND DISCREPANCIES?	49
5.3. ARE NBS-RELATED POLICIES CONTRIBUTING TO THE IMPLEMENTATION OF NBS? ...	51
5.4. WHAT IS THE STATE OF COLLABORATION IN NBS?.....	53
5.5. HOW EFFECTIVE IS COLLABORATION IN NBS?	55
6. CONCLUSION.....	59
6.1. ATTAINMENT OF OBJECTIVES	59
6.2. RECOMMENDATIONS.....	61
REFERENCES	63
APPENDICES	71

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LIST OF FIGURES

Figure 1. Thematic map showing codes	35
Figure 2. The objectives of NbS according to practitioners in Madrid (green: environmental, blue: social, yellow: economic, white: hybrid; more than one response allowed per practitioner).....	37
Figure 3. The added value of NbS according to practitioners in Madrid (green: environmental, blue: social, yellow: economic, white: hybrid; more than one response allowed per practitioner).....	38
Figure 4. Risks of NbS in Madrid as per practitioners (more than one response allowed per practitioner)	41

LIST OF TABLES

Table 1. Research questions matching their corresponding objectives	28
Table 2. Summary of discrepancies and understanding among stakeholders (*partially indicates it is shared among green spheres).....	39
Table 3. Summary of interview findings.....	48

LIST OF ABBREVIATIONS

EC – European Commission

ES – Ecosystem Services

EU – European Union

GI – Green Infrastructure

GIS – Geographic Information Systems

H2020 – Horizon 2020 Programme

IUCN – International Union for Conservation of Nature

MEA – Millennium Ecosystem Assessment

MS – Member States

NbS – Nature-based Solutions

PPGIS – Public Participation Geographic Information Systems

R&I – Research & Innovation

SSI – Semi-Structured Interview

SuDS – Sustainable urban Drainage System

ABSTRACT

Climate change and urban sprawl are threatening urban liveability by producing environmental and social challenges. Consequently, new approaches to simultaneously face these issues are increasingly being sought by planners, especially in those regions with a high urban population, given their limited resilience. This is the case for the European Union's (EU) policy-making, where this is being reified by the promotion and implementation of Nature-based Solutions (NbS), a green urban planning approach that, based on nature and multidisciplinary, designs solutions to context-specific environmental, economic, and social challenges. Encouraged by this rising political support, and the newness of the approach, scholars have also significantly increased their efforts in terms of researching NbS projects in cities around the EU. This has led to some weaknesses being highlighted, namely in policy implementation and understanding, technical knowledge, and multidisciplinary engagement. Remarkably, the latter has been highlighted as critical for a successful uptake given its links with agreed design, social acceptance, commitment, and long-term viability. Therefore, this research was aimed at testing and expanding the existing evidence on integration of stakeholders by interviewing local practitioners in a European city (Madrid) where local policies boosted NbS, but evidence in terms of its state and effectiveness was still absent.

The results found that NbS were poorly understood, and among those knowledgeable, an overly biophysical and economic understanding in both professional and legal terms was leading to an under-representation of NbS' social dimension, thus integration. This meant that the development of stakeholders' networks was not being granted enough importance among leaders, nor funding in legal mandates, which produced a fragmented environment. Notably for Madrid, the research unveiled the large size of the municipality, the high proportion of the aged population and the semi-arid features of the city as context-specific aspects that needed to be considered if enablers for integration were to be developed. In this vein, the research suggested that mediation, and innovative tools and approaches needed to be developed so more awareness and good communication practices were possible. The administration should therefore support the creation of spaces where these could progressively be developed so effective means for integration and positive evidence evolve.

Key words: barriers, collaboration, enablers, engagement, European Union, green infrastructure, innovation, integration, Madrid, Nature-based Solutions, networks, practitioners, social dimension, stakeholders, urban challenges.

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DECLARATION

No portion of the work referred to in the dissertation has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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1. INTRODUCTION

1.1. BACKGROUND

The reliance on fossil fuels alongside intensive forms of development (e.g., intensive farms, or monocrops) may be leading earth to a catastrophic tipping point (Cohen-Shacham et al., 2019; Grêt-Regamey et al., 2017). For example, the Intergovernmental Panel on Climate Change's forecasts warn about a climatic imbalance that could lead to a biodiversity loss, and poverty (Seddon et al., 2021). This is especially true in urban areas, where these imbalances combine with their increasing sprawl, producing several challenges, such as resource scarcity, or biodiversity loss, that traditional planning approaches cannot face, and make cities especially vulnerable (EC, 2015). Therefore, it seems reasonable to claim for the development of new innovative means to restore and protect nature, and to address new societal challenges (Cohen-Shacham et al., 2019; McPhearson et al., 2022).

In this vein, “eco-friendly” infrastructure approaches such as Nature-based Solutions (NbS), which consist of “solutions to societal challenges that involve working with nature” (Seddon et al., 2021, p.1519) and include urban and rural examples such as green roofs, sustainable irrigation systems or Sustainable urban Drainage Systems (SuDS), have recently gained momentum in planning spheres (EC, 2015). NbS present a holistic and multifunctional approach that can protect nature, decrease urban temperature, or develop food production initiatives, thus enhancing biodiversity while guaranteeing liveability (IUCN, 2016; Kabisch et al., 2022). Consequently, they have received strong support in international fora such as Sustainable Development Goals or the Paris Climate Agreement (Kumar et al., 2020). This has in turn led to private organisations, governments, and academia worldwide being encouraged to develop implementation frameworks (McPhearson et al., 2022), or local enablers scaling them up (Frantsezkaki and Bush, 2019). As such, at the time of this research examples of NbS can be found from the United States (McPhearson et al., 2022) to Australia (Frantsezkaki and Bush, 2019).

Nevertheless, it is in the European Union's (EU) cities, which host 75% of its population (above global average – 54%), where the aim to scale NbS projects up is being

particularly pursued, given their previously mentioned vulnerability (Faivre et al., 2017; Nesshöver et al., 2017). Consequently, the European Commission (EC) has embedded NbS in its policy framework (e.g., Research and Innovation (R&I), or Horizon 2020 programme (H2020)) (Faivre et al., 2017). Nevertheless, NbS' infancy still prevents a meaningful operationalisation (Davis et al., 2017). Certainly, their implementation and interpretation is context-specific, so they cannot be systematically applied (IUCN, 2020). Therefore, identifying and understanding local barriers for their successful implementation is ongoing (Sarabi et al., 2020).

So far, technical, political, and collaborative issues have been identified as impediments for the upscaling of this infrastructure (Cortinovis et al., 2022; Sarabi et al., 2020). However, it is the need to create integrated networks of stakeholders where authors could closely share knowledge, or coordinate approaches which has received special attention, as this is a must to guarantee NbS' long-term viability (Giordano et al., 2020; van der Jart et al., 2019). This means that further research exploring enablers in this area is especially needed (Lupp et al., 2021; Sarabi et al., 2020).

1.2. SCOPE OF THE STUDY

Given the EU's principal role in urban NbS promotion, this research focuses on its stakeholders and cities. In terms of stakeholders, literature meaningfully explored collaboration with decision-makers, scientist, and citizens (Frantzeskaki and Kabisch, 2016, Nóblega-Carriquiry et al., 2022; Lupp et al., 2021). However, practitioners' perspectives had only been addressed in a single paper (Moreau et al., 2022). This undermined the EC's recognition of practitioners as key drivers in NbS implementation as their engagement could bring technical knowledge and funding (Skodra et al., 2021), which in turn could trigger the EC's major objectives for green employment and business opportunities (NetworkNature, 2021). Thus, this research explored practitioners' thoughts and experiences through a series of Semi-Structured Interviews (SSI).

Additionally, guided by the context-specific nature of NbS, and the time limitations of the project, a case study approach narrowed down the study area, making reliable data collection feasible. Madrid was selected as its recently promoted local policies for NbS implementation and engagement (Ayuntamiento de Madrid, 2018a; 2018b; 2018c) had

not been monitored in terms of effectiveness and need for enhancement, which contrasted with other European cities (Nóblega-Carriquiry et al., 2022; Lupp et al., 2021). Arguably, this approach shed light on the aims of accelerating NbS uptake, and the private sector's engagement.

1.3. AIMS AND OBJECTIVES

Based on the scope of the study, this research was aimed at exploring the barriers and enablers to forge integrated networks of stakeholders to effectively operationalise urban NbS.

To achieve this aim, the following objectives were followed:

- O1.** To review the current conceptual understanding of NbS.
- O2.** To review the current practice on NbS and the gaps to scale up.
- O3.** To analyse existing knowledge on barriers and enablers on the specific need to develop an efficient integration of stakeholders.
- O4.** To explore the integration of NbS stakeholders according to practitioners in Madrid for the first time.
- O5.** To formulate recommendations for more efficient engagement of stakeholders, and future research.

1.4. STRUCTURE OF THE RESEARCH

The structure of the piece is:

➤ Chapter 2: Literature review

This chapter provides the reader with the latest knowledge and practice on NbS. It first explores the origins of NbS and its theoretical understanding. Afterwards, it outlines the current state of implementation as per policies and practice. This identifies existing gaps, so leads to the justification of stakeholders' engagement as the gap to be analysed. Therefore, the final section synthesises knowledge on the need to integrate stakeholders.

➤ Chapter 3: Methodology

This chapter provides information regarding the methods by which the aim and objectives were achieved. First, it outlines the research framework and design. Then, the selection of the study area is explained. Afterwards, data collection and analysis are explored in detail, i.e., the procedure and justification of selected methods. And, finally, ethical aspects of the research are outlined.

➤ Chapter 4: Results

This chapter shows the main findings from interviews as themes resulting from the thematic analysis.

➤ Chapter 5: Discussion

This chapter interprets previously revealed findings, comparing them with academic literature. As such, any particularity is evaluated, so implications for efficient integration can be provided.

➤ Chapter 6: Conclusion

This chapter overviews the attainment of the research objectives by summarising what the research contributed to. This leads to the production of recommendations, and statements for future research.

2. LITERATURE REVIEW

2.1. INTRODUCTION

Literature of NbS covers a wide range of topics from theoretical understanding to practice. This chapter therefore brings the reader up to date on NbS by outlining the concepts NbS stem from (Section 2.2) and providing the different perspectives by which NbS are understood (Section 2.3). It also outlines the state of NbS implementation, thus revealing and describing the gaps to be overcome (Section 2.4). This produces the justification to steer the chapter to the examination of the need to integrate stakeholders (Section 2.5).

2.2. THE FOUNDATIONS OF NATURE-BASED SOLUTIONS

Familiar wording makes communication and understanding easier (Barton, 2016; Escobedo et al., 2019). In this context, Ecosystem Services (ES) and Green Infrastructure (GI), concepts NbS stem from, still dominate green urban planning literature (Escobedo et al., 2019; Wild et al., 2020). Thus, the following lines clarify these terms before directly exploring NbS.

2.2.1. Ecosystem Services

ES describe the benefits humankind receives from healthy and functional ecosystems. Therefore, they provide a theoretical framework that bridges the gap between nature and society (Grêt-Regamey et al., 2017). They first appeared in the 1970s (Cohen-Schaman et al., 2019), but gained momentum during the early 2000s, launched by the Millennium Ecosystem Assessment (MEA) (2005) and The Economics of Ecosystems and Biodiversity (2010), which looked at the reversion of the biodiversity and ecosystem quality loss (Partidario and Gomes, 2013). According to MEA (2005), ES can be sorted into four categories:

- 1) *supporting services*, which sustain other services and include water cycling, or biodiversity;
- 2) *provisioning services* such as food, fuel, and fibre supply;
- 3) *regulating services* like water purification and the regulation of climate; and
- 4) *cultural services* such as social relations, and recreation.

2.2.2. Green Infrastructure

GI consists of “a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver ... ecosystem services” (EC, 2013, p.3). It emerged in the 1990s and includes examples from local gardens to international river basins (Smith et al., 2019) that provide biodiversity conservation, or climate change adaptation (Nistorescu et al., 2019). Specifically, GI focuses on conservation and connectivity to provide societal benefits, therefore, literature highlights its emphasis in spatial patterns (Smith et al., 2019; Escobedo et al., 2019).

2.3. THE CONCEPT OF NATURE-BASED SOLUTIONS

2.3.1. Defining Nature-based Solutions: a look into existing debates

The relationship between human well-being and the natural environment has been recognised for centuries (Cohen-Schaham et al., 2019). However, it has not been until climate change risks (e.g., droughts, or flooding) have become evident, and ES have made the nexus between nature and society explicit, that a new claim to gather benefits from conservation and protection has emerged in the urban planning discourse (Davis et al., 2017; Frantzeskaki et al., 2018). As such, the traditional grey infrastructure aimed at protection against natural disasters (e.g., dams, seawalls, or levees) is being left aside to embrace multifunctional “eco-friendly” solutions that not only protect, but also enhance, restore, and engage (Kumar et al., 2020; Laforteza et al., 2018; Dushkova and Haase, 2020).

In this context, NbS, which are planning solutions that involve the use of nature, have rapidly gained momentum since their first acknowledgement in 2008 as a means to operationalise ES and tackle those urban challenges derived from climate change and urban sprawl that limit the resilience (i.e., the capacity to resist and adapt) of cities. These challenges can be reified in examples such as biodiversity loss, precarious employment, heat islands, or diseases (Dorst et al., 2019; Davis et al., 2017). NbS uptake is being carried out by developing projects (e.g., green roofs, parks, or SuDS) that embed nature into urban activities, and simultaneously produce environmental (e.g., thermoregulation) and socio-economic (e.g., jobs for maintenance) benefits (i.e., co-benefits) (EC, 2015; McPhearson et al., 2022). However, this rapid and ambitious uptake

has also resulted in uncoordinated and broad framings that make common understandability difficult (Nesshöver et al., 2017). For instance, the International Union for Conservation of Nature (IUCN) 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” (IUCN, 2016, emphasis added), while the EC's (EC, n.d.-a, emphasis added) “solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, *social*, and economic benefits and help build resilience” arguably shows less social awareness when emphasising environmental and economic issues.

Additionally, the ample scope of NbS is reflected in their intended objectives. For example, the EU has mostly incorporated NbS in its environmental policies to reduce disaster risks such as floods or droughts (EC, 2016), or to reduce emissions and adapt to climate change (EC, 2020). According to Davis et al. (2017), this environmental focus would show a biophysical bias. However, other scholars argue that this is confusingly expanded by the R&I policy, which understands NbS as a means to advance in the fight against climate change, but also as a push of economic growth (Nesshöver et al., 2017).

It could therefore be said that this lack of agreement requires explanation and intelligibility. In this vein, Raymond et al. (2017) suggested that a clear distinction between NbS and similar approaches (see Section 2.2) should be developed so they can be improved, managed, or chosen. For this, perspectives should be aligned, or the existence of different interpretations acknowledged early (Nesshöver et al., 2017). Certainly, their multifunctional potential, if well understood and implemented, could potentially trigger transformative interventions to effectively achieve holistic objectives (Bulkeley, 2020a). Therefore, the next subsection further explores NbS, by clarifying the unique features of the approach.

2.3.2. Nature-based Solutions: clarifying their added value

The previous section discussed that the broadness of the scope by which NbS are being conceived is a major drawback, leading to ambiguity and lack of clarity on what NbS offer. Therefore, it could be said that the claims of some scholars to clarify their added

value seem reasonable (Nesshöver et al., 2017; Dorst et al., 2019; Bulkeley, 2020b). In this context, Dorst et al. (2019) outlined NbS' core principles: i) *nature-based*, i.e., inspired by nature, ii) *solution-oriented*, i.e., attempting to remediate existing problems (see Section 2.3.1), iii) *multifunctional*, i.e., providing co-benefits (see Section 2.3.1), iv) *integrated*, i.e., gathering multiple authors, and v) *context-specific*, i.e., tailored to the geographical area.

Following the scope of this research, NbS highlight the virtue of engaging multiple authors (e.g., governments, academia, businesses, or local communities) (van Ham and Klimmek, 2017). The delivery of urban GI is influenced by a context-specific combination of social and ecological processes such as climate change, urban densification, political support, or public usage (van der Jart et al., 2019). Nevertheless, NbS differ from previous urban planning approaches, as when considering such a broad scope of aspects, they uniquely accept interpersonal trade-offs by being open to innovation to accommodate parties in a flexible, respectful, and effective approach (Laforteza et al., 2018). In turn, this could achieve trust and long-term commitment (Frantzeskaki et al., 2020; van der Jart et al., 2019; Kumar et al., 2020). However, it is certainly true that NbS are still unknown which, combined with a usually fragmented European administration, halts coordination, and thus the reification of their added values. As such, it seems reasonable to further explore the existing practice on NbS in the next section, so a deeper sense of what the current situation is can be achieved, and major gaps for their full potential implementation revealed.

2.4. THE STATE OF THE ART IN NATURE-BASED SOLUTIONS IMPLEMENTATION

Previous sections have explored NbS in theory, which has led to the outline of their origins, and theoretical understanding according to relevant authors, namely in the EU. The emphasis on the EU is deliberate to steer the chapter to explore its current practice, as it is the major global author regarding NbS implementation. This strong support is based on three pillars (EC, 2015):

- 1) the EU's expertise, and technological capability;
- 2) NbS' co-benefits; and

- 3) the high proportion of the urban population of the EU (75%), which is expected to increase.

Accordingly, NbS are being widely implemented in policies, as well as receiving funding (Kumar et al., 2020; Nesshöver et al., 2017; Verweij et al., 2015). As per the former, NbS were promptly included in the R&I policy, the Biodiversity Strategy, or the disaster risk plans (Faivre et al., 2017; EC, 2020; EC, 2016), and, more recently, they have been highlighted in the European Green Deal for climate change adaptation and sustainable economy (EC, 2019). This promotion is also progressively spreading through Member States (MS). However, there is still a long way to go in terms of gathering or coordinating the numerous voluntary national mandates (Davis et al., 2017). Notably, Spain set a precedent when extensively and explicitly adopting the use of NbS in policy terminology, and making the consideration of GI strategies mandatory (Jefatura del Estado, 2007).

Regarding funding, the H2020 is the major responsible programme for operationalising NbS by providing economic resources to collect positive evidence on the integrative, cost-effective, and technical effectiveness (EC, n.d.-b). This has been described as essential to increase social willingness for NbS uptake and acceptance (EC, 2015). However, H2020 is relatively recent and unknown, which leads to NbS being a secondary approach compared with grey infrastructure (Kumar et al., 2020). Adversely, this is making NbS a GI mainly adopted as pilot projects or add-ons, something that makes the production of full scale examples to meaningfully support them difficult (van der Jart et al., 2019; Kumar et al., 2020).

Therefore, literature states that the challenge now is shifting from small scale evidence production to full scale implementation (Cortinovis et al., 2022). This has been acknowledged as the 'upscale' or 'scale up' of NbS (EC, 2015; Raymond et al., 2017; Davies and Laforteza, 2019) and has resulted in extensive research on the gaps to be overcome so efforts can be effectively conveyed to their solution. To date, three major gaps have emerged: the policy, technical, and engagement gaps (Cortinovis et al., 2022; Sarabi et al., 2020).

First, Davis et al. (2017) described strong biophysical bias in the majorly voluntary policies promoting NbS. This limits their promotion, as many of their added values,

namely social benefits (e.g., gathering local knowledge, or enhance accountability), are often overlooked (Seddon et al., 2021). Therefore, NbS need a holistic and mandatory scope if they want to be widely recognised and applied (Liquete et al., 2016). Arguably, this would increase their uptake among other urban planning alternatives and highlight the need for a transformative or structural shift.

Secondly, there is a lack of understanding, skills, and experience. This means that practitioners and politicians often lack guidance to locally undertake NbS. Nevertheless, guidance is needed to address potential interdisciplinary or technical trade-offs, or quantify benefits (Somarakis et al., 2019; Grace et al., 2021). As such, currently inefficient performances are frequent, leading to an increase in the required budget for the delivery of NbS and insufficient monitoring, which in turn severely impedes the production of recommendations for better uptake (Somarakis et al., 2019). Further research on technical innovation, and the development of posterior follow-up, might therefore be required (Somarakis et al., 2019).

Finally, there is a limited public engagement and awareness that impedes the development of NbS (Sarabi et al., 2020). As in Section 2.3.2, NbS require multiauthor integration to create positive evidence and thus establish credibility and trust, in turn a long-term commitment (Kumar et al., 2020; Frantzeskaki and Kabisch, 2016). Nonetheless, the creation of collaborative spaces requires significant planning, and this is being hindered by the fragmentation of European policy-making (van Ham and Klimmek, 2017). Reasonably, there have been calls for more social research and innovative engagement in NbS (Kumar et al., 2020; Sarabi et al. 2020).

In sum, this section has reviewed existing NbS practice and the potentially required actions to improve it, which has established the background to steer the research to the exploration of one of the existing needs. This piece explored the gap on engagement, as numerous scholars have pointed out it as the most important in terms of research (Sarabi et al., 2020; Giordano et al., 2020; Cortinovis et al., 2022). A solution could overcome the reiteratively mentioned fragmentation, and influence remaining gaps by creating networks to share knowledge, or public support (Raymond et al., 2017).

2.5. THE NEED TO FORGE EFFECTIVE COLLABORATION NETWORKS

Based on the previous subsections, it could be concluded that integration is a cornerstone of NbS. Integration has been described as the development of inclusive (i.e., proactively seeking multiauthor engagement) and collaborative (i.e., that share resources, and skills) networks (Kabisch et al., 2016; 2022). These networks “consolidate, expand and support a community of practice for NbS” (Wild et al., 2020, p.298), as they allow dialogue and close and flexible work (i.e., co-design and co-management), in turn producing trust and lasting commitments, and enhancing accountability (Dushkova and Haase, 2020; Cortinovis et al., 2022; Seddon et al., 2021; Frantzeskaki and Kabisch, 2016). Existing literature highlights the roles each author should undertake for collaboration to be effective. First, the administration and private sector are often highlighted as leaders of NbS, given their financial power, negotiating skills, and knowledge (Favre et al., 2017; Skodra et al., 2021). On the other hand, academia should help promote NbS by the production of positive evidence and frameworks (EC, 2015). Finally, citizens should unavoidably be included, as they could be the drivers of NbS in the long-term (e.g., in maintenance, or supporting with local knowledge) (Seddon et al., 2021; EC, 2015).

However, the implementation of such approaches is a complex task that still requires fine-scale, and city-specific knowledge and evidence for a successful engagement (Lupp et al., 2021). Relatedly, Sarabi et al. (2020) identified fifteen barriers to NbS implementation. For this research, encountered engagement-related barriers have been classified into four categories (path dependence, silo-thinking, training, and communication), thus gaining clarity to produce a critical analysis (Sections 2.5.1–2.5.4).

2.5.1. Path dependence

Path dependence refers to the situation where past thoughts influence individuals, and lead to the same errors being voluntarily repeated, which demotivates the engagement in the development of new alternatives (Davies and Laforteza, 2019). In NbS, this is illustrated by the traditional thoughts regarding their unsureness in terms of low cost-effectiveness and longer times of implementation compared with grey infrastructure (Liquete et al., 2016). Arguably, producing a framework to gather positive evidence

could help overcome such pre-established thoughts and trigger greater integration (Bulkeley, 2020a).

2.5.1.1. Barriers

Unlike grey infrastructure, NbS require continuous maintenance (e.g., pruning, or planting) to be fully operational (Kabisch et al., 2022). This leads private companies and decision-makers not been encouraged to actively support those projects.

As per the private sector, this sets a strong emphasis on positive economic balance. As such, potential revenue losses derived from the abandonment caused by a lack of political long-term commitment to maintenance halts their engagement (Liquete et al., 2016). To shed light on this issue, the EC developed a series of case studies where positive evidence in terms of financial revenues was shown (EC, 2015). However, this might not be recommendable, as the cost-effectiveness of NbS in strictly monetary terms is still unclear (Liquete et al., 2016; Frantzeskaki et al., 2018).

On the other hand, decision-makers have traditionally dismissed GI projects. Primarily focused on re-election, they could not achieve political gains by the implementation of an infrastructure that requires a continuous, non-momentaneous commitment (Sarabi et al., 2020). This needs special consideration as, given the central role of decision-makers, it might have led to NbS not being optimally disseminated (Nóblega-Carriquiry et al., 2022; Sarabi et al., 2020).

2.5.1.2. Enablers

Raymond et al. (2017) argued that positive evidence should be developed considering intangible benefits (i.e., those beyond monetary quantification) such as health, or leisure. These should be appropriately communicated (see Section 2.5.4), so long-term benefits can be understood and valued. In this vein, ES (see Section 2.2.1) stand out as potential indicators, as they reveal both financial and social benefits (Liquete et al., 2016). For example, in Skania (Sweden), ES showed that NbS can increase land value and create revenues from ecotourism, while enhancing recreation and well-being (Wamsler et al., 2016). Arguably, this could boost private willingness toward implementation.

Additionally, if these benefits could be communicated through collaborative platforms, the EC argues that “co-ownership and higher public support” (Bulkeley, 2020a, p.165) might arise. This could therefore increase citizens' interest, in turn potentially enhancing willingness of decision-makers towards NbS.

2.5.2. Silo-thinking

Organisations often operate establishing “silos”, i.e., psychological boundaries that cause compartmentalisation, as these allow a simultaneous emphasis on different tasks, resulting in a fast and efficient performance (Morgan et al., 2012). However, due to the multidisciplinary nature of NbS, silos act as a barrier, as they halt sharing of information, responsibilities, and skills (de Waal et al., 2019). Consequently, innovative attempts conveyed to effectively overcome fragmentation are required (Wild et al., 2020).

2.5.2.1. Barriers

Currently, the EU's MS have a fragmented policy framework that is failing to provide proportionate clear information and accountability. For example, in Germany, Wamsler et al. (2017, p.269) described how a member claimed to be unaware of “who is responsible for climate mitigation ... (*work*) is dealt with separately” between the climate mitigation and adaptation departments. This fact discouraged engagement, notably of citizens, as they had more difficulties when it came to accessing the decision-making. Additionally, literature also describes that, as consequence of this lack of consideration of the entire range of opinions, conflict and lack of social acceptance might arise (Giordano et al., 2020; Nóblega-Carriquiry et al., 2022).

2.5.2.2. Enablers

To overcome consequences of fragmentation, literature highlights innovative approaches that gather stakeholders early and continuously during the planning stages (Frantzeskaki et al., 2018; Frantzeskaki et al., 2020; van der Jart et al., 2019; Malekpour et al., 2021). For instance, power-interest matrices could enhance representativity by identifying and incorporating salient stakeholders (i.e., those who have more connections with the private, public, and social spheres) from an early stage of the collaboration process (van der Jart et al., 2019). This is achieved by looking at the power

(level of influence and control) and interest (level of concern and involvement) of each party. Consequently, they have successfully engaged relevant under-represented groups in previous projects (e.g., as it was the case when they found adolescents under-represented in Ljubljana's GI plan) (van der Jart et al., 2019).

2.5.3. Training

Training refers to the process of learning skills and understanding for a particular activity. In terms of collaboration, it can develop conflict-solving or trade-off management skills, so it may increase acceptance and willingness to participate (Giordano et al., 2021).

Given the newness and multidisciplinary nature of NbS, training is especially required to develop a holistic view and skills that integrate stakeholders (Giordano et al., 2021). However, literature states that guidance to develop these skills is still absent (Sarabi et al., 2020; de Waal et al., 2019).

2.5.3.1. Barriers

In NbS, guidance to train experts and officials on skills to agree a pathway on green urban planning policies at the local level is needed (Nesshöver et al., 2017; Seddon et al., 2021; Frantzeskaki and Kabisch, 2016). For example, Nóblega-Carriquiry et al. (2022, p.9), while exploring NbS implementation in the Delta of the Tordera River (Catalonia), found that locals called for “municipal politicians ... be better trained ... since they have the capacity to make decisions”. However, even when guidance could be developed, Sarabi et al. (2020) also found it is useless unless issues in scarcity in qualified personnel are overcome, as without these the collaborative approach cannot take place and, thus, the development of trust and the overcoming of conflicts.

2.5.3.2. Enablers

Guidance should explain how to engage and promulgate NbS benefits, thus understanding and subsequently agreeing objectives. This guidance could teach the use of Geographic Information Systems (GIS), as it can display advantages in a simple manner, and thus could be used for further engagement, and acceptance (Frantzeskaki et al., 2018). Additionally, GIS can show the state to which goals are being met, or should

be changed (e.g., by combining with ES – Section 2.5.1.2), which might trigger motivation towards changes in mindset (Laforteza et al., 2018). This was the case in a workshop in Berlin (Germany), where scientists showed to decision-makers, through maps, the consequences (e.g., heat island, and diminished well-being) of not implementing GI in land-use objectives. This resulted in bidirectional learning, and triggered support to GI among policy-makers. Additionally, these advised scientist on the best methods of implementation (Frantzeskaki and Kabisch, 2016).

On the other hand, this guidance should especially apply to those guiding the integration process. As per literature, these should be experts in leadership (van der Jart et al., 2019; de Waal et al., 2019) and interpersonal skills (e.g., problem-solving, silo-bridging, or negotiation) (Sarabi et al., 2020; Frantzeskaki et al., 2020). However, depending on the scale of the project, this could be costly and discourage private sector engagement. As such, locally available personnel might be prioritised, so the training process could be shortened given the potentially available interpersonal trust (van der Jart et al., 2019).

2.5.4. Communication

Communication refers to the process where meanings are negotiated and constructed (Bryson et al., 2015). It involves a regular exchange of information (e.g., strategies, or values), and invitations to participate. In turn, it might lead to increased collaboration potential, as public perception is shaped and intellectual and social accountability is provided (Malekpour et al., 2021; de Waal et al., 2019; Bryson et al., 2015). However, there is still a lack of meaningful communication in NbS which limits mutual learning, consensus, and trust (Giordano et al., 2021).

2.5.4.1. Barriers

At the moment of this research, public hearings in NbS projects are scarce. An interviewee in Nóblega-Carriquiry et al. (2022, p.9) claimed that “experts ... come with fixed ideas and do not listen to us”, which was “very discouraging”. This is detrimental for NbS, as their multifunctional scope requires multiple authors to be considered (Laforteza et al., 2018; van Ham and Klimmek, 2017). If not, some risks might be overlooked. For instance, this has been the case for green gentrification, which is the process of increasing the property or rental value consequence of nearby green spaces

developments, eventually worsening the social background of deprived groups (McPhearson et al., 2022).

Additionally, the previously exposed ambiguity in definitions or objectives (see Section 2.3.1) poses a barrier to successfully agree terms for the development of NbS projects (Frantzeskaki and Kabisch, 2016; Frantzeskaki et al., 2018; Seddon et al., 2021). This is because NbS supporters do not have enough evidence to distinguish NbS from other alternatives and, thus, to reach agreement on the need to boost NbS (Nesshöver et al., 2017).

2.5.4.2. Enablers

Bidirectional communication, where decision-makers explain their views on NbS, and an audience can produce feedback (e.g., risks, or context-specific affairs) to be evaluated, could develop understanding and trust on green urban planning. To be effective, messages should be transparently communicated (e.g., through information campaigns, and online communication platforms) and far-reaching (i.e., reach a wide audience and be understandable) (Somarakis et al., 2019).

As per the agreement of terms for the uptake of NbS, early debate, guided by a stakeholder knowledgeable of their added value, has been advised (Bulkeley, 2020b). Nonetheless, it is worth mentioning that this emphasis on consensus should not dismiss alternative views. An intermediate approach where dissent and respective contestation take place seems therefore the most reasonable option (Bulkeley, 2020b). As such, Living Labs – spaces to test new approaches and engage a wide range of stakeholders – seem reasonable (Lupp et al., 2021). For instance, these were used to undertake a series of early meetings aimed at gathering a broad spectrum of participants, which created and stimulated new ideas in the river restoration “Isar-Plan” (Germany). These were later mutually discussed and screened, which increased agreement in future steps, and produced a longer commitment (Lupp et al., 2021).

2.6. SUMMARY

This chapter has introduced the reader to the concept of NbS and their current state, indicating major knowledge and performance gaps for a meaningful upscale of the

approach. This has been done by reviewing relevant policy aims and academic papers. In this context, integration of NbS stakeholders has been pointed out as a major problem to be overcome, given its links with remaining gaps. Consequently, the chapter has deeply explored the state of NbS' integration, producing evidence to show that more innovative approaches and tools could help boost the major need to scale them up from pilot projects to be a truly alternative to grey infrastructure. As such, it might be concluded that further research could produce recommendations to better integrate stakeholders and scale NbS up, meeting with the added values of the approach. Therefore, the next chapter will accordingly shape the outline followed for the data collection (Chapter 3). Additionally, this chapter will be relevant for the discussion (Chapter 5) of those results found by primary data collection (Chapter 4).

3. METHODOLOGY

3.1. INTRODUCTION

This chapter delves into the methodological aspects of the research. First, it addresses the aim, objectives, and research questions (Section 3.2). Then, it describes how the completion of the objectives was accomplished by outlining the research design (Section 3.3). The following section expands the rationale for the selection of the study area (Section 3.4). Afterwards, further information and justification regarding primary data collection and analysis is produced (Section 3.5–3.6). Finally, the way in which ethical aspects were addressed is outlined (Section 3.7).

3.2. RESEARCH FRAMEWORK

This research was aimed at exploring the barriers and enablers to forge integrated networks of stakeholders to effectively operationalise urban NbS.

To achieve this aim, the following objectives were established:

- O1.** To review the current conceptual understanding of NbS.
- O2.** To review the current practice on NbS and the gaps to scale up.
- O3.** To analyse existing knowledge on barriers and enablers on the specific need to develop an efficient integration of stakeholders.
- O4.** To explore the integration of NbS stakeholders according to practitioners in Madrid for the first time.
- O5.** To formulate recommendations for more efficient engagement of stakeholders, and future research.

The literature review examined the origins of NbS in terms of preceding concepts, variety of definitions, added value, and intended objectives (Objective 1). Practice and its need to scale up (Objective 2) were afterwards addressed, reviewing the features of existing NbS projects and gaps. This led to the identification of engagement as the major issue, so this was explored by providing examples of weak and good practice (Objective 3).

To gain depth in the analysis of reviewed literature, the research also addressed existing practice by interviewing NbS practitioners in a context-specific case, seeking to explore NbS collaborations in an area without previous research, and setting the views of practitioners in the wider research literature context (Objective 4). Therefore, the final goal identified and compared academic literature with local particularities and opportunities, as well as identified gaps for future research on NbS integrated networks of stakeholders (Objective 5).

To fulfil these objectives, four research questions were established (Table 1):

Table 1. Research questions matching their corresponding objectives.

		OBJECTIVES				
		O1	O2	O3	O4	O5
RESEARCH QUESTIONS	Q1. What do stakeholders understand by NbS in terms of: aims, objectives, added value, risk, and discrepancies?	✓			✓	Evaluation of responses
	Q2. Are NbS-related policies contributing to the implementation of NbS?		✓		✓	
	Q3. What is the state of collaboration in NbS? <ul style="list-style-type: none"> • Is there any innovative approach? • Who does engage? 			✓	✓	
	Q4. How effective is collaboration in NbS? <ul style="list-style-type: none"> • How and when is information being shared among interested parties? • Are facilitators identified in literature being utilised? 			✓	✓	

Question 1 explored understanding of NbS inspired by relevant features (Seddon et al., 2021; Nesshöver et al., 2017) at both the EU and local level. Question 2 referred to the scarce support for engagement by policy (Davis et al., 2017), and was also used to explore local practice. Question 3 sought an overarching description on practice and was aimed at bringing the reader to the research gap at the two scales of the research.

Finally, Question 4 produced a background for the identification of enablers of a previously identified background. Arguably, this led to the production of recommendations to solve existing issues, and future research.

3.3. RESEARCH DESIGN

The research was designed to explore stakeholders' networks at two different scales: the EU, and the city level. Considering the limited time frame for the dissertation, approximately three months, particular consideration was given to the type of data collection method each level needed to be successfully accomplished.

Objectives 1, 2 and 3 were aimed at exploring the theory and practice, namely at the EU level. Arguably for this approach, the selection of desk-based research was convenient, as the EU possessed extensive, reliable, and accessible data on the topic (e.g., Google Scholar and Scopus, or Verweij et al., 2015). This was essential for the success of the research, as it followed a hypothetico-deductive approach (Moreau et al., 2022), which meant that major categories for barriers and enablers on the need to create integrated networks of stakeholders were first identified in literature and then used to design the case study analysis.

Objective 4 was aimed at discovering first-hand what practitioners *thought* about stakeholders' integration in NbS at the city level. As it needed both to delve into the *personal experience* of those involved, and to obtain a representative number of participants per area, a case study methodology was selected. This “contributes uniquely to our knowledge of individual, organizational, social, and political phenomenon” (Yin, 1994, p.2). Additionally, it narrowed down the area of research so it increased chances to collect a meaningful sample. Therefore, it could be said that the approach was the most convenient method for the attainment of objectives. Furthermore, online interviews were selected to collect primary data based on the geographical distance of the study area and researcher, and their ability to explore a complex issue, such as interpersonal relationship effectiveness (see Section 3.5) (Reed et al., 2009). Arguably, these choices helped in the collection of reliable data for the posterior analysis, which was essential, as this research explored the topic in the area for the first time.

Finally, Objective 5 discussed and compared findings from the desk-based research and interviews to raise opportunities and recommendations for further research, thus potentially meeting the principal aim (Section 3.2).

3.4. STUDY AREA

Increasing population exacerbates those challenges derived from climate change (EC, 2015). Therefore, when selecting the case study approach, it was concluded that this was an opportunity to further explore practice in a large city where NbS were being promoted, but literature was still absent.

In this context, Madrid, the capital city of Spain, was selected for having the following features:

- 1) it was the second city of the EU in urban area population (6,221,000) (Demographia, 2022); and
- 2) it had plans (Ayuntamiento de Madrid, 2018a; 2018b, 2018c) promoting the incorporation of nature in the city to mitigate climate change impacts, such as heatwaves or heavy rainfalls, predicted to increase in the future.

Interestingly, before the research took place, the city council developed the Plan A (Ayuntamiento de Madrid, 2018a), of which a branch addressing NbS was developed in 2016. This branch was the “Madrid + Natural” strategy, which promoted NbS at the building, neighbourhood, and city scale, and had only appraised the status of projects by categorising their physical features (Ayuntamiento de Madrid, 2018b). As such, it was only in the “Green Infrastructure and Biodiversity Plan” where collaborative approaches were found. These involved the engagement of citizens, public, and private sector to collaboratively gather and implement GI projects in the long-term (Ayuntamiento de Madrid, 2018c). However, even when this plan engaged different stakeholders, this was for its write-up, thus follow-up examining the extent to which its mandates were being implemented was absent and undermined the reliability of intended measures.

Arguably, this was a weakness that contrasted with major cities in the EU (e.g., Berlin, Barcelona, Rotterdam, or Munich), where collaboration had been further researched (Frantzeskaki and Kabisch, 2016; Nóblega-Carriquiry et al., 2022; Lupp et al., 2021), and made Madrid an appropriate study area.

3.5. PRIMARY DATA COLLECTION

3.5.1. Selection of participants

Participants were selected following a purposive sampling method (Guest et al., 2006). This meant that only those candidates that followed pre-established criteria were interviewed. The criteria were considered to give the best chance of a meaningful response to the interview questions (Appendix III), and were:

- 1) being experienced in the city of Madrid;
- 2) being found as the result of searching for ‘environmental consultant’, ‘green infrastructure’, ‘Nature-based Solutions’, or ‘sustainability’; and
- 3) being practitioners, i.e., professionals working out of the administration, as they were understudied, even when their funding and knowledge was key for a successful scale up (Moreau et al., 2022; Skodra et al., 2021; NetworkNature, 2021).

Additionally, after each interview, ‘snowballing sampling’ was implemented (Reed et al., 2009). This meant that once the interview was concluded, participants were asked for potential candidates that met these criteria and that could provide insight. However, this approach could have led to bias caused by interviewing practitioners from the same companies, i.e., it could have led to similar responses (Reed et al., 2009). As such, snowballing was limited to two interviewees from the same company, and interviews were done privately (Guest et al., 2006).

3.5.2. Interviews

A series of online SSI collected primary data between 29 June and 18 July, 2022. At the end of that period, forty-nine individuals and three organisations were approached by email/LinkedIn, of which thirteen individuals accepted and undertook SSI. This was a sample of the practitioners in the area, so any analysis should cautiously be extrapolated to the entire poll of stakeholders. Nonetheless, the sample was considered appropriate for the purposes of the research, as it met with the criteria established by literature for a reliable sample size. For example, literature argues that twelve interviews (Guest et al., 2006), or even four if the group is homogeneous, “can render extremely accurate information with a high confidence level” (Romney et al., 1986, p.326). Regarding

homogeneity, this was assumed, as sampling was restricted to practitioners following pre-established criteria (Section 3.5.1) (Guest et al., 2006).

The use of SSI was prioritised, as this approach enabled benefiting simultaneously from advantages of other interview methods. For example, while SSI allowed the dialogue to “meander around the topics on the agenda” (Adams, 2015, p.493), as is the case in *structured interviews*, they also allowed unforeseen themes to arise, and thus further insight be gained, as in non-structured interviews (Adams, 2015). This was strongly relevant to follow the design outlined from the reviewed literature (Appendix III), but also to expand the exploration of particularities. Additionally, it improved the trustworthiness of findings, which was essential, given the pioneering nature of the research. Arguably, other approaches would have not been so trustworthy, especially given the remote/online data collection nature of the research. For example, when using questionnaires, chances for cheating from secondary sources could have increased (Thompson et al., 2016).

In this vein, it was the remote nature of the research which presented greater limitations. This was decided given the time and budget limitations travelling from Manchester (where the researcher was based) to Madrid would have involved. Nonetheless, the absence of face-to-face features might have decreased quality of data and diminished comfort among interviewees. Therefore, it was decided to allocate a welcome and a short introduction about the topic to the first part of the interview (Appendix III) (Adams, 2015). Moreover, even when the design of the interviews was completely flexible (i.e., questions in Appendix III did not correspond to a set order), the first question was always set as “which his/her definition about NbS was”, as easy questions had previously been described as appropriate (Adams, 2015). On the other hand, the individual responses of each participant were audio recorded and, later, verbatim transcribed to avoid prescriptive interpretations of what interviewees meant, e.g., by losing changes of voice tones (e.g., motivating, enthusiastic, or sceptical) (Grace et al., 2021).

Finally, the interviews were conducted in Spanish, seeking to maximise potential response of candidates. Additionally, interviewing in the native language was fully relevant to improving the quality of collected data, as it “produces more authentic

answers that exhibit more subtle nuances” since interviewees might be “more relaxed and open” (Welch and Piekkari, 2006, p.428). However, it was certainly true that interviewing in Spanish involved longer times to translate, and the potential costs of hiring a translator (Cortazzi et al., 2011). These potential limitations were addressed by the Spanish origins of the researcher, so any detail in the form of cultural expressions, or idioms, was noted, and the cost of hiring a translator avoided (Cortazzi et al., 2011).

3.6. PRIMARY DATA ANALYSIS

Thematic analysis was followed to analyse qualitative data of the interviews. This is a flexible and unbiased process of “identifying patterns ... within qualitative data” (Maguire and Delahunt, 2017, p.3352) to analyse identified codes and outline themes (i.e., patterns arising from the transcripts) (Braun and Clarke, 2006).

According to Braun and Clarke (2006), the flexibility of this method required explicit information of the position utilised. This research followed Braun and Clarke's (2006) six-step framework where the researcher first became familiar with data by reiteratively reading transcripts. This generated initial codes that were sorted according to relevance to be retrospectively analysed and produce themes (Chapter 4). The final draft was then reviewed and polished (i.e., avoiding duplicates among themes). Regarding the level of analysis (i.e., the extent to which interviewees' information was analysed), a latent level took place in order to gain insight on practitioners' responses, as apart from *strictly* looking at what each participant thought and had experienced (i.e., semantic level), it was sometimes the case that *underlying* meanings and interpretations were referred to as emotions (e.g., exclamations) or metaphors that reflected how the social context affected participants (McClure, 1989; Priya and Dalal, 2015) (Appendix V).

On the other hand, the interview protocol included answers to closed-ended questions such as “Yes/No” questions or “single-word answer” questions (e.g., the aim, added value, or the risk of NbS) that needed the use of frequencies to be clearly communicated. In this context, given the diversity of different topics arising, it would have been unfeasible to fit all of them within the word limit of this piece (approximately 15,000) by only “quoting” relevant sentences from the thematic analysis. Therefore, even when major trends were illustrated using quotes, the use of charts and tables was selected to

show overall frequencies and distributions on responses, and thus consider the integrity of participants (Adams, 2015).

3.7. ETHICAL ISSUES

This research followed the ethical guidance of the University of Manchester (University of Manchester, 2021). Participants were identified as of low-risk, therefore, non-vulnerable. This meant that, prior to the interview, informed consent was obtained, which consisted of an information sheet and consent form that needed to be signed (Appendix I, and Appendix II). These allowed an appropriate conveyance and understanding of information regarding good practice for participation (e.g., right of withdrawal, duration of interview, or anonymity) (Adams, 2015). Regarding anonymity, the identifying code assigned to participants did not respond to any particular order, e.g., duration of the interview (See Appendix IV).

3.8. SUMMARY

This chapter has produced a description and justification for the methodology conducted for the research. First, it has exposed the research framework where the aim, objectives, and research questions, as well as the relationship between them, have been outlined. Afterwards, the research design to fulfil these goals more appropriately has been outlined. This allowed the selection of the most suitable study area and method for the research, as specific explanation, justification and overcoming of potential limitations were therefore achieved. Additionally, this chapter has considered good data collection practice.

In sum, the chapter has allowed the production of a meaningful approach by which practitioners' insights were explored in-depth in Madrid for the first time. This led to the continuation of the research and the presentation of findings (Chapter 4).

4. RESULTS

4.1. INTRODUCTION

This chapter presents the findings from the interviews with practitioners in Madrid. The structure of the chapter follows that of the research objectives (Figure 1), which means that themes that arose from thematic analysis are classified into three topics to allow in-depth analysis and later discussion (Chapter 5). These topics start with practitioner understanding of NbS (Section 4.2), then, the extent to which policies promote engagement in NbS (Section 4.3), and, finally, the topic of collaborative networks (Section 4.4), which presents findings from the description of the state of collaboration (i.e., the engagement level) (Section 4.4.1–4.4.2) to enablers to improve performance (i.e., effectiveness) (Sections 4.4.3–4.4.4).

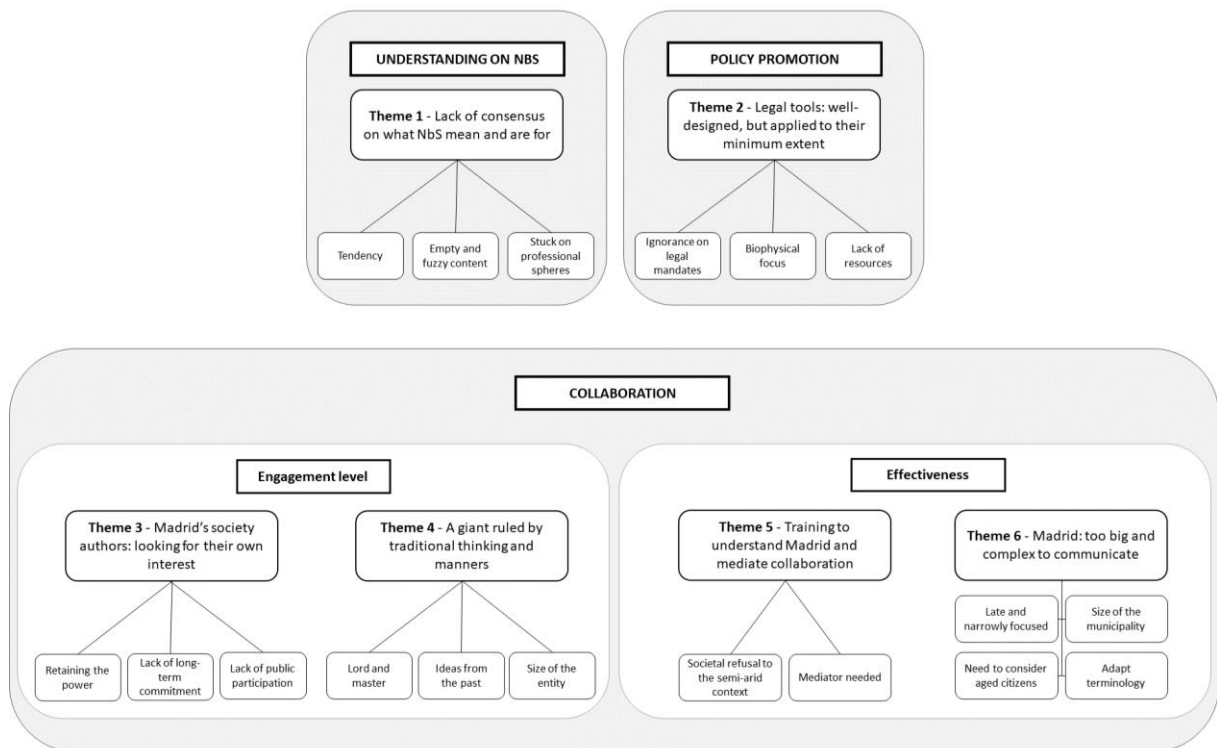


Figure 1. Thematic map showing codes.

4.2. LACK OF CONSENSUS ON WHAT NBS MEAN AND ARE FOR

The interviewees presented five different definitions for NbS in Madrid (Table 2). A majority (7 out of 13) of green sector professionals agreed to NbS being a replication inspired by nature to enhance urban planning. In their words, NbS majorly consisted of

trees, or gardens to promote biodiversity, diminish the heat island effect, or capture pollutants. This was the most popular view of NbS in Madrid, as it was among those supporting this definition that a greater level of agreement was reached (Table 2). Moreover, this predominancy aligned with interviewee #13's opinion on a “tunnel vision to ecological restoration, or tree-planting” when it came to GI, which suggested a biophysical emphasis in the city. This made this interviewee, alongside #5 and #12 feel better identified with the IUCN's definition for NbS (Section 2.3.1), as it accounted for “social-, economic-, and justice-dimensions” (interviewee #12).

Interviewees also warned that, away from the green spheres, the extent of agreement diminished. In this vein, interviewees #2, #6, and #9 stated that this was because green understanding on NbS had not been permeable to the engineering and architecture spheres. Consequently, “professionals with a more biological background ... do have these (*NbS*) concepts quite clearly”, but this was not the case for “professionals with a more engineering or team-management focus” (interviewee #2), who were the major private authors in terms of NbS implementation and tended to focus on effectiveness (e.g., savings in materials, or water), according to interviewee #6.

This lack of agreement caused two adverse effects. Firstly, there was found a nascent discomfort regarding engagement in interviewee #6, who said NbS were being “developed by people who don’t ... understand about the concept”, which caused this participant a “hard time when defending NbS”. Moreover, interviewees #1, #4, #6, #7, and #8 further warned that the existence of too many definitions might have been leading to NbS lack theoretical content, also increasing scepticism about participating in NbS projects. Consequently, interviewee #7 concluded that NbS was already an empty concept (Figure 4) and attributed them to a global trend that “assumes them (*NbS*) for almost everything. It has happened with a lot of terms, such as sustainability”.

This intelligibility was also reified when asked about the objectives of NbS, as interviewees provided eleven goals that did not discern consensus, apart from general agreement in an environmental aspect, i.e. “to adapt to climate change” (9 out of 13) (i.e., flood risk reduction, or decarbonisation). This reified interviewee #13's perception on the existence of a biophysical focus, as the socio-economic dimension was under-represented due to the dominance of environmental objectives, and only those

supporters of IUCN's definition (interviewees #5, #12, and #13) systematically considered this dimension (Figure 2).

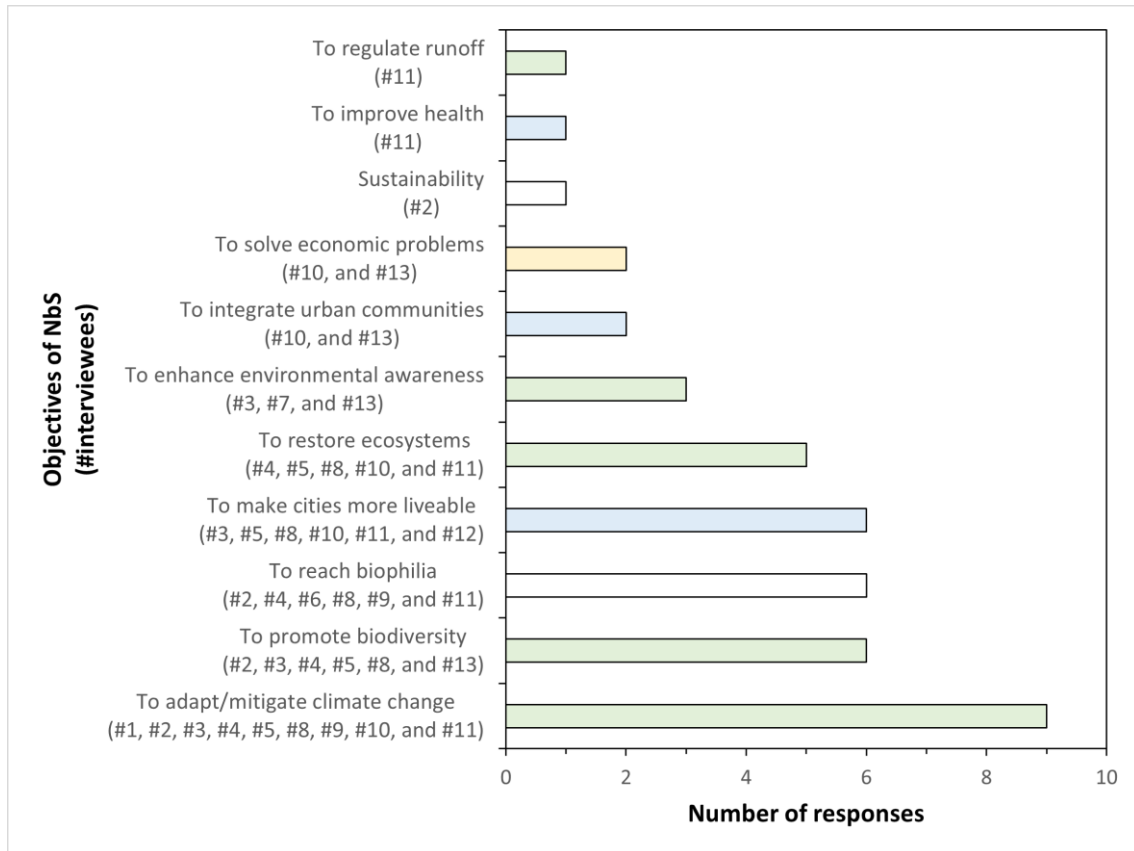


Figure 2. The objectives of NbS according to practitioners in Madrid (green: environmental, blue: social, yellow: economic, white: hybrid; more than one response allowed per practitioner).

Nonetheless, the environmental focus changed when asked about the added value, as cost-effectiveness was significantly the dominant response (9 out of 13) (Figure 3). Furthermore, some participants (interviewees #6, #9, #10, #12, and #13) supporting or not supporting cost-effectiveness, claimed that NbS would not be implantable without this consideration among the stakeholder spectrum. Perhaps interviewee #9's sincerity reifies this claim: “we should support the most what reaches people the most, which in the end is money. It’s sad, but it’s like that. Everything comes down to money”.

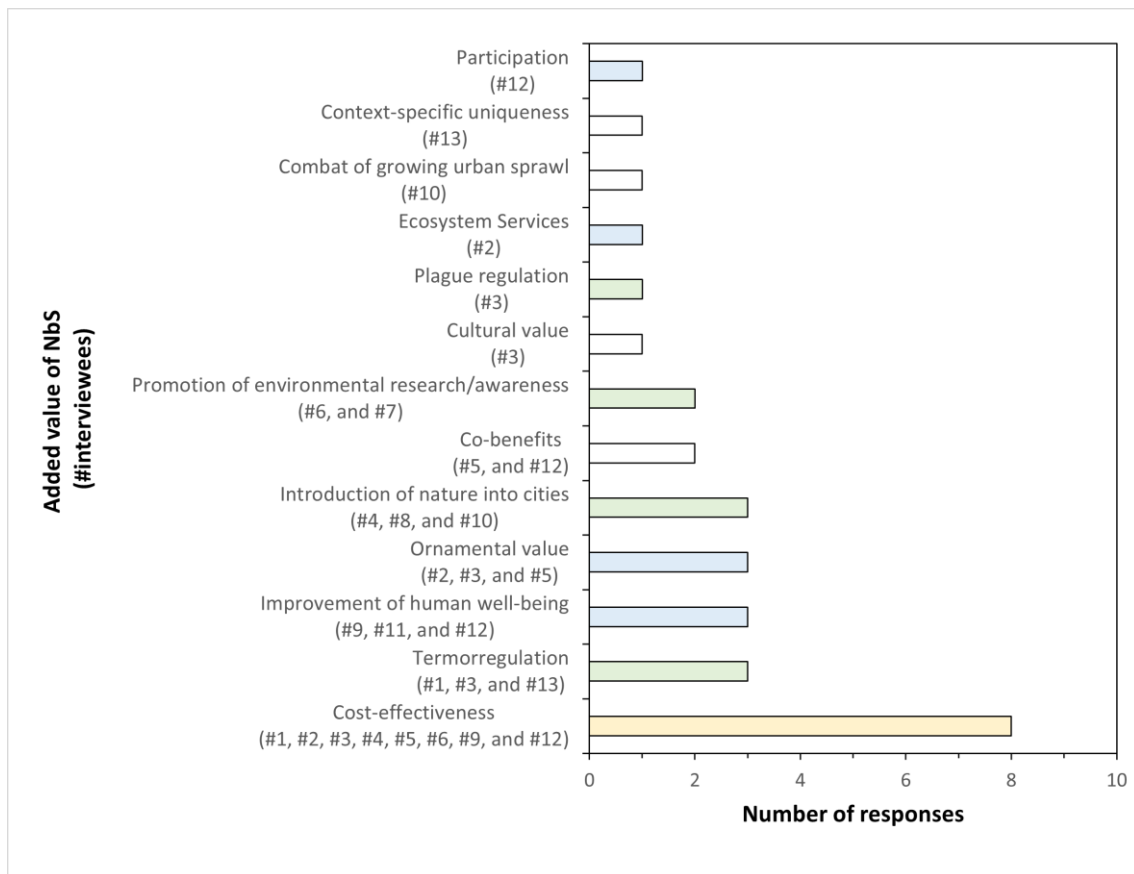


Figure 3. The added value of NbS according to practitioners in Madrid (green: environmental, blue: social, yellow: economic, white: hybrid; more than one response allowed per practitioner).

This last quote directly led to exploring practitioners' views regarding non-practitioners' understanding about NbS. According to interviewees, this differed across decision-makers and citizens (Table 2). On the one hand, all interviewees claimed that the economic dimension of NbS projects predominated when it came to public managers, as these understood urban planning projects as a means to achieve political gains (e.g., greenwashing) (see Section 4.4.1). On the other hand, all interviewees agreed that citizens were absent in NbS projects (see Section 4.4.1), which meant they “have no idea about what’s behind” (interviewee #3). Therefore, they translated NbS to daily things “such as in going to work under the shade” (interviewee #4).

Table 2. Summary of discrepancies and understanding among stakeholders (*partially indicates it is shared among green spheres).

Definition	Interviewee	Is your definition shared by:		
		Professionals?	Decision-makers?	Citizens?
“Replicate nature for urban planning solutions”	#2	*PARTIALLY	NO	
	#3	YES		
	#4			
	#6			
	#8			
	#9			
	#11			
Reference to IUCN's definition	#5			
	#12			
	#13			
“Solutions to positively impact nature”	#10			
“Solutions to climate change”	#1			
“A term without content”	#7			

4.3. LEGAL TOOLS: WELL-DESIGNED, BUT APPLIED TO THEIR MINIMUM EXTENT

All interviewees thought that legal instruments at the national, autonomous, and local level theoretically considered integration of stakeholders. For example, interviewee #9 claimed that:

“In theory, Madrid has a strategic plan for Green Areas and Biodiversity approved by the municipal government. This must be complied with and acts as the City's Green Infrastructure Plan. This plan establishes that you must have communication with all stakeholders when undertaking any type of measure, project, or improvement”

However, no practitioner was able to state that these legal mandates were being meaningfully carried out in the study area. Certainly, interviewee #12, who worked closely with the public sector, stated that “the way this conception (*integration*) is being materialised ... is very complicated, but the spirit is there, and that multipurpose does appear, it is not eluded, what is recognised is the complexity of putting it into practice”.

According to the analysis, this gap between theory and practice in the integration mandate's application was caused by ignorance on legal mandates, a biophysical bias, and a lack of resources.

Notably, there was a predominant ignorance on legal mandates among practitioners, as it was often the case that they did not know about major laws regarding GI (interviewees #1, #2, #4, #5, #6, #7, #11, and #13), so they broadly referred to their experience regarding application in practice. In this vein, practitioners agreed that this also applied to urban managers, as they did not know what green legislation stated. For example, among those who explicitly knew about legal mandates, interviewee #9 claimed that sometimes public officials “have not read their own municipal regulations” even though “it is mandatory”, so any consideration of engagement was often dismissed. This was a source of discomfort for green practitioners, who could not effectively carry out their jobs. Interviewee #8 claimed with anger:

“The problem is that everyone is in its own box. You arrive with a project that a priori is amazingly designed, and they just ask you about the price for maintenance. Well, they are right, this is a legal mandate ... But they ask you questions like if it will involve irrigation, when this is mandatory. Of course it will; we have no other option!”

Furthermore, this lack of awareness might be leading to participants predominantly understanding GI law in biophysical terms. To illustrate this point, when answering the question of what the legal interpretation of GI was, “conservation” (interviewee #11) or “reversal in harms made” (interviewee #1) to the green structure were typical responses. As in the previous section, interviewee #13 shed light on this issue and explained that, in Madrid, “NbS are closely linked ... to the development of parks and gardens”.

Finally, the lack of resources was mentioned by interviewees #4 and #5, who warned that while the law showed a tendency towards stricter mandates, this was not being followed by more instruments (e.g., additional staff) to meaningfully apply them. As per interviewee #4, this equalled “putting more obstacles in (*officials'*) way” and halted further actions.

4.4. COLLABORATION IN MADRID: PRACTITIONERS' INSIGHTS ON ITS STATE AND EFFECTIVENESS

4.4.1. First insight into the study area - Madrid's society authors: looking for their own interest

A majority of practitioners took part in NbS projects (interviewees #3, #4, #6, #7, #8, #9, #10, #11, and #13). When they were further asked to describe multiauthor engagement, they responded that it was infrequent. In more depth, interviewees #6, #8, #10, and #13 explicitly said that it was an exceptional event when these projects were open to public consultation. As such, these kinds of approaches only took place in major projects (e.g., El Bosque Metropolitano or Madrid Nuevo Norte) according to interviewees #3, #8, #9, #10, #11, and #13; and to #2, #5, and #12 whom, even when they had not participated in NbS networks (see Appendix IV), were knowledgeable about these projects.

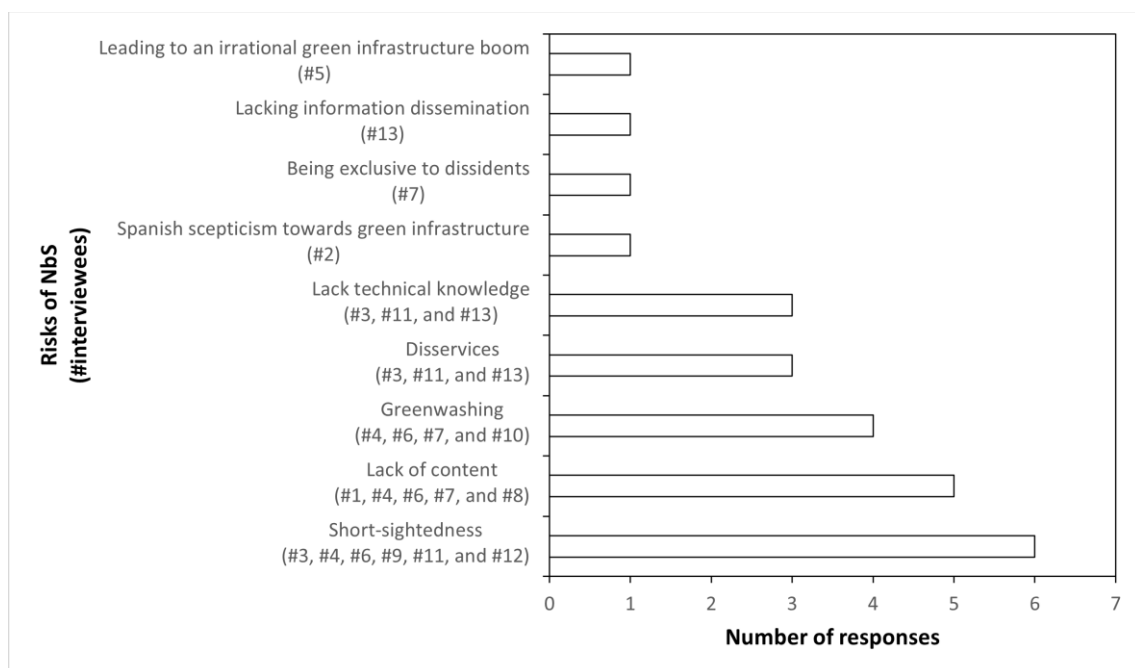


Figure 4. Risks of NbS in Madrid as per practitioners (more than one response allowed per practitioner).

As per interviewee #10, this scarce social engagement caused “a very large bias towards the same groups always participating”. Likewise, interviewee #12 argued that this was due to “(collaboration) not being so well-established in the municipal decision-making structure ... as that culture of participation has not been harvested in the past” (interviewee #12). Therefore, stakeholders predominantly sought their personal

interest. Actually, this lack of collaborative culture was the source of the major problems (Figure 4, e.g., “greenwashing”, and “short-sightedness”) in terms of participation, according to most interviewees.

At the company level, interviews revealed that retaining power status halted integration. For example, interviewee #4 claimed that experienced practitioners with an engineering background did not engage with or accept the public's opinion because “since the 1980s ... they have lost power, so instead of making an effort to adapt to what society asks, they have treated outsiders like fools”. Additionally, interviewees #6 and #10 claimed that power struggles were also reified in professionals from big engineering companies competing to obtain funding and reputational gains. This caused existing networks to act as “closed groups, a bit elitist” (interviewee #10) where information remained in non-green professional spheres where practitioners' major aim was the company's logo to appear in any big project's promotion. These two interviewees linked competition with “greenwashing” practices, which were also an issue according to #4 and #7 (Figure 4), as could lead to NbS being understood as a “style” or a “type of green marketing”.

At the decision-making level, interviewees claimed that the four-year cycle of the administration acted as a barrier to trustworthy engagement, as the major concern was winning the next elections. This meant that decision-makers placed the emphasis on measures with a quick political gain. Interestingly, interviewees #1 and #3 stated that decision-makers tried to embellish any NbS by advertising at all costs, even by “communicating late” (interviewee #1) or “hiding” (interviewee #3) potential weaknesses, because they feared “the distrust of the population” (interviewee #3). This could therefore explain the view of interviewee #7, that existing “participatory processes ... are more a kind of brand that legitimises decisions already made”. That resulted in a lack of commitment for long-term NbS implementation, as planning was “absent” (interviewees #4, and #6), for example, “when it comes to maintenance, in the sense of collaboratively cleaning, cutting or whatever” (interviewee #4).

Regarding citizens, all practitioners accepted that they hardly ever engaged in NbS projects. When they participated, it was as affected parties, and, to make things worse,

they were interested in seeing “a direct benefit” (interviewees #5, and #11) from their investments in the land allocated for NbS.

4.4.2. Madrid city council: a giant ruled by traditional thinking and manners

All participants identified the city council as the unavoidable leader of NbS projects to the extent that it received enough evidence to dedicate an independent subsection, as its organisation remarkably affected engagement.

Interviewees #1, #4, #5, #6, #7, #8, #10, and #13 described in negative terms the way the city council inter- and intradisciplinary worked. For example, “fragmented” (interviewee #7), “hierarchical” (interviewee #5), or “uncoordinated” (interviewee #10) were among the adjectives assigned, and that in turn eroded transparency, participation, and interdisciplinary engagement.

On the root of this problem, interviewees described the conservatism, or traditional manners of the administration. These caused some public servants to be unwilling to innovate/change, or have “ideas of no connection in any case with the natural space and natural resources” (interviewee #7), e.g., the “idea of cleanliness” (interviewee #5), which often led to trees being prematurely chopped down. Interviewee #5 described this as “a limitation as a way of understanding public space either in Spain or Madrid”. Additionally, traditional thinking led to major strategies and projects in GI not being collaboratively developed, but externalised to the private sector: “the city council gives you the money, then you take it and execute the project on your own” (interviewee #4).

However, interviewees who did not negatively describe the city council also said its big size made it “even more complex than a ministry” (interviewee #9), which was a problem in terms of both inter- and intrasectorial collaboration. Nevertheless, it was also the case that some interviewees (interviewees #1, and #10), aware of this opinion, highlighted that this was not a valid justification as, despite the size being an obstacle, interdepartmental coordination and communication “had not been granted as much importance as, they *should* really have” (interviewee #1), which led to a potentially avoidable “significant lack of coordination” (interviewee #10).

4.4.3. Training to understand Madrid and mediate collaboration

Most interviewees (interviewees #1, #2, #3, #4, #5, #6, #7, #9, #10, #11, and #13) mentioned that the lack of training acted as a barrier for collaboration since being effective “requires a high degree of citizen education” (interviewee #11) in some concepts (e.g., disservices, life cycle) and, without it, citizens' contributions lacked relevant content. Adversely, this was a source of frustration among some interviewees (interviewees #1, and #11).

In this context, the analysis yielded two main points that needed to be addressed: the lack of context-specific understanding, and the need for a mediator.

For the former, some interviewees (interviewees #1, #5, #8, and #10) claimed that citizens rejected the semi-arid features of Madrid. In this vein, interviewee #5 produced an ample source of relevant data, as this participant thought that, “In Madrid ... we are highly influenced by the vision of the north, of green vegetation”, which limited NbS projects, as it led to rejecting the identity of the city. This caused discomfort among interviewed practitioners, to the extent that interviewee #5 coined a new term, “stale participation” for the engagement approaches of the city. To illustrate this participation: “in Madrid ... you try to plant local plants that are yellow, that dry up in summer and require a bit of complicated maintenance and this meets with no support” (interviewee #5). According to interviewee #1, this happened because “when they (*citizens*) see that there are dry plants, do not know that ... it is necessary for them to dry up so they have fulfilled their development function in nature”. As such, interviewees often claimed that the public first needed to be educated on how nature looks in Madrid, so a meaningful engagement and geographical approach could take place. If not, the city council would continue to ineffectively spend money because Madrid's environment “does not have the capacity to implement (*NbS*) as in other areas of Europe” (interviewee #1).

Secondly, given the previously outlined lack of coordination (see Section 4.4.2), interviewees were asked about the figure of a mediator that guided the integration process. Surprisingly, this met with incoherent responses.

Predominantly, respondents (interviewees #1, #2, #3, #5, #6, #8, #11, #12, and #13) did not identify or know about the existence of such a figure. Nevertheless, they described

it as potentially “useful” (interviewee #5) and “one of the objectives” (interviewee #11) they were working for in Madrid. These interviewees also said that the use of GIS in that hypothetical intermediation process could be essential, as it could make projects “visually understandable” (interviewees #8, and #10) or “more didactic” (interviewee #2). For instance, interviewee #13 suggested replicating successful applications such as “dynamic before/after photos”.

On the other hand, remaining participants provided dissimilar responses. Interviewees #7 and #10 stated that the Innovation and Technology for Development Centre or private companies respectively had performed some pilot projects where the nexus between public, private, and academic entities was developed. However, these were “unofficial” attempts (interviewee #7, and #10) where “they do not have infinite resources” (interviewee #10). Meanwhile, interviewees #4 and #9 claimed that official mechanisms for coordination existed. For example, interviewee #9 said the administration had “the general coordinator” figure, which “establishes that coordination work between all the planning departments”. The same interviewee also said that, out of the administration, the ‘El Árbol’ board gathered quarterly and informed the public, academia, and companies about GI-related news in the city.

4.4.4. Madrid: too big and complex to communicate

Previous subsections have showed a fragmented and close environment where participation was scarce, resulting in a lack of awareness, or scepticism among many stakeholders. To make things worse, professionals involved knew communication was not effective: “many times they (*Nbs*) stay in the internal fora of professionals who dedicate ourselves to them” (interviewee #9). However, they continued to communicate in a “discontinuous” way (interviewee #4), “too late” (interviewee #1), and “as an advertisement” (interviewee #6). In this context, interviewees were asked about the reasons communication was so ineffective. Surprisingly, a unanimity of participants changed their focus from mainly blaming those involved and claimed the big size of Madrid was the major barrier. Their view was clearly reified by interviewee #13 who argued that was being “honest” and explained that, even if communication was attempted, “in large cities it is very difficult to reach the public; the audience you reach is going to be a very general percentage”. As such, at the time of the research,

information only reached those directly affected by projects, as it was sometimes the case that interviewees had worked in “a series of meetings ... with the citizens who own affected land, to inform and communicate with them” (interviewee #11).

In this context, interviewees identified online platforms (i.e., city council's website), as the most far-reaching means through which information was being disseminated. This was the case for the El Bosque Metropolitano, which had all information “posted on the municipal website, therefore, any citizen who wants to consult what is the value of the urban forest of Madrid, can do it” (interviewee #9). However, online means were also rejected given the “very old” (interviewee #4) population of Madrid, and the noticeable “generational gap” (interviewees #3, and #8). In this vein, even when barriers for successful communication were numerous, interviewees showed willingness to overcome this situation. First, interviewee #8 thought that “we should work with neighbourhood associations, or even senior centres”, giving them a “personal care”, i.e., going “around the districts”. Interviewees #4, #7, #11, #12, and #13 argued that these face-to-face approaches should communicate NbS' added value in flexible and tailored terminology, which meant that they refused the use of the previously suggested ES for Madrid. For example, interviewee #7 stated that “the content can be grounded in a common language without the need to always be on top of these technicalities (ES)”. Furthermore, interviewee #11 argued that ES could be preventing the collaboration of citizens because “the name already overwhelms”.

Apart from that, 12 out of 13 interviewees supported bidirectional communication so they could also proactively learn from citizens. Interviewee #2 based this on “knowing the idiosyncrasy, the particularities of the area, not only in cultural, but also environmental terms”, while interviewee #12 claimed this was required, as not doing so “has sometimes been a source of failures and conflicts”. Regarding the unique dissident to bidirectional communication, this explained that the company where this participant worked had a well-implemented experience in its niche, so there was no need for communication, as “(clients) already know perfectly well how we work when they hire us” (interviewee #6).

4.5. SUMMARY

This chapter has presented practitioners' thoughts in their understanding on NbS, the extent to which policies promoted integration, and the state and effectiveness of such integration attempts in Madrid. As per understanding, discrepancies on the definition and objectives at both the professional and societal level caused tensions towards inter- and intradisciplinary engagement. Regarding policies, the analysis has showed a biophysical emphasis, lack of awareness on their mandates, and a lack of resources significantly affecting integration. The final section has explored collaboration in terms of its state and effectiveness, which has revealed a non-innovative, uncoordinated approach led by personal interest and unwillingness to cooperate, so multiauthor collaboration was extremely limited. This required innovative means in both training and communication, according to interviewees.

Therefore, this chapter has produced evidence to be used as a basis for a comparison with academic literature, and a preliminary outline of recommendations for good practice (Table 3). This was a requirement to fulfil the final objective of this research (Section 3.2), which was done in the next section (Chapter 5).

Table 3. Summary of interview findings.

CATEGORY	BARRIERS	OUTCOME	RECOMMENDATIONS
Understanding	Scarce understanding out of professional spheres, tendency towards environmental issues, ambiguity	Scepticism, discomfort, lack of content, discrepancies	Closely work with social associations Adapt terminology to stakeholders Education Bidirectional communication
Policy promotion	Lack of resources, ignorance, biophysical bias	Gap between theory and practice, engagement often dismissed	
COLLABORATION Engagement-level	Same authors engage over time, fear of other stakeholders' engagement, power struggles, conservatism, lack of long-term perspective, big size of administration	Scarce public participation, search of personal interest, lack of social awareness, fragmentation	
Effectiveness	Knowledge retained at the entity level, large size of municipality, lack of context-specific understanding, lack of an official mediator, demographics of Madrid	Incoordination, non-transparency, lack of bidirectional learning, refusal by non-professionals, frustration by professionals	

5. DISCUSSION

5.1. INTRODUCTION

This chapter discusses findings on practitioners' perspectives on integration in NbS (Chapter 4) with relevant academic literature. To maintain coherency with the research framework (Section 3.2) and results, the chapter's structure follows the research questions. While discussing findings, each section produces recommendations to scale up, thus meeting the research aim stated in the research framework.

5.2. WHAT DO STAKEHOLDERS UNDERSTAND BY NBS IN TERMS OF: AIMS, OBJECTIVES, ADDED VALUE, RISK, AND DISCREPANCIES?

This research has shown that defining NbS is a difficult task that depends on multidisciplinary understanding and agreement. In Madrid, a lack of consensus on what NbS meant and were for was found among professional disciplines, who argued this was also the case among remaining groups of stakeholders (i.e., decision-makers and citizens).

Strictly among practitioners, the poor representation of green professionals in NbS leadership positions compared with engineering professionals led to scarce agreement on NbS definition and objectives (i.e., more environmental vs. more technical bias). This caused demotivation during multidisciplinary work, as the agreed design of projects was an unpleasant experience for some interviewees. For example, interviewee #6 had left NbS groups prior to arguing with architects because they “primarily aimed at removing water from NbS, even when nature requires huge amounts of this”. This situation agrees with Venkataramanan et al. (2020), who described a series of stormwater management projects where frustration led to withdrawals to participation among green practitioners, and in turn to a scarce multidisciplinary professional engagement. However, multidisciplinary is a must for NbS, as not engaging different perspectives causes a poor technical performance, in turn making decision-makers discredit GI against grey infrastructure (Grace et al., 2021). Therefore, Venkataramanan et al. (2020) advised clarification of responsibilities as a key driver to effective collaboration, so each professional could understand its task towards the objectives of any NbS project.

In this vein, objectives could be mutually agreed at an early phase of the development so potential trade-offs due to misunderstandings were diminished. Nesshöver et al. (2017) suggested the incorporation of ranges of variability to desired or accepted objectives, so green spheres could represent a minimum requirement for ecological features (e.g., native species or local resources), while remaining professionals could potentially incorporate the desirable range of effectiveness. Arguably, if responsibilities were evenly allocated in Madrid, and the theoretical framework flexibly agreed, this would help coordinate (i.e., share skills and ideas) and appropriately represent green professionals and their knowledge.

As per decision-makers, findings revealed that they understood cost-effectiveness as the major benefit of NbS, since interviewees claimed politicians saw NbS as economical structures that could gain public support, and in turn decision-makers could maintain their leadership. In Europe, this view might be caused by the narrow, market-driven understanding of the EC in leading global environmental markets (see EC, 2015, p.6), which produces a cash-flow insight, according to Nesshöver et al. (2017). Adversely, this perspective persists even when academics attempt to explain that ES approaches should not be related to strictly monetary terms, as their cost-effectiveness might not be a rule and could lead to political disinterest if positive revenues do not arise (DeLorme et al., 2021; Liquete et al., 2016; Nóblega-Carriquiry et al., 2022).

DeLorme et al. (2021) suggest that this bias could be overcome by developing strong evidence and understanding on intangible benefits such as the leisure that green spaces provide. However, developing it can be a fuzzy process leading to inaccurate calculations, given the difficulties of measuring subjective aspects. Buchel and Frantzeskaki (2015) demonstrated how Q-methodology – a tool to assess social impacts by measuring personal data – can help demonstrate which are the best-regarded social benefits by identifying common perceptions towards an issue and designing profiles according to their given value, which can be used to produce analyses that relate identified perceptions with ES benefits (e.g., recreation, or aesthetics). Afterwards, this output can be used to tailor projects to the top-rated benefits, in turn increasing public value and usage. Arguably, efforts in this matter could be conveyed in NbS in Madrid, so the most valued intangible benefits could be revealed, and thus the city council could

include these in local NbS developments, increasing public willingness towards them and, in turn, their political reputation.

Finally, regarding citizens, practitioners said they did not know about the existence of NbS. Arguably, the absence of the social dimension might be leading to Madrid's lack of participation, even when citizens' input is essential as they can help design projects, e.g., by considering context-specific (e.g., green gentrification) risks often dismissed by administrations (McPhearson et al., 2022). The latter example seemed to be the case in Madrid, as only disservices (e.g., allergies derived from the disregarded introduction of non-native species) (Schaubroeck, 2017) were acknowledged by some interviewees. Adversely, not considering the entirety of negative effects of NbS can affect well-being, in turn diminishing their reputation or causing rejection (e.g., understanding GI as an empty instrument from big companies or politicians) (Seddon et al., 2021; Chandrasekaran et al., 2021). Worryingly, in Madrid, this seemed to be a nascent view, as interviewee #7 argued for an empty concept. Aiming to shed light on this issue, some interviewees claimed that NbS should be defined by IUCN's definition, which considered the social dimension (IUCN, 2016), fact that might make relevant the production of a holistic, respectful, and integrated perspective in the city.

In essence, more emphasis is required in permeability among authors to enhance willingness towards NbS. Special emphasis is needed in developing approaches to reach minimum professional consensus in objectives and responsibilities, thus guaranteeing the best technical performance. Additionally, the city's understanding needs to recognise intangible features and achieve holistic thinking, thus considering the social dimension in terms of benefits and risks. Arguably, this would lead to a better integration, and a minimum shared understanding among stakeholders.

5.3. ARE NBS-RELATED POLICIES CONTRIBUTING TO THE IMPLEMENTATION OF NBS?

According to practitioners, there was a gap between theory and practice, as policies considered integration, but they were not contributing to the development of integrated networks of stakeholders. Surprisingly, this opposed to scholars' findings, as literature described an excessive environmental and economic emphasis by the EC at the policy level (i.e., theory) (Maes and Jacobs, 2015; Sarabi et al., 2020; Davis et al.,

2017) (e.g., Davis et al. (2017) found social cohesion, participation, or cultural diversity as the least frequently targeted challenges in legal mandates). However, it could be argued that this apparent disparity was an effect of interviewees' lack of knowledge regarding legal mandates, as even among those who knew about local plans, there was an overreliance on the 'Green Infrastructure and Biodiversity Plan' (e.g., interviewee #9). This plan includes accountability and participation as a core value, and has therefore undertaken some engagement approaches for its design (Ayuntamiento de Madrid, 2018c). However, this is an overarching (i.e., not tailored) plan of the city aimed at gathering local approaches towards environmental enhancement.

Consequently, a review on the Plan A or "Madrid + Natural", which are directly responsible for NbS projects (Ayuntamiento de Madrid, 2018a; 2018c) was performed. The analysis found that participatory principles were severely under-represented. As in Section 3.4, "Madrid + Natural", described only physically (e.g., in terms of size, or apparency) previously undertaken developments (Ayuntamiento de Madrid, 2018b). Regarding Plan A, only 2 out of its 30 measures were targeted at collaboration, e.g., by vaguely mentioning the aims to develop "formulas for public-private collaboration in sustainable and innovative urban logistics" (Ayuntamiento de Madrid, 2018a, p.43), and remaining measures predominantly sought to enhance air quality. Consequently, it could be concluded that Madrid was not an exception at the European level in terms of biophysical focus (Davis et al., 2017), and that lack of awareness might be leading to an overly optimistic perspective.

Lack of awareness has been described as a major issue blocking political changes to promote NbS upscale in Apulia (Italy), where legal tools mandated "soft" (i.e., voluntary) measures that led to a limited implementation of NbS (Barbanette and Grassini, 2022). However, voluntary measures might be an issue, as they usually consist of scarcely quantifiable targets and are applied to their minimum extent (e.g., online information disclosure) (Davis et al., 2017). According to Barbanette and Grassini (2022), this was the case for the Italian region, where it was not until authorities realised this weakness that stakeholders assigned a measurable target and greater weight to those mandates related to collaborative objectives (e.g., in terms of resources assigned). As a result, proponents were encouraged to undertake actions to collaborate (Barbanette and

Grassini, 2022). In this context, the production of a coordinated work among stakeholders, where weaknesses are shown by experts and agreed measures are undertaken, might be recommendable (Sarabi et al., 2020). Arguably, when working closely with policy-makers, practitioners could better understand the legal framework, thus producing feedback for its improvement, which should be measurable and well-focused following Apulia's case (Barbanette and Grassini, 2022).

Additionally, it could be said that by allocating such a quantifiable feature to participation mandates (e.g., in the form of funding), their applicability could be enhanced in Madrid, as it could guarantee the delivery of resources to the development of networks, which was identified as a weakness by some interviewees. Frantzeskaki et al. (2020) described this in Glasgow (United Kingdom), where the reduction of staff (i.e., expertise) caused a lack of monitoring of SuDS, and led to little positive evidence. However, positive evidence is essential to engage, gain credibility, and trust (Frantzeskaki and Kabisch, 2016). Therefore, authors called for a change in the existing legal framework, so the development of collaborative work and skills could receive enough attention (Frantzeskaki et al., 2020). In this vein, it could be stated that the previously defended, co-ordinated work (Barbanette and Grassini, 2022) could be a potential driver for this issue.

In sum, if legal mandates were co-designed, awareness could be developed, so increased focus could be placed on overcoming weaknesses such as those identified in the under-representation of participatory aspects, or lack of measurability. The co-design process could allocate a proportionate and quantifiable share of resources to collaboration. In turn, it might encourage willingness and credibility towards NbS among stakeholders, therefore potentially increasing external funding, which could further overcome those issues of scarce resources.

5.4. WHAT IS THE STATE OF COLLABORATION IN NBS?

Past sections discerned that greater engagement could be desirable in Madrid. Nevertheless, interviewees described a poor background where personal interest, lack of commitment for engagement, and the city council's size and conservatism in the form of fragmentation, or unwillingness to innovate, led to seeking personal benefits

(e.g., re-election, receiving public funding, or gaining benefits from investments) instead of the creation of integrated networks. Arguably, these findings restate the need to scale up NbS promulgated by scholars (e.g., Sarabi et al., 2020; or Cortinovis et al., 2022 – see Section 2.4), and go against the EU's aims of multiauthor participation so knowledge can be gathered, and democratic principles followed (NetworkNature, 2021; Bulkeley, 2020b).

Interviewees described sectoral interest and competitiveness at all levels, leading to the creation of close groups not committed to integration, as small companies (notably, those from the biological spheres) and citizens were not well-represented. However, poor representation might lead to scarce attainment of NbS goals (Grace et al., 2021). In this vein, Calliari et al. (2022) presented an inspiring and innovative example in landslides management in Italy, where stakeholders worked separately with technical experts to co-design their preferred strategy. After this, views were clustered into competitive narratives, which served to co-generate an agreed final output. Arguably, the competitive environment of Madrid makes this approach an interesting one to try, as it uses personal interest as the basis to engage and achieve consensus, and could overcome any potential reluctance of existing leaders. Nevertheless, potential limitations of innovation should be considered, as Barbanette and Grassini (2022) warned that embedding innovative approaches into a well-established planning system might not be easy. Therefore, they proposed that 'innovation niches' aimed at regeneration, and where innovation can take place at small scale, might be first required.

Innovative niches could work for Madrid, as its well-established but fragmented background makes it reasonable to progressively replicate such approaches in controlled environments, where new stakeholders can get involved, and pre-established manners changed, thus seeding the interest of stakeholders. Arguably, Living Labs (see Section 2.5.4.2) seem a good choice, as they could engage people from academia, public organisations, society and private enterprises, and opinions could be stimulated, gathered and agreed, while in turn generating commitment towards participation (Lupp et al., 2021; Frantzeskaki and Kabisch, 2016).

On the other hand, interviewees said that NbS implementation completely relied on the city council. Giordano et al. (2021) described how, when leadership is performed by an entity not committed to collaboration, it presents a weakness, as it prevents further engagement of other agents. This was exacerbated by the big size of the administration, which represented a barrier for coordination. These two factors combined led to a frequent externalisation of services, which caused NbS projects in the city to be independently developed by different companies. Consequently, it could be stated that accountability and public awareness were inevitably limited, and negative perception towards NbS could potentially increase (Nóblega-Carriquiry et al., 2022). Kabisch et al. (2016) mentioned that citizens should be included early in co-creation solutions, as it enhances social acceptance, therefore, it could be stated that previously supported innovative approaches should engage stakeholders from the earliest phase of any NbS project in Madrid.

In outline, integrated networks might be relevant for NbS projects in Madrid. However, its pre-established manners, interests, and fragmentation are so deeply rooted that, without progressive, respectful, and innovative approaches that include early engagement, these might be impossible. However, if accomplished, any potential positive evidence could inspire existing entities to further commit.

5.5. HOW EFFECTIVE IS COLLABORATION IN NBS?

According to interviewees, Madrid's large size was the major problem when it came to the development of effective strategies for collaboration. Combined with previously discussed barriers, this meant that NbS projects were not effectively engaging the public (i.e., information was conveyed late, and did not reach a meaningful sample of population, namely the aged population). Interestingly, this issue is not unique to Madrid, as a large size and population makes information dissemination especially complex in major cities worldwide (e.g., Melbourne, Australia) (Frantzeskaki and Bush, 2019). According to interviewed practitioners, in Madrid this limited the agreement of common objectives, as information was disseminated through passive means (e.g., the local website), and without frequent public workshops. However, according to van der Jart et al. (2019), communication should involve bidirectional learning, and adapted means to vulnerable groups if interest among stakeholders towards engagement is to

be developed. From findings, it could be therefore said that Madrid requires tailored enablers to embed in their previously defended (Section 5.4) early and innovative spaces to ensure their effectiveness.

Inspired by the resemblance of Melbourne in terms of size and population (Frantzeskaki and Bush, 2019), and the wide willingness shown by practitioners (9 out of 13), it could be argued that the use of intermediaries to guide the previously proposed innovative approaches seemed appropriate for Madrid. Intermediaries are individuals that can adopt a range of roles, from enhancing coordination to disseminating information, potentially increasing the chances of integration approaches being effective (Frantzeskaki and Bush, 2019). Additionally, when intermediaries frequently and closely work with stakeholders from the outset of the project, interdisciplinary dialogue can take place, so mutual understanding and learning is triggered (Frantzeskaki and Bush, 2019; Frantzeskaki and Kabisch, 2016). In this context, scholars highlight that those guiding collaboration processes should be expert in leadership skills (van der Jart et al., 2019; de Waal et al., 2019), and have good relationships with stakeholders (Frantzeskaki et al., 2020). Given the central role of the administration in Madrid, and the major responsibility the EC allocates to administrations for the NbS uptake (Skodra et al., 2021; Raymond et al., 2017), it could be therefore argued for the mediator coming from the green areas of the city council, as they hold green urban planning competencies, and thus increases the chances of closely knowing the entire stakeholder spectrum. Arguably, the willingness of practitioners towards this figure and the connections of the city council could also be used to effectively save times in the development of interpersonal relationships (de Waal et al., 2019).

Additionally, this figure could help address the public refusal of the context-specific semi-arid features of Madrid (i.e., address the general understanding of NbS as something inherently green), which was essential for a suitable NbS uptake in the city given its natural features such as its native species life cycle. Venkataramanan et al. (2020) described this same issue in bioswales in Portland (United States), a city with a hot-summer Mediterranean climate (as Madrid), where citizens refused ongoing engagement for maintenance, as this did not include keeping green features. However,

continuous maintenance is essential for NbS to be operational (Kabisch et al., 2022). Therefore, Venkataramanan et al. (2020) came to say that citizens needed to be educated so they were aware of the nature of the implemented GI. In this vein, interviewee #1 mentioned a tool already being used in Madrid and that was potentially powerful for communication: GIS (Rall et al., 2019).

GIS can produce visual outputs to effectively educate in context-specific affairs, a process that has been named Public Participation GIS (PPGIS). Essentially, PPGIS consists of developing layers that gather knowledge, preferences, and values that support urban happiness while shedding light on spatial features that can be brought to the collaborative process in the form of online and paper-based features (Rall et al., 2019). This can enhance the scope of the audience, and has already triggered bidirectional communication and learning in successful attempts, such as in Berlin, where scientists and decision-makers could exchange knowledge on the best way to implement NbS (Frantzeskaki and Kabisch, 2016). Arguably, if the intermediary was trained in the use of PPGIS, it could enhance any innovative attempt at collaboration in Madrid by teaching the entire spectrum of stakeholders in the context-specific features, potentially triggering an effective, tailored co-learning process showing maps, graphs, or images. These could be previously produced by professionals who first consulted citizens to collect social data for layers and would then add this information to their geographical, climatic, or ecologic data (Rall et al., 2019; Frantzeskaki and Kabisch, 2016). Consequently, further awareness and knowledge could lead to a mutual agreement in actions (e.g., maintenance) respectful of the geographical and social features.

Finally, findings have shown that special attention needs to be given to the vocabulary by which information is communicated. This agrees with literature which mentions differences in terminology (e.g., technicism from academia vs. language from citizens) among involved authors as a barrier for effective integration (Thompson et al., 2016). In this context, the intermediary could adapt the language to each party so they could mutually understand. Even when a case study involving four GI projects in Skania found ES as a framework to show benefits in economic terms (i.e., easy-to-understand and compare) (Wamsler et al., 2016), practitioners interviewed argued against ES, as non-professionals could find them difficult. Arguably, this might be due to the demographics

of Madrid, as it has a large aged population, which led to many calls for “personal attention” by adapting the terminology to “plain language”. In this context, DeLorme et al. (2021) said that ES might have unclear definitions, vague interpretations and be predominantly used in academia. Therefore, instead of scientific jargon, it seems reasonable the mediator be trained in equivalent words often used by citizens (Somarakis et al., 2019), such as the examples provided by interviewee #13 (i.e., “pollinators”, “shade” or “oxygen” instead of “water cycle” or “purification services”).

In sum, to gain effectiveness, Madrid needs a “holistic” author able to teach and motivate the broad spectrum of stakeholders early and continually in the designing process and keep them until the management phase of NbS (Malekpour et al., 2021). The research identified skills to develop context-specific awareness and adapted communication as essential for the city's features (i.e., in terms of size or demographics). If accomplished, innovative NbS engagement approaches could be effectively scaled up in the city.

6. CONCLUSION

This research was targeted at better understanding the barriers and drivers to integrate stakeholders from NbS in collaborative networks. A series of objectives and methodological approaches were therefore outlined to meaningfully meet this aim by reviewing existing practice and exploring further features in a local context.

This section therefore summarises the attainment and findings for each objective. This information is used to produce recommendations towards the effective collaboration, and reveal gaps for future research.

6.1. ATTAINMENT OF OBJECTIVES

O1. *To review the current conceptual understanding of NbS.*

The piece produced a critical review of the theoretical understanding of NbS. This revealed that even when concepts preceding NbS should be considered in terms of communication, the unique attention to multifunctionality, or integration, makes NbS something to be streamlined. However, the low awareness and vagueness of NbS in terms of definitions and objectives makes of them something confusing, focused on environmental affairs, and risking the dismissal of some added values, especially in social engagement.

O2. *To review the current practice on NbS and the gaps to scale up.*

The review of existing practice revealed that NbS are widely supported by the EU's policies, which results in ample funding by H2020 for the development of projects. However, the examination also showed that this consideration is mainly voluntary, and biophysically focused, so NbS are implemented as pilot projects, accessories to grey infrastructure, and lacking participation. Consequently, a trend to scale up is going on among scholars, who have identified gaps of knowledge for a full implementation of NbS. Remarkably, the research identified engagement-related issues as the major gap on the grounds of meeting the multidisciplinary nature, and reaching the social dimension, which would lead to long-term implementation, or maintenance. Therefore, it was this gap which the researcher further analysed.

O3. *To analyse existing knowledge on barriers and enablers on the specific need to develop an efficient integration of stakeholders.*

The desk-based research identified four categories relevant to the development of NbS collaborative networks. These were pre-established thoughts about the times and costs, siloed working structures, scarce skills in terms of engagement, and scarce communication and consensus. Drivers to overcome this situation were therefore explored, which revealed numerous enablers for better collaboration. The consideration of intangible benefits, the application of innovative approaches and tools to coordination, or conducting a bidirectional communication, arose as urgent aspects that could lead to a meaningful achievement of the theoretically regarded participatory added value.

O4. *To explore the integration of NbS stakeholders according to practitioners in Madrid for the first time.*

Based on the output of the previous objectives, engagement in NbS was explored in Madrid by interviewing thirteen practitioners from different entities (see Appendix IV). The researcher afterwards conducted a thematic analysis that yielded three major topics with themes that involved the lack of consensus among stakeholders on the definition, focus, and objectives of NbS; the lack of awareness and application of legal mandates in terms of integration; and a deep review on collaboration in terms of its existing state and effectiveness. For the latter, the research found that personal interest from stakeholders led to scarce motivation to promote engagement, therefore this was not being meaningfully delivered. This was reflected in incoordination, traditional thinking, or lack of commitment. Additionally, the research also found tailored barriers for Madrid in terms of communication: the large size of the municipality, the high proportion of the aged population, and the semi-arid features of the city. Therefore, the evaluation of effectiveness yielded a negative view of scepticism, or a lack of knowledge that needed to be tackled by innovative approaches, tools, and skilled authors.

05. To formulate recommendations for more efficient engagement of stakeholders, and future research.

By following the research design, the researcher was able to compare and discuss networking approaches in the EU and a newly explored city (Madrid). This provided the opportunity to understand practitioners' views on NbS, the effectiveness of policies, and the context of collaboration. It was therefore possible to produce strong recommendations reflecting enablers interviewees considered relevant for Madrid, and recommendations for future research (Section 6.2).

6.2. RECOMMENDATIONS

- Stakeholders showed an incoherent and scarce understanding of NbS, especially among citizens. Therefore, further emphasis should be given to the objectives and responsibilities, and incorporating the social dimension of NbS not to dismiss knowledge and risks. Madrid could be inspired by IUCN's definition, and produce its tailored approach by using flexible objectives. Additionally, further research considering intangible benefits for citizens could be useful.
- Stakeholders showed lack of awareness about legal instruments for integration. However, the local policy analysis showed that this tended to be biophysically biased, therefore there is a need to promote collaboration. Further coordination, where experts can show weak points to stakeholders, might therefore be advisable. The new mandates should be proportionate, clear, mandatory, and measurable, so enough resources for implementation are granted.
- Engagement is not being undertaken in Madrid, given its traditionally fragmented, large, disinterested, and competitive narratives. This research therefore concluded that it still seemed unfeasible to implement NbS engagement on a full scale. Further efforts might be needed in innovative, progressive, and respectful attempts developed in early and ongoing 'niches' guided by a mediator from the administration, and where positive evidence is generated.
- To be effective, previous efforts should be granted support by the research community. This means that the mediator should receive relevant content, and be taught in tools and adapted language respectful of context-specific features.

Notably, academia should create this content by further assessing social impacts, and context-specific abiotic features to produce outputs that merge, and reflect these variables in a comprehensive and tailored manner.

REFERENCES

Adams, W.C. (2015). 'Conducting Semi-Structured Interviews', in Newcomer, K.E., Hatry, H.P. and Wholey, J.S. (eds.) *Handbook of practical program evaluation*. 4th ed. Hoboken, New Jersey (US): Jossey-Bass, A Wiley Brand, pp. 492-505.

Ayuntamiento de Madrid (2018a). *Plan A: air quality and climate change plan for the city of Madrid*. Available at: https://www.madrid.es/UnidadesDescentralizadas/Sostenibilidad/CalidadAire/Ficheros/PlanAire&CC_Eng.pdf (Accessed: 6 August 2022).

Ayuntamiento de Madrid (2018b). *Madrid + Natural*. Available at: <https://www.madrid.es/portales/munimadrid/es/Inicio/El-Ayuntamiento/Medio-ambiente/Cambio-Climatico/?vgnextfmt=default&vgnextoid=0ca36936042fc310VgnVCM1000000b205a0aRCRD&vgnnextchannel=4b3a171c30036010VgnVCM100000dc0ca8c0RCRD&idCapitulo=8617429> (Accessed: 10 July 2022).

Ayuntamiento de Madrid (2018c). *Plan de infraestructura verde y biodiversidad*. Available at: <https://www.madrid.es/portales/munimadrid/es/Inicio/Medio-ambiente/Parques-y-jardines/Plan-de-Infraestructura-Verde-y-Biodiversidad/?vgnextoid=5fdec0f221714610VgnVCM2000001f4a900aRCRD&vgnnextchannel=2ba279ed268fe410VgnVCM1000000b205a0aRCRD> (Accessed: 10 July 2022).

Barbanette, A. and Grassini, L. (2022). 'Integrating Nature-based Solutions into urban planning and policies: learning from the Apulia case study', in La Rosa, D. and Privitera, R. (eds.) *Innovation in Urban and Regional Planning*. Cham (Switzerland): Springer, pp. 12-21.

Barton, M.A. (2016). *Nature-based Solutions in urban contexts – A case study of Malmö, Sweden*. MSc Thesis. Jointly operated by Lund University – University of Manchester – University of the Aegean – Central European University.

Braun, V. and Clarke, V. (2006). 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3, pp. 77-101.

Bryson, J.M., Crosby, B.C. and Middleton, M. (2015). 'Designing and implementing cross-sector collaborations: needed and challenging', *Public Administration Review*, 75(5), pp. 647-663.

Buchel, S. and Frantzeskaki, N. (2015). 'Citizens' voice: a case study about perceived Ecosystem Services by urban park users in Rotterdam, the Netherlands', *Ecosystem Services*, 12, pp. 169-177.

Bulkeley, H. (2020a). 'Nature-based Solutions towards sustainable communities', in Wild, T., Freitas, T. and Vandewoestijne, S. (eds.) *Nature-based Solutions state of the art in EU-funded projects*. Luxemburg: Publications Office of the European Union, pp. 157-180.

- Bulkeley, H. (2020b). 'Governing NBS towards transformative action', in Wild, T., Freitas, T. and Vandewoestijne, S. (eds.) *Nature-based Solutions state of the art in EU-funded projects*. Luxemburg: Publications Office of the European Union, pp. 181-202.
- Calliari, E., Castellari, S., Davis, M., Linnerooth-Bayer, J., Martin, J., Mysiak, J., Pastorf, T., Ramieri, E., Scolobig, A., Sterk, M., Veerkamp, C., Wendling, L. and Zandersen, M. (2022). 'Building climate resilience through Nature-based Solutions in Europe: a review of enabling knowledge, finance and governance frameworks', *Climate Risk Management*, 37, 100450.
- Chandrasekaran, K., Marian, N., Rojas, I., Shaw, S. and Counsell, S. (2021). [Amigos de la Tierra Internacional report on] *Soluciones basadas en la Naturaleza: un lobo con piel de cordero* [Online]. Available at: <https://www.tierra.org/soluciones-basadas-en-la-naturaleza-un-lobo-con-piel-de-cordero/> (Accessed: 6 August 2022).
- Cohen-Shacham, E., Andrade, A., Dalton, J., Dudley, N., Jones, M., Jumar, C., Maginnis, S., Maynard, S., Nelson, C.R., Renaud, F.G., Welling, R. and Walters, G. (2019). 'Core principles for successfully implementing and upscaling Nature-based Solutions', *Environmental Science and Policy*, 98, pp. 20-29.
- Cortazzi, M., Pilcher, N. and Jin, L. (2011). 'Language choices and 'blind shadows': investigating interviews with Chinese participants', *Qualitative Research*, 11(5), pp. 505-535.
- Cortinovis, C., Olsson, P., Boke-Olén, N. and Hedlund, K. (2022). 'Scaling up Nature-based Solutions for climate-change adaptation: potential and benefits in three European cities', *Urban Forestry & Urban Greening*, 67, 127450.
- Davies, C. and Laforteza, R. (2019). 'Transitional path to the adoption of Nature-based Solutions', *Land Use Policy*, 80, pp. 406-409.
- Davis, M., Abhold, K., Mederake, L. and Knoblauch, D. (2017). [NATURVATION report on] *Nature-based Solutions in European and national policy frameworks* [Online]. Available at: <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5b64f88d5&appId=PPGMS> (Accessed: 11 June 2022).
- de Waal, A., Weaver, M., Day, T. and van der Heijden, B. (2019). 'Silo-busting: overcoming the greatest threat to organizational performance', *Sustainability*, 11, 6860.
- DeLorme, D.E., Stephens, S.H., Collini, R.C., Yoskowitz, D.W. and Hagen, S.C. (2021). 'Communicating and understanding Ecosystem Services assessment with coastal stakeholders: obstacles and opportunities', *Frontiers in Communication*, 6, 656884.
- Demographia (2022). *Demographia world urban areas 18th Annual ed.* [Online] Available at: <http://www.demographia.com/db-worldua.pdf> (Accessed: 28 July 2022).
- Dorst, H., van der Jagt, A., Raven, R. and Runhaar, H. (2019). 'Urban greening through Nature-based Solutions – Key characteristics of an emerging concept', *Sustainable Cities and Society*, 49, 101620.

Dushkova, D. and Haase, D. (2020). 'Not simply green: Nature-based Solutions as a concept and practical approach for sustainability studies and planning agendas in cities', *Land*, 9, 19.

Escobedo, F.J., Giannico, V., Jim, C.Y., Sanesi, G. and Laforteza, R. (2019). 'Urban forests, Ecosystem Services, Green Infrastructure and Nature-based Solutions: nexus or evolving metaphors?', *Urban Forestry & Urban Greening*, 37, pp. 3-12.

European Commission (EC) (n.d.-a). *Nature-based Solutions*. Available at: https://ec.europa.eu/info/research-and-innovation/research-area/environment/nature-based-solutions_en (Accessed: 15 June 2022).

European Commission (EC) (n.d.-b). *Horizon 2020*. Available at: https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en (Accessed: 6 August 2022).

European Commission (EC) (2013). *Communication from the Commission to the European parliament, the Council the European Economic and Social Committee and the Committee of the Regions – Green Infrastructure (GI) – Enhancing Europe's natural capital. SWD(2013) 155 final*. Brussels: EC. Available at: https://ec.europa.eu/environment/nature/ecosystems/docs/green_infrastructures/1_EN_ACT_part1_v5.pdf (Accessed: 12 June 2022).

European Commission (EC) (2015). *Towards an EU Research and Innovation policy agenda for 'Nature-based Solutions and re-naturing cities'. Final report of the Horizon 2020 Expert Group on Nature-based Solutions and re-naturing cities (full version)*. Luxemburg: EC. Available at: <https://op.europa.eu/en/publication-detail/-/publication/fb117980-d5aa-46df-8edc-af367cddc202> (Accessed: 11 June 2022).

European Commission (EC) (2016). *Action plan on the Sendai framework for disaster risk reduction 2015-2030. A disaster risk-informed approach for all EU policies. SWD(2016) 205 final*. Brussels: EC. Available at: http://ec.europa.eu/echo/sites/echo-site/files/sendai_swd_2016_205_0.pdf (Accessed: 15 June 2022).

European Commission (EC) (2019). *Communication from the Commission to the European Parliament, the European Council, the European Economic and Social Committee and the Committee of the Regions - The European Green Deal*. Available at: https://ec.europa.eu/info/sites/default/files/european-green-deal-communication_en.pdf (Accessed: 19 June 2022).

European Commission (EC) (2020). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – EU Biodiversity Strategy 2030: bringing nature back into our lives. COM(2020) 380 final*. Brussels: EC. Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:a3c806a6-9ab3-11ea-9d2d-01aa75ed71a1.0001.02/DOC_1&format=PDF (Accessed: 12 June 2022).

Faivre, N., Fritz, M., Freitas, T., de Boissezon, B. and Vendewoestijne, S. (2017). 'Nature-based Solutions in the EU: innovating with nature to address social, economic and environmental challenges', *Environmental Research*, 159, pp. 509-518.

Frantzeskaki, N. and Bush, J. (2019). 'Governance of Nature-based Solutions through intermediaries for urban transitions – A case study from Melbourne, Australia', *Urban Forestry & Urban Greening*, 64, 127262.

Frantzeskaki, N. and Kabisch, N. (2016). 'Designing a knowledge co-production operating space for urban environmental governance – Lessons from Rotterdam, Netherlands and Berlin, Germany', *Environmental Science & Policy*, 62, pp. 90-98.

Frantzeskaki, N., McPhearson, T., Collier, M.C., Kendal, D., Bulkeley, H., Dumitru, A., Walsh, C., Noble, K., van Wyk, E., Ordóñez, C., Oke, C. and Pintér, L. (2018). 'Nature-based Solutions for urban climate change adaptation: linking science, policy, and practice communities for evidence-based decision-making', *Bioscience*, 69, pp. 455-466.

Frantzeskaki, N., Vandergert, P., Connop, S., Schipper, K., Zwierzchowska, I., Collier, M. and Lodder, M. (2020). 'Examining the policy needs for implementing Nature-based Solutions in cities: findings from city-wide transdisciplinary experiences in Glasgow (UK), Genk (Belgium) and Poznań (Poland)', *Land Use Policy*, 96, 104688.

Giordano, R., Máñez Costa, M., Pagano, A., Rodríguez, B.M., Zorrilla-Miras, P., Gómez, E. and López-Gunn, E. (2021). 'Combining social network analysis and agent-based model for enabling nature-based solution implementation: the case of Medina del Campo (Spain)', *Science of the Total Environment*, 801, 149734.

Giordano, R., Pluchinotta, I., Pagano, A., Scricciu, A. and Nanu, F. (2020). 'Enhancing Nature-based Solutions acceptance through stakeholders' engagement in co-benefits identification and trade-offs analysis', *Science of the Total Environment*, 713, 136552.

Grace, M., Balzan, M., Collier, M., Geneletti, D., Tomaskinova, J., Abela, R., Borg, D., Buhagiar, G., Camilleri, L., Cardona, M., Cassarf, N., Cassar, R., Cattafi, I., Cauchi, D., Galea, C., La Rosa, D., Malekkidou, E., Masini, M., Portelli, P., Pungetti, G., Spagnol, M., Zahra, J., Zammitt, A. and Dicks, L.V. (2021). 'Priority knowledge needs for implementing Nature-based Solutions in the Mediterranean islands', *Environmental Science and Policy*, 116, pp. 56-68.

Grêt-Regamey, A., Altwegg, J., Sirén, E.A., van Strien, M.J. and Weibel, B. (2017). 'Integrating Ecosystem Services into spatial planning – A spatial decision support tool', *Landscape and Urban Planning*, 165, pp. 206-219.

Guest, G., Bunce, A. and Johnson, L. (2006). 'How many interviews are enough? An experiment with data saturation and variability', *Field Methods*, 18(1), pp. 59-82.

International Union for Conservation of Nature (IUCN) (2016). *Defining Nature-based Solutions*. WCC-2016-Res-069-EN. Hawaii: IUCN. Available at: https://portals.iucn.org/library/sites/library/files/resrecfiles/WCC_2016_RES_069_EN.pdf (Accessed: 31 July 2022).

International Union for Conservation of Nature (IUCN) (2020). *Guidance for using the IUCN global standard for Nature-based Solutions*. Gland (Switzerland): IUCN. Available at: <https://portals.iucn.org/library/sites/library/files/documents/2020-021-En.pdf> (Accessed: 17 June 2022).

Jefatura del Estado (2007). Ley 42/2007, de 13 de diciembre, del Patrimonio Natural y de la Biodiversidad. Boletín Oficial del Estado, 36, <https://www.boe.es/buscar/doc.php?id=BOE-A-2008-2323>.

Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M., Artmann, M., Haase, D., Knapp, S., Korn, H., Stadler, J., Zaunberger, K. and Bonn, A. (2016). 'Nature-based Solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action', *Ecology and Society*, 21(2), 39.

Kabisch, N., Frantzeskaki, N. and Hansen, R. (2022). 'Principles for urban Nature-based Solutions', *Ambio*, 51, pp. 1388-1401.

Kumar, P., Debele, S.E., Sahani, J., Aragão, L., Barisani, F., Basu, B., Bucchignani, E., Charizopoulos, N., Di Sabatino, S., Domeneghetti, A., Sorolla Edo, A., Finér, L., Gallotti, G., Juch, S., Leo, L.S., Loupis, M., Mickovski, S.B., Panga, D., Pavlova, I., Pilla, F., Löchner Prats, A., Renaud, F.G., Rutzinger, M., Sarkar Basu, A., Rahman Shah, M.A., Soini, K., Stefanopoulou, M., Toth, E., Ukonmaanaho, L., Vranic, S. and Zieher, T. (2020). 'Towards an operationalisation of Nature-based Solutions for natural hazards', *Science of the Total Environment*, 731, 138855.

Laforteza, R., Chen, J., van den Bosch, C.K. and Randrup, T.B. (2018). 'Nature-based Solutions for resilient landscapes and cities', *Environmental Research*, 165, pp. 431-441.

Liquete, C., Udias, A., Conte, G., Grizzetti, B. and Masi, F. (2016). 'Integrated valuation of a Nature-based Solutions for water pollution control. Highlighting hidden benefits', *Ecosystem Services*, 22, pp. 392-401.

Lupp, G., Zingraff-Hamed, A., Huang, J.J., Oen, A. and Pauleit, S. (2021). 'Living Labs – A concept for co-designing Nature-based Solutions', *Sustainability*, 13, 188.

Maes, J. and Jacobs, S. (2015). 'Nature-based Solutions for Europe's sustainable development', *Conservation Letters*, 10(1), pp. 121-124.

Maguire, M. and Delahunt, B. (2017). 'Doing a thematic analysis: a practical, step-by-step guide for learning and teaching scholars', *All Ireland Journal of Teaching and Learning in Higher Education*, 3, pp. 3351-3364.

Malekpour, S., Tawfik, S. and Chesterfield, C. (2021). 'Designing collaborative governance for Nature-based Solutions', *Urban Forestry & Urban Greening*, 62, 127177.

McClure, B. A. (1989). 'More metaphor: concerns and considerations in groups', *Small Group Behavior*, 20(4), pp. 449-458.

McPhearson, T., Cook, E.M., Barbés-Blázquez, M., Cheng, C., Grimm, N.B., Andersson, E., Barbosa, O., Chandler, D.G., Chang, H., Chester, M.V., Childers, D.L., Elser, S.R., Frantzeskaki, N., Grabowski, Z., Groffman, P., Hale, R.L., Iwaniec, D.M., Kabisch, N., Kennedy, C., Markolf, S.A., Matsler, A.M., McPhillips, L.E., Miller, T.R., Muñoz-Erickson, T.A., Rosi, E. and Troxler, T.G. (2022). 'A social-ecological-technological systems framework for urban Ecosystem Services', *One Earth*, 5, pp. 505-518.

Millennium Ecosystem Assessment (MEA) (2005). *Ecosystems and human well-being*. Synthesis. Washington, D.C. (US): Island Press. MEA. Available at:

<https://www.millenniumassessment.org/documents/document.356.aspx.pdf>
(Accessed: 6 August 2022).

Moreau, C., Cottet, M., Rivière-Honegger, A., François, A. and Evette, A. (2022). 'Nature-based Solutions (NbS): a management paradigm shift in practitioners' perspectives on riverbank soil bioengineering', *Journal of Environmental Management*, 208, 114638.

Morgan, R.K., Hart, A., Freeman, C., Coutts, B., Colvill, D. and Hughes, A. (2012). 'Practitioners, professional cultures, and perceptions of impact assessment', *Environmental Impact Assessment Review*, 32, pp. 11-24.

Nesshöver, C., Assmuth, T., Irvive, K.N., Rusch, G.M., Wayven, K.A., Delbaere, B., Haase, D., Jones-Walters, L., Keune, H., Kovacs, E., Krauze, K., Külvik, M., Rey, F., van Dijk, J., Vistad, O.I., Wilkinson, M. and Wittmer, H. (2017). 'The science, policy and practice of Nature-based Solutions: an interdisciplinary perspective', *Science of the Total Environment*, 579, pp. 1215-1227.

NetworkNature (2021). *Welcome package for Horizon 2020 Nature-based Solutions task forces*. Available at: <https://networknature.eu/networknature/nature-based-solutions-task-forces> (Accessed: 28 July 2022).

Nistorescu, M., Ioniță, A. and Alexandra, D. (2019). [European Regional Development Fund report on] *Keeping nature connected – EIA for integrated green infrastructure planning. Training package*. Romania: Propark. Available at: https://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/f5374e0aee3813cfd352c8005b5ceb0da52d52c5.pdf (Accessed: 12 June 2022).

Nóblega-Carriquiry, A., March, H. and Sauri, D. (2022). 'Community acceptance of Nature-based Solutions in the delta of the Tordera River, Catalonia', *Land*, 11, 579.

Partidario, M.R. and Gomes, R.C. (2013). 'Ecosystem Services inclusive strategic environmental assessment', *Environmental Impact Assessment Review*, pp. 36-46.

Priya, K.R. and Dalal, A.K. (2015). *Qualitative research on illness, well-being and self-growth; contemporary indian perspectives*. London (UK): Routledge.

Rall, E., Hansen, R. and Pauleit, S. (2019). 'The added value of public participation GIS (PPGIS) for urban Green Infrastructure planning', *Urban Forestry & Urban Gardening*, 40, pp. 264-274.

Raymond, C.M., Frantzeskaki, N., Kabisch, N., Berry, P., Breil, M., Nita, M.R., Geneletti, D. and Calfapietra, C. (2017). 'A framework for assessing and implementing the co-benefits of Nature-based Solutions in urban areas', *Environmental Science and Policy*, 77, pp. 15-24.

Reed, M.S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C.H. and Stringer, L.C. (2009). 'Who's in and why? A typology of stakeholder analysis methods for natural resource management', *Journal of Environmental Management*, 90, pp. 1933-1949.

Romney, A., Batchelder, W. and S. Weller, S. (1986). 'Culture as consensus: a theory of culture and informant accuracy', *American Anthropologist*, 88, pp. 313-338.

- Sarabi, S., Han, Q., Romme, A.G.L., de Vries, B., Valkenburg, R. and den Ouden, E. (2020). 'Uptake and implementation of Nature-based Solutions: an analysis of barriers using interpretive structural modelling', *Journal of Environmental Management*, 270, 110749.
- Schaubroeck, T. (2017). 'A need for equal consideration of Ecosystem Disservices and Services when valuing nature; countering arguments against disservices', *Ecosystem Services*, 26, pp. 95-97.
- Seddon, N., Smith, A., Smith, P., Key, I., Chausson, A., Girardin, C., House, J., Srivastava, S. and Turner, B. (2021). 'Getting the message right on Nature-based Solutions to climate change', *Global Change Biology*, 27, pp. 1518-1546.
- Skodra, J., Connop, S., Tacnet, J.-M., van Cauwenbergh, N., Almassy, D., Baldacchini, C., Basco Carrera, L., Caitana, B., Cardinali, M., Feliu, E., Garcia, I., Garcia-Blanco, G., Jones, L., Kraus, F., Mahmoud, I., Maia, S., Morello, E., Pérez Lapeña, B., Pinter, L., Porcu, F., Reichborn-Kjennerud, K., Ruangpan, L., Rutzinger, M. and Vojinovic, Z. (2021). [EC report on] *Evaluating the impact of nature-based solution – a handbook for practitioners*. [Online] Available at: https://ec.europa.eu/info/news/evaluating-impact-nature-based-solutions-handbook-practitioners-2021-may-06_en (Accessed: 6 August 2022).
- Smith, M., Welling, R. and van Ham, C. (2019). 'Green Infrastructure and natural infrastructure approaches', in Cohen-Shacham, E., Walters, G., Janzen, C. and Maginnis, S. (eds.) *Nature-based Solutions to address global societal challenges*. Gland, (Switzerland): IUCN, pp. 20-22.
- Somarakis, G., Stagakis, S. and Chrysoulakis, N. (2019). [ThinkNature report on] *ThinkNature Nature-based Solutions handbook. No. 730338*. [Online]. Available at: https://platform.think-nature.eu/system/files/thinknature_handbook_final_print_0.pdf (Accessed: 2 August 2022).
- Thompson, J.L., Kaiser, A., Sparks, E.L., Shelton, M., Brunden, E., Cherry, J.A. and Cebrian, J. (2016). 'Ecosystem – What? Public understanding and trust in conservation science and Ecosystem Services', *Frontiers in Communication*, 1(3), pp. 1-9.
- University of Manchester (2021). *Privacy notice for research participants – research at UoM*. Available at: <https://documents.manchester.ac.uk/display.aspx?DocID=37095> (Accessed: 28 July 2022).
- van der Jagt, A.P.N., Smith, M., Ambrose-Oji, B., Konijnendijk, C.C., Giannico, V., Haase, D., Laforteza, R., Nastran, M., Pintar, M., Železnikar, Š. and Cvejić, R. (2019). 'Co-creating urban Green Infrastructure connecting people and nature: a guiding framework and approach', *Journal of Environmental Management*, 233, pp. 757-767.
- van Ham, C. and Klimmek, H. (2017). 'Partnerships for Nature-based Solutions in urban areas – Showcasing successful examples', in Kabisch, N., Korn, H., Stadler, J. and Bonn, A. (eds.) *Nature-based Solutions to climate change adaptation in urban areas – Linkages between science, policy and practice*. Cham (Switzerland): Springer, pp. 275-290.
- Venkataramanan, V., Lopez, D., McCuskey, D.J., Kiefus, D., McDonald, R.I., Miller, W.M., Packman, A.I. and Young, S.L. (2020). 'Knowledge, attitudes, intentions, and behavior

related to Green Infrastructure for flood management: a systematic literature review', *Science of the Total Environment*, 720, 137606.

Verweij, P., Pérez-Soba, M., Vanmeulebrouk, B., Brown, C., Wilkinson, T., Cojocar, G., Aldescu, A., Brown, M., Porter, J., Mahoney, P., Metzger, M., Rounsevell, M., Delbaere, B., Saarikoski, H. and Harrison, P. (2015). *A demonstration version of the common platform (Oppla)*. <http://oppla.eu/home> (Accessed: 27 February 2022).

Wamsler, C., Niven, L., Beery, T.H., Bramryd, T., Ekelund, N., Jönsson, K.I., Osmani, A., Palo, T. and Stålhammar, S. (2016). 'Operationalizing ecosystem-based adaptation: harnessing Ecosystem Services to buffer communities against climate change', *Ecology and Society*, 21(1), 31.

Wamsler, C., Pauleit, S., Zölch, T., Schetke, S. and Mascarenhas, A. (2017). 'Mainstreaming Nature-based Solutions for climate change adaptation in urban governance and planning', in Kabisch, N., Korn, H., Stadler, J. and Bonn, A. (eds.) *Nature-based Solutions to climate change adaptation in urban areas – Linkages between science, policy and practice*. Cham (Switzerland): Springer, pp. 257-274.

Welch, C. and Piekkari, R. (2006). 'Crossing language boundaries: qualitative interviewing in international business', *Management International Review*, 46(4), pp. 417-437.

Wild, T., Bulkeley, H., Naumann, S., Vojinovic, Z., Calfapiedra, C. and Whiteoak, K. (2020). *Nature-based Solutions. State of the art in EU-funded projects*. Luxemburg: Publications Office of the European Union.

Yin, R.K. (1994). *Case study research: design and methods* 2nd ed. London (UK): Sage Publications.

APPENDICES

Appendix I – Sample Consent Form

University of Manchester - School of Environment, Education and Development

Scaling up Nature-based Solutions: the need to integrate stakeholders. Case Study: Madrid

Consent Form

If you are happy to participate, please read the consent form and initial it:

Si está de acuerdo con participar, por favor, lea a continuación y firme el consentimiento:

Please, initial box/

Por favor, marque con sus iniciales

1. I confirm that I have read the attached information sheet on the above project and have had the opportunity to consider the information and ask questions and had these answered satisfactorily.

Confirmando que he leído la información adjunta y el proyecto arriba mencionado y que se me ha proporcionado la oportunidad de considerar la información y preguntar cualquier duda, en cuyo caso se han respondido de manera adecuada.

2. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving a reason and without detriment to any treatment/service.

Entiendo que participo voluntariamente y que tengo total libertad para pedir la retirada de la información proporcionada en cualquier momento y sin consecuencias.

3. I understand that the interviews will be audio-recorded.

Entiendo que el audio de las entrevistas se grabará.

4. I agree to the use of anonymous quotes.

Acepto el uso de anonimización mediante citas.

Data protection information/**Información sobre protección de datos:**

- Participant information sheet/Hoja de Información sobre la participación
- [Privacy Notice for Research Participants](#)

I agree to take part in the above project/**Acepto mi participación en el proyecto:**

	Date/Fecha	Signature/Firma
_____ Name of participant/Nombre del entrevistado	_____	_____
_____ Name of the person taking consent/Nombre del entrevistador	_____	_____

Appendix II – Participation Information Sheet

- *What is the title of the research? ¿Cuál es el título de la investigación?*
Scaling up Nature-based Solutions (NbS): the need to integrate stakeholders.
Case Study: Madrid
Mejorar las Soluciones basadas en la Naturaleza (SbN): la necesidad de integrar a las partes interesadas. Caso de estudio: Madrid
- *Who will conduct the research? ¿Quién llevará a cabo la investigación?*
Jon Larrinaga López
- *What is the aim of the research? ¿Cuál es el objetivo de la investigación?*
To explore the barriers and enablers to forge integrated networks of stakeholders needed to effectively operationalise urban NbS.
Explorar las barreras y facilitadores para desarrollar redes de autores interesados integradas, así implementando efectivamente las SbN urbanas.
- *Why have I been chosen? ¿Por qué he sido elegido para participar?*
As a professional, you are able to provide insight about relevant aspects of engagement in EU's NbS.
Desde tu perspectiva como profesional, se te considera capacitado para proporcionar información en la involucración en las SbN demandada por la UE.
- *What would I be asked to do if I took part? ¿Qué se me pedirá si decido participar?*
A one-to-one interview, where I will ask you your opinion about aspects of “effective” engagement in NbS.
Una entrevista personal, en la cual te preguntaré sobre tu opinión en los procesos de colaboración/participación en las SbN.
- *What happens to the data collected? ¿Qué pasará con la información recolectada?*
Data collected will be recorded and transcribed to a Word document.
La información se grabará y transcribirá a un documento Word.
- *How is confidentiality maintained? ¿Cómo se mantendrá la confidencialidad?*
Information will be anonymised from the beginning: transcripts will be identified using an identifying-code, those documents will be kept in a password-protected personal account, and the final document will keep the identifying-code.
La información será anonimizada desde el primer paso: la transcripción recibirá un identificador en código, estos documentos se guardarán en una cuenta

personal protegida con contraseña durante el análisis de resultados y el documento final respetará los identificadores en código.

- *What happens if I do not want to take part or if I change my mind? ¿Qué ocurre si no quiero participar, o cambio de opinión tras dar mi consentimiento?*

You will always be free to withdraw your consent to store and use collected data. In that case, this information will not be part of the final output.

Siempre prevalecerá el derecho a retirar el consentimiento a guardar y usar la información obtenida, en cuyo caso esta no será parte del documento final.

- *Will I be paid for participating in the research? ¿Seré pagado por participar?*

No, participation is voluntary.

No, la participación es voluntaria.

- *What is the duration of the research? ¿Cuál es la duración de la participación?*

Interviews are expected to last 30-45 minutes. However, this can vary according to the answers you provide.

Potencialmente, las entrevistas durarán 30-45 minutos, aunque la libertad para extenderse lo requerido dependiendo de las respuestas que decidas proporcionar es absoluta.

- *Where will the research be conducted? ¿Dónde se llevará a cabo la investigación?*

Using remote means (e.g., phone- or videocall-interview) and at your earliest convenience.

A través de medios telemáticos y siempre a tu disponibilidad horaria (ejemplos, llamada telefónica o videollamada).

- *Will the outcomes of the research be published? ¿Serán los resultados de la investigación publicados?*

The final output will be stored by The University of Manchester, who has certain rights of ownership.

Los resultados de la entrevista formarán parte del apartado de resultados del documento final, en los cuales la Universidad de Mánchester tendrá ciertos derechos de propiedad.

- *Contact for further information. En caso de mayores dudas, por favor, pregunta al:*

Jon Larrinaga López (researcher/investigador):

jon.larrinagalopez@postgrad.manchester.ac.uk o (+34) 655 19 26 58.

- *What if something goes wrong? ¿Qué ocurre si no me siento cómodo con parte del proceso?*

During the interview, you conserve the right to stop the process at any time. Afterwards, you can ask to delete or withdraw the data you provided, so no record would be available.

Durante la entrevista, siempre tendrás el derecho de interrumpir o finalizar el proceso. Adicionalmente, una vez concluida, podrás pedir que la información no sea usada o sea eliminada, en cuyo caso no quedará ningún registro de la misma.

Appendix III – Sample transcript of Semi-Structured Interviews

First, thank you for taking part in this research. As a brief summary, I am researching the effectiveness of urban NbS' collaborative networks of stakeholders to scale up the implementation of their major goals, such as long-term climate adaptation or increased well-being. Academia has so far researched this topic in some European cities such as Barcelona, Berlin, or Rotterdam. However, the topic in Madrid, at least to the extent of my knowledge, has not been studied. Therefore, today I hope to shed some light on this issue by posing some questions. As a practitioner, you will have a useful insight of current practice in the city. First, I will briefly ask you about the concept and some policy features; afterwards, I will ask about your view on barriers and enablers for an effective integration.

In case of having any further doubt, I am now open to hear from these prior to the first question.

Allow some time the interviewee to add any note (If needed)

Questions

- What do you understand by the term Nature-based Solutions, and what is their goal? *Probe*. Do you consider that this view is shared among the city's practitioners? *Probe*. And outside professionals? *Probe*.
- In your opinion, what is the added value of NbS?
 - o If cost-effectiveness inside: and have you ever been involved in any approach measuring this added value? *Probe*.
 - o If cost-effectiveness not mentioned: and do you consider that NbS should be promoted as a cost-effective means to solve current urban challenges? *Probe*.
- And, in your opinion, what is their major risk? *Probe*. Is this being communicated to the society?
 - o If yes: when and through which means?
 - o If no: stop.
- And in general, which are the means through infrastructure project information is being disseminated in the city? *Probe*. When is this done? *Probe*. Who does it reach? *Probe*.
- In Spain, mandatory consideration of Green Infrastructure is a fact in the 42/2007 Natural Heritage and Biodiversity Law. Do you think the interpretation by the autonomies considers the integration of stakeholders?
 - o If no: and what is the major consideration, then?
 - o If yes: in what sense has mandatory nature scale up NbS collaboration networks?
- Have you ever engaged in any NbS project in the city?
 - o If no: do you know about the existence of any collaborative approach during the development in the city? → *Probe*.
 - If no: and, in case those existed, do you think practitioners should be a relevant group needed to be involved?
 - If yes: see below.

- If yes: was this community, public-sector or private-sector led? *Probe*. Which were the non-leading stakeholders involved?
 - If more than one stakeholder group involved. Was a mediator guiding the engagement process?
 - If yes: could you describe it? (e.g., its origin)
 - If no: how effective was multifactor communication?
- Do you think that Ecosystem Services and/or Geographic Information Systems are well-established concepts among NbS-stakeholders?
 - If no: do you consider that they could potentially improve NbS understanding?
 - If no: what knowledge is still needed to better integrate NbS stakeholders in urban agendas?
 - If yes: stop.
 - If yes: are this utilised as facilitators of networking?
 - If yes: in which ways?
 - If no: what is their purpose?
- Finally, and in your opinion, can practitioners learn from citizens?
- Thank you very much, have you any further comment of collaborative networks in the context of NbS from Madrid?

Appendix IV – Personal data

Table 1 (Appendix). Information regarding participants and interviews (SME: Small and Medium-sized Enterprise: <250 employees, big companies: >250 employees).

Participant code	Type of practitioner	Ever engaged in NbS?	Duration of interview (min)
#1	Big company	NO	27
#2	Big company	NO	24
#3	SME	YES	35
#4	SME	YES	32
#5	SME	NO	54
#6	SME	YES	40
#7	SME	YES	28
#8	SME	YES	35
#9	SME & Academic	YES	40
#10	SME & Academic	YES	35
#11	Freelance	YES	33
#12	Foundation	NO	30
#13	Foundation	YES	48

Appendix V – Sample of coding

Interviewee #7

Text highlighted: semantic level analysis

Text underlined: latent level analysis

Emotions-
negative

CODES

COMMENTS

What do you understand by the term Nature-based Solutions, and what is NbS' goal?

Lack of
content

I think that it is a brand, a way of working and has a lot to do with a type of green marketing that is currently being used. I am not saying that it is not useful, but it does raise some doubts about the term from its origin. I think that at first it begins to be used in this form (NbS) and then everyone assumes it for almost anything. It has happened with a lot of terms such as sustainability. Today it is used for any ecological term or nature-based solution; it is part of that field. If we try to deepen and extract something of interest and we try to understand it as a way of working in interventions in the city and territory that connects us with an ecological awareness linked to natural processes and learn from those natural processes for artificial or human interventions, then it would be good news. So, there is a lot of interest in this but it does have that complicated nuance due to that name or brand that gives prestige without knowing if it gives content.

Tendency

Also
mentioned by
#1, #4, #6, 7
and #8

Do you consider that this view is shared among the city's practitioners?

Tendency

Lack of
content

In my small team, which is my company, yes, we are always wondering about these nuances, but I think that it is being widely accepted among a small group of professionals as the new general-agreement term to use. The problem is more the content and how they do it, not so much what we call it. If there is a context of climatic emergency, of loss of biodiversity, I believe that a good entity for the installation of ecosystems, introduction of Green Infrastructure, its compression, e.g., continuous plots... I think that this is the way of action. The way we call it ... if it helps to convince some politician, then will it be welcomed, but for now it is not very widespread.

Disagreement-
professionals