



Replication Process and Analysis Report

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Contents

- Contents 3
- Document revision history 4
- Partner organisations 4
- Abbreviations..... 4
- Executive Summary 5
- 1. Introduction..... 6
 - 1.1. Introduction to proGIreg project..... 6
 - 1.2. Introduction to replication in WP6..... 7
 - local collaboration between the city/municipality and local communities, stakeholders, and relevant local actors 8
 - international collaboration between the leading and following cities, learning from previous experiences and exchanging information of the current work 8
 - 1.3. Link to other deliverables 10
- 2. Methodology..... 10
 - 2.1. Replication research and strategy 10
 - 2.2. Replication criteria 11
 - 2.3. Rationale and replication process development..... 12
- 3. Replication workshops in FRC 15
 - 3.1. Preparation for replication workshops 15
 - 3.2. Turin Local Replication Workshop..... 26
 - 3.3. Turin International Replication Workshop 28
 - 3.4. Local replication workshop in Zagreb 30
 - 3.5. International Replication Workshop in Zagreb 32
 - 3.6. Local replication workshop in Dortmund 36
 - 3.7. International Replication Workshop Dortmund 37
- 4. Lessons learnt and important outcomes from replication process 40
- 5. Replication of NBS in proGIreg FC 44
- 6. Outlook 47

Document revision history

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Partner organisations

No.	Name	Short name	Country
1	ICLEI Local Governments for Sustainability	ICLEI Europe	Germany
2	City of Dortmund	DORTMUND	Germany
3	City of Turin	COTO	Italy
4	City of Zagreb	ZAGREB	Croatia

Abbreviations

CH	Chapter
D	Deliverable
EU	European Union
FRC	Front-Runner Cities
FC	Follower Cities
GI	Green Infrastructure
LL	Living Lab
NBS	Nature-Based Solutions
proGIreg	productive Green Infrastructure for post-industrial urban regeneration
WP	Work Package

Executive Summary

Nature-based solutions (NBS) are promising options for re-greening a city or community, because they can be small in scale, flexible in installation and/or implementation and easily transferred to and repeated in other locations, sites, or cities. The NBS implementation successes achieved by the proGReg project is leading the project partner and Front Runner Cities (FRC) Turin, Zagreb and Dortmund to provide insights, suggestions and lessons for other cities and communities that are keen to re-develop and regenerate post-industrial sites through urban greening activities and the implementation of NBS. The proGReg NBS are adaptable, thus can be used as additions to the existing green infrastructure and when implemented together with local stakeholders meet the needs and demands of end users. They are all designed to provide a multitude of benefits to contribute to the overall socio-economic regeneration of areas.

ProGReg's tried and tested solutions in the FRC are adapted in the form of local strategies (Final Urban Plans) in the Follower Cities (FC) that have closely followed this process (Cascais, Cluj-Napoca, Piraeus and Zenica), enabling them to create more comprehensive and strategic approaches that can be integrated into existing or planned urban planning frameworks. This transfer activity has been captured and documented within a replication framework and process, which aims to help others also utilise the implemented NBS.

The replication framework and process, which is summarized and commented upon in this report, entails methodological elements, including ongoing consultation in workshop format between the FRC and with the FC and other external cities, and demonstrates the adaptability of NBS to specific contexts, embedding them in local planning processes, fostering citizens' ownership of the solutions. This report summarizes and highlights key outcomes of the two rounds of replication workshops (local and international replication workshops) held in the three FRC (Dortmund, Zagreb and Turin) from February 2022 to August 2022. In addition, it provides with main outcomes and recommendations for the successful replication of NBS, in other districts of the FRC, but also in other cities and communities, beyond the proGReg project. A number of external cities, and their stakeholders, has been invited to these workshops to ensure that the proGReg Community of Practice for NBS is maintained and expanded throughout Europe.

1. Introduction

1.1. Introduction to proGReg project

Traditionally urbanisation has meant the loss of green spaces in cities, which has a negative impact on water, air, soil, biodiversity, human health and the climate. A sustainable future needs sustainable cities; and this is where green infrastructure and nature-based solutions can play a role and bring green elements into everyday urban living. The European Commission defines nature-based solutions as ‘solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience’.

Green Infrastructure for post-industrial urban regeneration (proGReg) is developing and testing nature-based solutions (NBS) co-creatively with public authorities, civil society, researchers and businesses. Eight NBS, which will support the regeneration of urban areas affected by deindustrialization, have been implemented or are going to be deployed in four front-runner cities (FRC): Dortmund (Germany), Turin (Italy), Zagreb (Croatia) and Ningbo (China). The follower cities (FC) of Cascais (Portugal), Cluj-Napoca (Romania), Piraeus (Greece) and Zenica (Bosnia and Herzegovina), in the meantime, will receive support in developing their strategies for improving NBS at local level through co-design processes (see Figure 1).

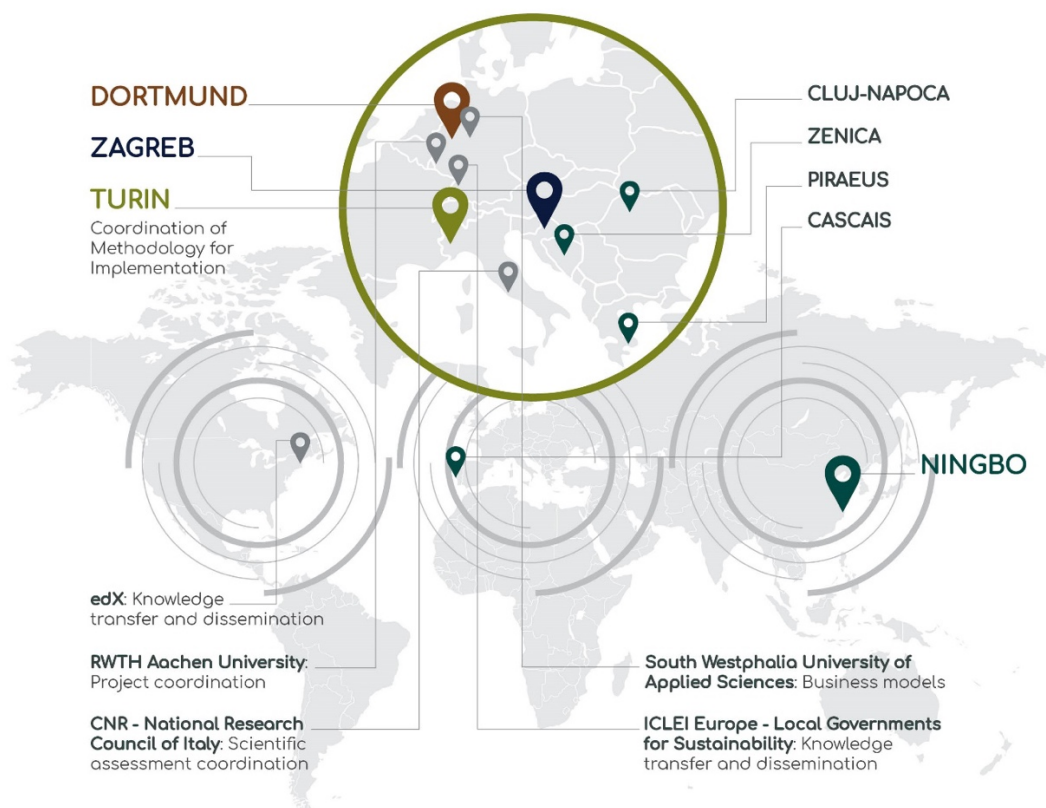


FIGURE 1 - THE PROGREG PARTNERSHIP. SOURCE: ICLEI EUROPE

ProGReg deploys the following eight (8) NBS embedded into Living Labs (LL), working with the local stakeholder landscape to create ownership and locally rooted solutions (see Figure 2):

- NBS 1 – Leisure activities and clean energy on former landfills
- NBS 2 - Regenerated soil
- NBS 3 - Community-based urban farms and gardens
- NBS 4 - Aquaponics
- NBS 5 – Green walls and roofs
- NBS 6 – Accessible green corridors
- NBS 7 - Establishing protocols and procedures for environmental compensation
- NBS 8 - Pollinator biodiversity

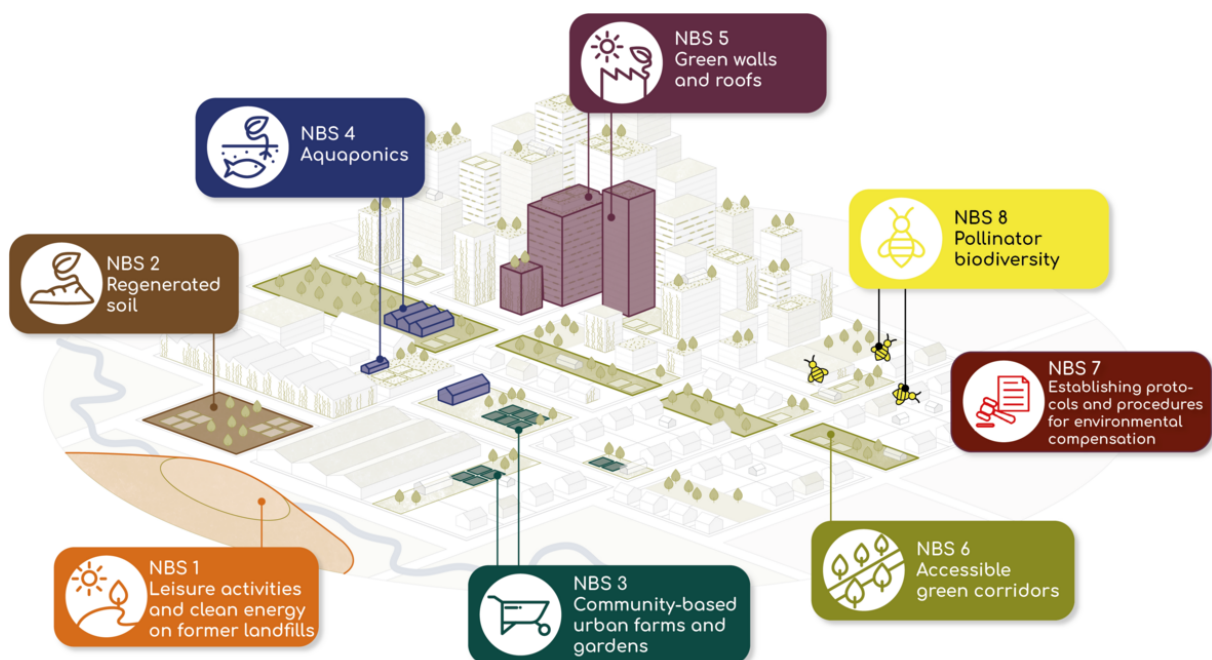


FIGURE 2 - SPATIAL REPRESENTATION OF PROGIREG NBS, RWTH

1.2. Introduction to replication in WP6

Innovating and testing NBS approaches, processes, technologies or policies is an important step in creating long lasting effects and/or change in proGReg cities. ProGReg's previous activities (e.g. co-design workshops within Task 2.2) have already shown that an innovative co-created approach to NBS planning and development can benefit the development of Living Labs, influence successful NBS implementation and enhance the socio-economic sustainability of NBS in the long term. From the beginning of the project, Front-Runner Cities (FRC) have collected valuable experiences with new and possibly challenging approaches that can be replicated within their urban areas, as well as pass on to Follower Cities (FC) and other cities beyond the project.

FC and other national/international cities are looking for practical NBS examples, solutions and applications to replicate in their local context, being aware of barriers and other issues that may be encountered. In this respect, FC and other cities have been engaged (through different activities within T5.2 Non-technological barriers) to identify common (but also context-specific) barriers and enablers for NBS implementation. As part of T2.3 Urban Planning in Follower Cities, FC are seeking to include NBS replication into urban plans, based on FRC co-creation experiences and encountered challenges. Throughout proGfreg, it has been apparent that collaboration is key. ProGfreg cities are engaged in a collaborative process at two levels:

- local collaboration between the city/municipality and local communities, stakeholders, and relevant local actors
- international collaboration between the leading and following cities, learning from previous experiences and exchanging information of the current work

1.2.3. General drivers for replication

To accelerate the sustainability transition in cities and to overcome existing challenges in urban areas, local authorities are pressured to find effective means and solutions. Hence, the concept of replication has been attracting more attention. Replication is based on the common understanding that cities benefit from a more or less formalized exchange of information, experiences, ideas and technical solutions. Policymakers such as those at the European Commission have incorporated the idea of replication into their Smart city initiatives and funding schemes. However, replication strategies fall short of expectations and, in their current form, have limited applicability to urban transformation projects (IEEE, 2021).

Over the last years, it has been common for H2020 projects to bring together several European cities and several partners to pilot a series of demonstration actions and engage in facilitated replication and upscaling processes. This work has been producing numerous and diverse results, first in the form of formal deliverables and concrete achievements, but also more broadly in terms of new policies, experiences, business opportunities or connections. The exploitation of these results in further activities outside of the project is crucial for the transition towards urban regeneration and sustainability. Results should therefore benefit the largest number and be made available to local governments across Europe (City Loops, 2022).

Empowering local authorities to ensure city-wide and beyond-city replication and upscaling of solutions leads to:

- shaping the enabling governance arrangements,
- updating policy instruments
- promoting relevant financing mechanisms, by providing guidance
- targeted replication packages of solutions

- **At a micro level**, it has become convincing that during urban regeneration processes and NBS demonstrations, cities collect valuable experiences with new, and possibly challenging approaches; experiences passing on to stakeholders and policy makers, leading to replication or upscaling solutions in other contexts. Supporting cities in reapplying successful approaches in new settings is at the core of proGfreg's replication work. Therefore, cities outside of proGfreg can draw on practical examples to replicate, rather than reinventing the wheel each time. ProGfreg FRC may go beyond providing just information, but may act as mentors or trainers and provide expert support through peer-to-peer exchange.
- **At a macro level**, a successful replication process may foster the transition of European cities towards sustainability and resilience. Moreover, it will contribute to both reducing greenhouse gases emissions and lessening biodiversity loss while at the same time decoupling - to a certain extent - economic growth from resource use. In addition, a successful replication process of the NBS developed within the proGfreg FRC will undoubtedly do its bit to meet the European Green Deal objectives and is fully in line with the UN Sustainable Development Goals.

Therefore, a replication framework and process can be used to support municipalities in re-applying and transposing successful NBS approaches to new settings. In order to deepen the research on the analysed NBS, while extending the benefits they have demonstrated to further areas other than the FRC LL, three settings have been identified by the proGfreg WP6 team:

- replication in another area or district within each FRC (but definitely outside the LL area)
- replication in the FC
- or replication in other external cities (beyond the proGfreg project, which will be invited to join the replication process and provide feedback).

Of course, this is not a one to one approach, as replicating NBS always requires adaptation to the local context, processes and demands. This has been stressed throughout the replication process and has been a main topic of discussion among FRC and FC.

Other barriers/enablers to consider are:

- Level of political support;
- Level of support from the public, local ownership, citizens' engagement;
- Adequacy of financial means available for proper implementation and, in the long term, maintenance;
- Location-specific factors, such as composition of the city, natural landscape, geographical position, climatic conditions;
- Skills and knowledge of the implementing team, multidisciplinary team with skills on both urban resilience and industrial heritage.
- Willingness for shared (or-co) governance and flexibility

1.3. Link to other deliverables

The work conducted within Task 6.2 summarized in this deliverable is directly linked to Task 2.3, led by URBASOFIA. ProGReg FCs have identified urban regeneration areas for potential implementation and explored suitable solutions based on FRC experiences of implementing NBS. The final urban plans developed within Task 2.3 entail the involvement of local decision makers to help integrate the proGReg NBS into local planning frameworks. The proGReg team has supported the process in the cities by providing a set of tools and instruments to guide them through the NBS implementation.

The co-design guidelines, developed within WP2 (see D2.10 [here](#)), but also the replication roadmap and toolkit developed in T2.3 (see D2.6 Roadmap towards urban planning in Follower Cities [here](#)) are easy-to-follow guidelines for cities and others interested in regenerating urban areas with nature-based solutions. These accompanied the replication process in WP6 and have provided valuable insights to the project team leading the process.

2. Methodology

2.1. Replication research and strategy

To assess and analyse the replicability potential of the eight proGReg NBS implemented in the FRC, the proGReg team has applied a mixed research approach, combining literature review on replication and transferability (e.g. from H2020 NBS projects and grey literature), the development of a set of replication criteria and the implementation of two rounds of workshops in the FRC.

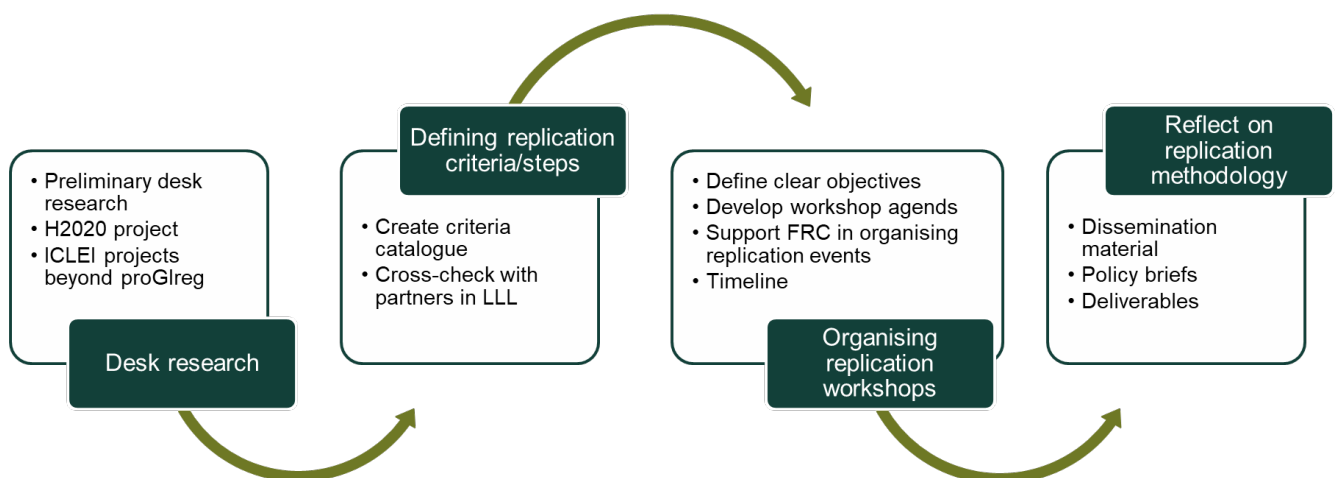


FIGURE 3 – TENTATIVE TIMELINE FOR PROGREG REPLICATION PROCESS (SOURCE: ICLEI, RWTH)

Preliminary desktop review

Identify and prioritize likely areas and concepts important to a replication process. The literature review considered requirements and variations for local and international replication, reviewing the following:

- 1) deliverables/relevant reports on replication/out-scaling and upscaling methodologies, processes, outcomes and learnings of the H2020 projects focusing on NBS;
- 2) relevant reports of previous (including non-NBS) projects with an element of replication and/or knowledge transfer (i.e. SMART city projects, projects working with Urban Living Labs, etc.);
- 3) relevant grey literature featuring experiences, approaches, lessons learnt with replication / knowledge transfer, or requirements for out scaling and upscaling (with a local and trans-local perspective).

Reviewing previous projects containing replication and/or knowledge transfer elements

ICLEI additionally employed knowledge from previous experiences aiming at emphasizing project implementation results and lessons learned, as well as important takeaways for replication. Some project examples studied including a transferability or replication process as follows: RESIN Climate Resilient Cities and Infrastructures (link [here](#)), Grow Smarter (link [here](#)), CLEVER Cities (link [here](#)) and City Loops (link [here](#)).

2.2. Replication criteria

Throughout proGfreg, innovative NBS have been harnessed to revive post-industrial districts for multiple benefits, such as addressing pollution, improving wellbeing and building resilience to climate change. The increasing use of NBS in cities and communities is definitely gathering momentum and successful pilot projects including NBS may be transferred to other contexts, if planned and executed carefully. In order to ensure that NBS become the go-to solution for politicians and local decision-makers, a set of replication criteria categories and critical success factors was developed as part of the methodology.

The criteria and critical success factors were discussed in a workshop within the first round of workshops (interactive exercise with invited stakeholders), while a checklist for each NBS was developed, including level of importance, challenges and opportunities and aimed to be used in the future by the FRC. See sample checklist in figure 4.

Criteria categories	Critical success factors (CSFs)	Level of importance
Generic	<ul style="list-style-type: none"> • answer to local needs; • common vision for future development 	
Finances/investment	<ul style="list-style-type: none"> • affordability; • funding availability • investment capacity • combination of 	

Institutional	<ul style="list-style-type: none"> • political will • institutional capacity • integration/cross-sectoral collaboration;
Policy framework	<ul style="list-style-type: none"> • alignment with other policies /strategies and programs
Environmental	<ul style="list-style-type: none"> • sustainability potential; • potential for direct climate mitigation benefits; • alignment with current environmental trends
Social	<ul style="list-style-type: none"> • social acceptance; • visibility for the city/municipality, • positive buzz • community/stakeholder engagement;

FIGURE 4 – NBS REPLICATION CRITERIA CHECKLIST SAMPLE

2.3. Rationale and replication process development

In order to strengthen the uptake of proGInreg NBS beyond the LLs in FRCs and FCs, ICLEI – in close collaboration with COTO, DORTMUND, ZAGREB and NMC-FSTS – organized two workshops in each European FRC (excluding Ningbo, as the funding period for the Chinese city had already ended, the moment the replication process was initiated). ICLEI developed the overall concept, which was locally adapted. The FRCs provided their expertise and support concerning local logistical organization. The workshops were based on the co-design workshops organized by ICLEI in WP 2 (task 2.2) and drew from the FRCs experience in experimenting with selected NBS for implementation (WP3).

The local replication workshops took place between February and March 2022 and the international replication workshops took place between May and August 2022).

TABLE 1 OVERVIEW OF REPLICATION WORKSHOP FORMATS

Type of workshop	Rationale	Objectives
Local replication workshop	Facilitating local knowledge transfer and disseminate performance results of the LLs within the local community and beyond and aiming at NBS replication outside the Living Lab, but within the FRCs	<ul style="list-style-type: none"> • Strengthen the local co-creation process • Facilitate local knowledge sharing, particularly related to enablers and barriers to NBS implementation • Define opportunities and potential locations for NBS replication within the city; and

		<ul style="list-style-type: none"> ● Identify critical success factors for replication
International replication workshop	<p>Two-fold purpose:</p> <ul style="list-style-type: none"> ● FRCs adopting a mentoring role for focused on NBS replication by FCs ● Foster regional, national and international collaboration by disseminating the project's interim results and outcomes to a larger audience in each FRC, but also to external cities that were invited in the second round of workshops 	<ul style="list-style-type: none"> ● Provide mentoring opportunities for FC and external cities; ● Increase the trans-local collaboration; ● Identify opportunities for NBS replication outside the FRC context; ● Disseminate learnings and outcomes of the proGReg activities to a broad audience interested in NBS implementation; ● Ensure the likelihood of success and the suitability of similar NBS applications or projects.

A preparatory online workshop as part of the Living Lab Lounge series was the first occasion for matching the interests of the FC with the competencies that have been developed within the FRC, either NBS-wise or concerning a barriers and competencies approach. The mapping of competencies did not only include municipal employees of course but also other competent persons from the local LLs which were identified by the FRC partner groups in the months leading up to the replication workshops.

In each local replication workshop, the attending cities brainstormed in groups on existing 'enablers'; what untapped potential exists within the cities to help speedy NBS deployment. All workshops were organized in partnership with each FRC – invitations to local stakeholders were sent by FRC, while invitations to external cities were sent by ICLEI making use of ICLEI network members, a combination of cities pioneering in NBS implementation and cities at 'starting level' when it comes to NBS. A preliminary list was initially shared with each FRC and project coordinator to agree on invitations (for the second round of workshops, five external cities were invited per session and 12 cities in total joined the three workshops).

Lead city staff that were responsible for the LLs shared the achievements at the point of mid-term implementation, also reflecting on the hurdles encountered and the lessons learned. Together with interested stakeholders of other districts in each FRC, they investigated the potential of transferring, adapting and implementing the NBS elsewhere in the city to scale them out and increase impact locally.

Local Replication Workshops (RW)



FIGURE 4 – LOCAL REPLICATION WORKSHOP PROCESS AND ACTIVITIES

For capacity building, the workshops offered a key opportunity for FCs to seek expertise, advice, and assistance in order to customize the proGReg NBS to the particular local contexts. Hence, FCs also co-developed the workshop agendas.

The international workshops were open to interested stakeholders from external cities, in particular urban planners and senior officials from local government departments in charge of social and cultural affairs, housing, economic development, energy management and the environment. Thus, the workshops did contribute to building the proGReg community of practice (CoP) and informed the work carried out in WP5 around the development of NBS business models. The replication workshops aimed at further building the CoP to continue to collaborate better, based on the social relations established between stakeholders.

International Replication Workshops (RW)



FIGURE 5 – INTERNATIONAL REPLICATION WORKSHOP PROCESS AND ACTIVITIES

Throughout proGReg cities were consulted to learn from their experience on what factors need to be considered when implementing a variety nature-based solutions. Their responses were analysed and used to develop a robust framework to help other cities to start planning to introduce nature-based solutions in their urban environments.

3. Replication workshops in FRC

3.1. Preparation for replication workshops

Ahead of the international replication workshops, the FRC were asked to pre-assess the replication criteria for each NBS that they were implementing. This assessment took place using a template that was developed by ICLEI making use of Miro Boards. The assessment should follow a 3- level process: Level 3: Define and assess the replication criteria; Level 2: Assess and brainstorm on the various categories of Success Factors and Level 1, which also serves as the goal of the exercise: Decide on options for a successful NBS replication.

In addition, to evaluate the Success Factors by providing a weighting index:

Enabling factor: It generates the conditions for successful replication of the NBS. If not considered, the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration, the replication of NBS is easier.

Low Influential Factor: If not taken into consideration, it might affect slightly the replication process of the NBS.

The following tables present the critical Success Factors per category:

Level 3: Define and assess replication criteria

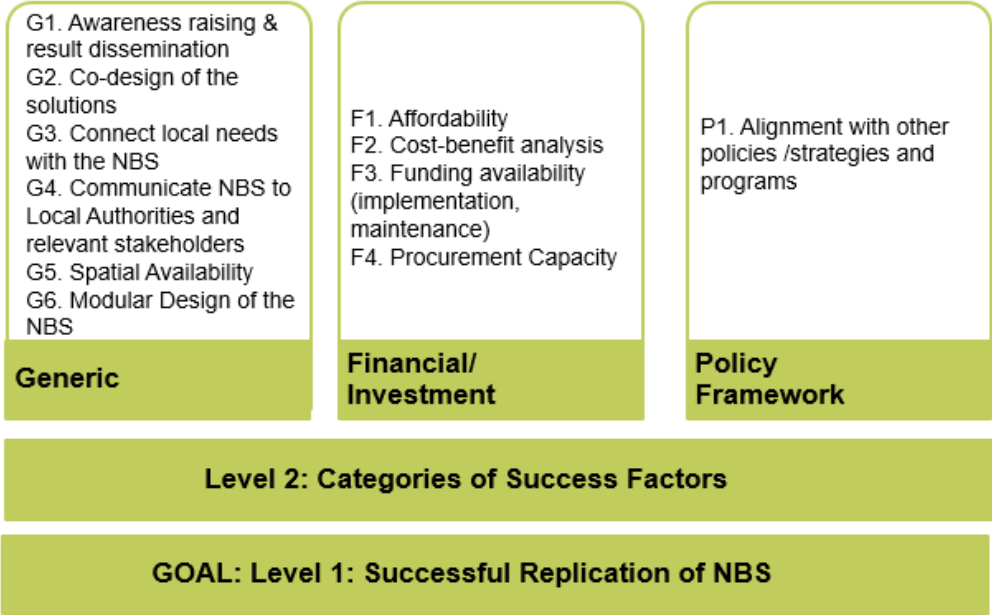


FIGURE 6 – SUCCESS FACTORS I (FOR REPLICATION CRITERIA: GENERIC, FINANCIAL/INVESTMENT AND POLICY FRAMEWORK)

Level 3: Define and assess replication criteria

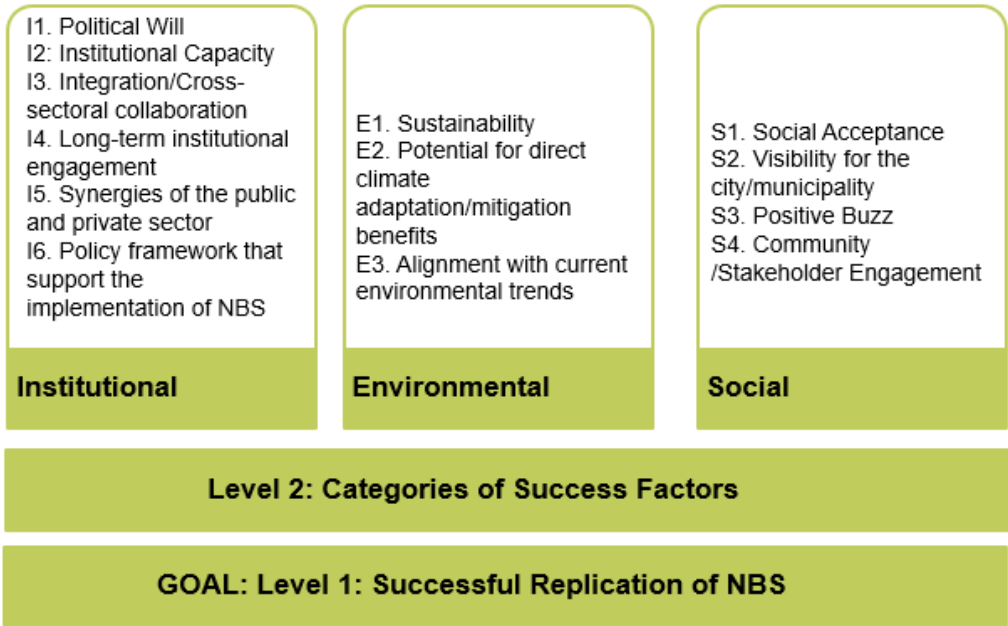


FIGURE 7 – SUCCESS FACTORS II (FOR REPLICATION CRITERIA: INSTITUTIONAL, ENVIRONMENTAL AND SOCIAL)

FRC staff were asked to fill out the template, in a brainstorming meeting format, which should involved the local team of proGReg partners, prior to the workshop and were asked to present when meeting for the 1st round of workshops. An example of the Miro-based template, can be seen below:

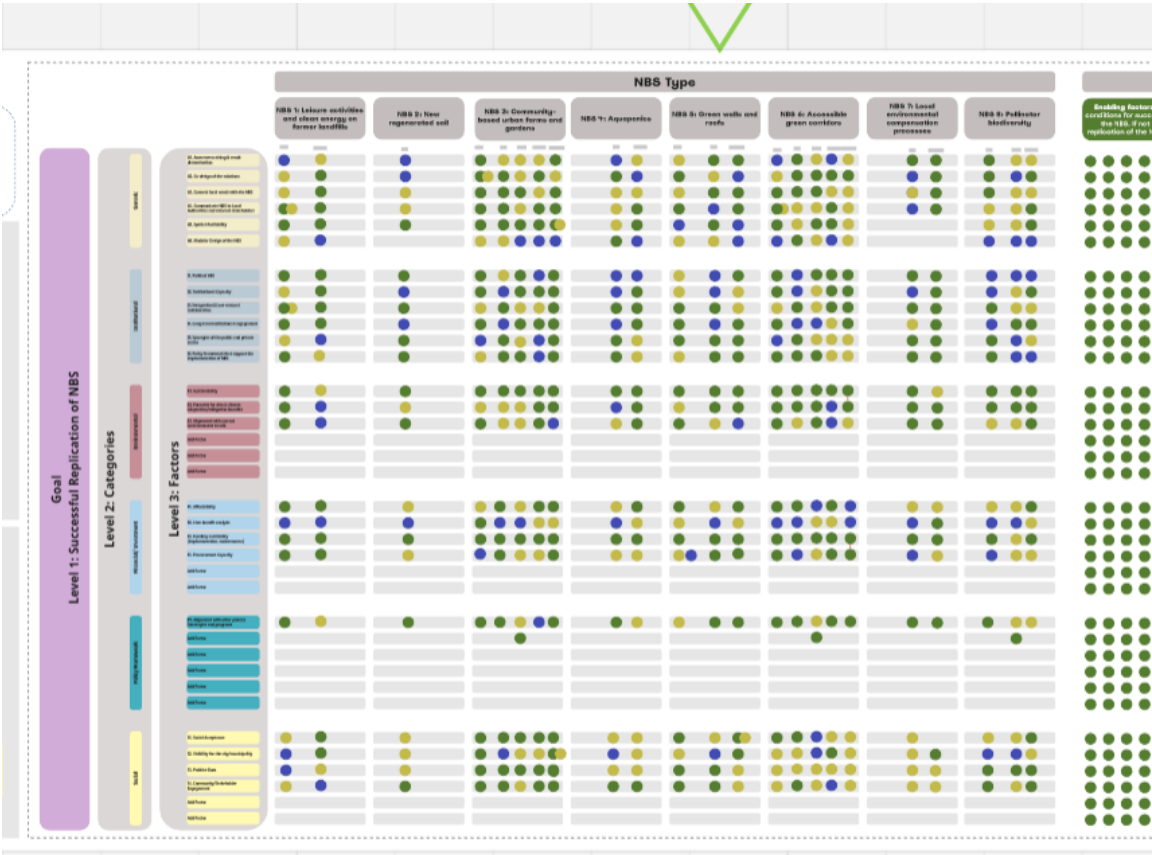
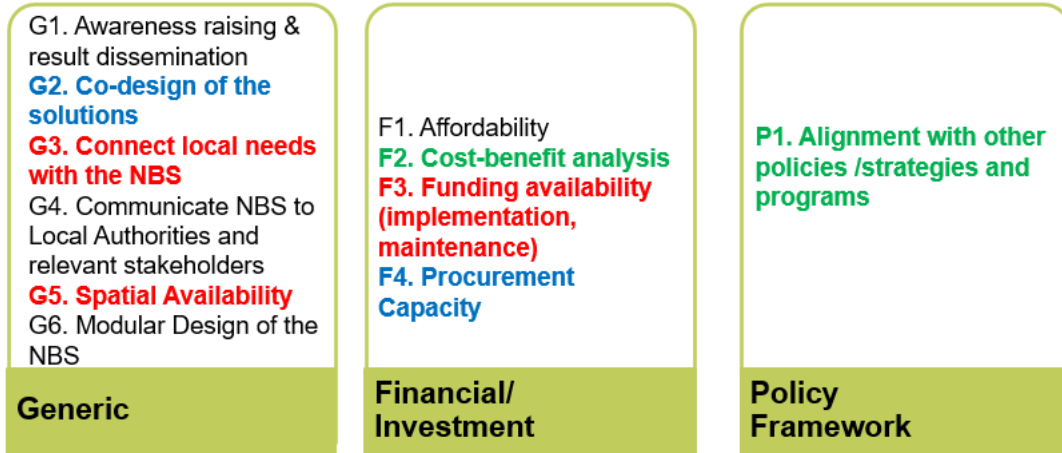


FIGURE 8 – EXAMPLE OF FILLED-OUT REPLICATION ANALYSIS TEMPLATE

Before the cities workshop, which took place in Cascais in March 2022, the FC were also asked to fill out the template and consider the replication potential for the various NBS they have been implementing or planning to implement (see example of the Miro-based template above).

The following figures show a collective zoom-out of the assessment that was performed by the FRCs Zagreb, Turin and Dortmund and for each NBS (NBS1-NBS8).

NBS 1: Leisure activities and clean energy on former landfills



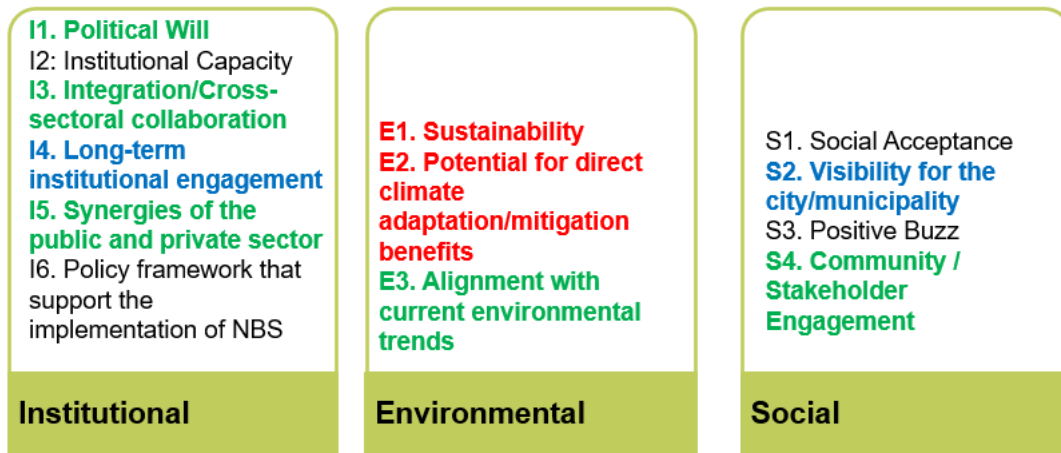
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 9 – NBS1 COLLECTIVE REPLICATION ASSESSMENT I

NBS 1: Leisure activities and clean energy of former landfills



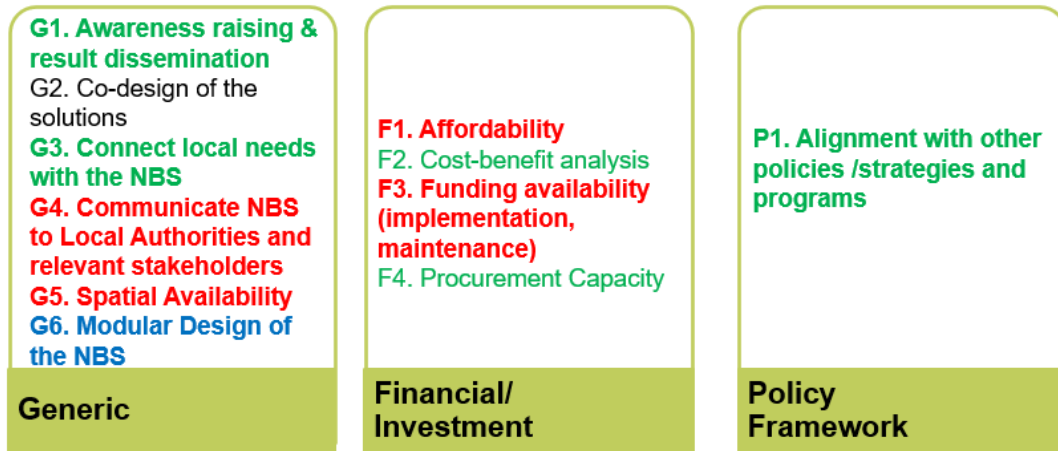
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 10 – NBS1 COLLECTIVE REPLICATION ASSESSMENT II

NBS 2: New regenerated soil



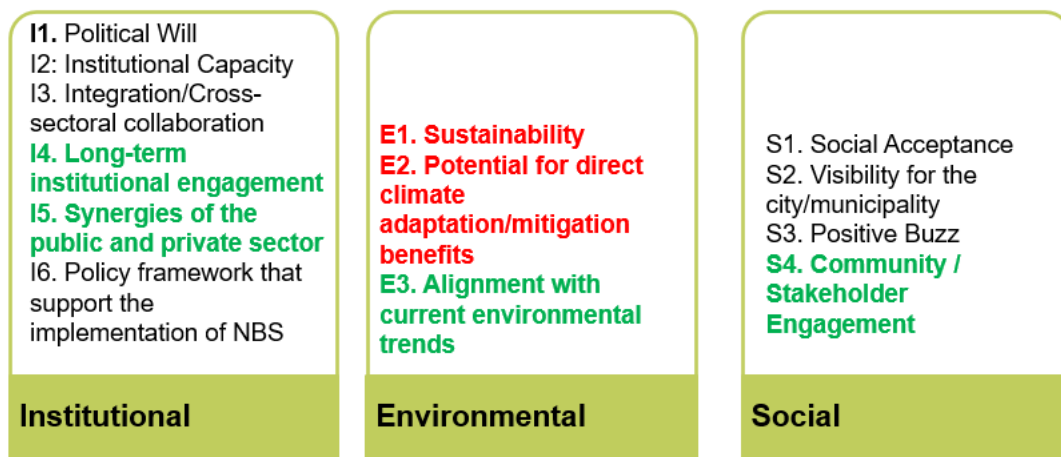
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 11 – NBS2 COLLECTIVE REPLICATION ASSESSMENT I

NBS 2: New regenerated soil



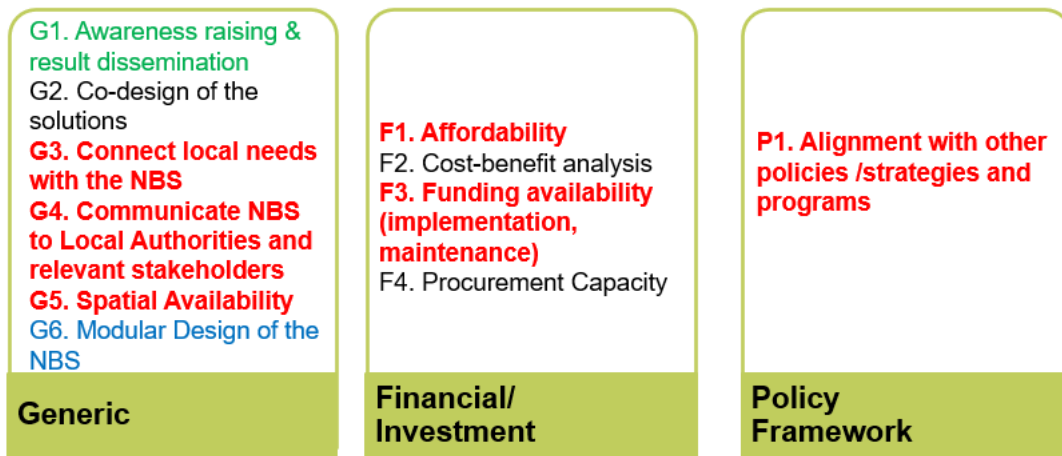
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 12 – NBS2 COLLECTIVE REPLICATION ASSESSMENT II

NBS 3: Community based farms and gardens



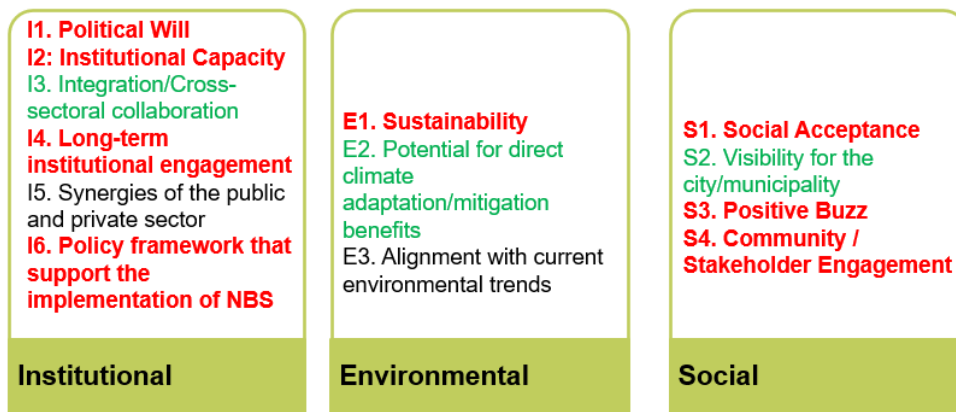
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 13 – NBS3 COLLECTIVE REPLICATION ASSESSMENT I

NBS 3: Community based farms and gardens



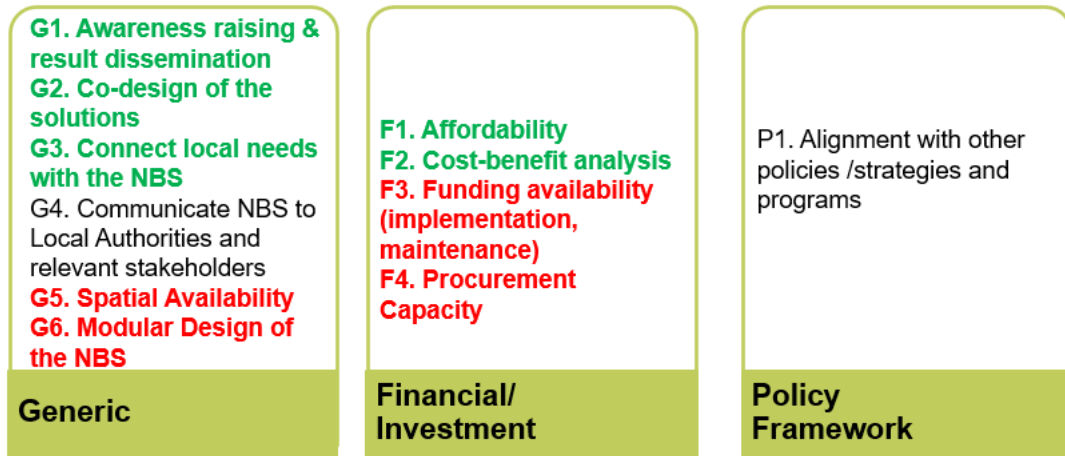
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 14 – NBS3 COLLECTIVE REPLICATION ASSESSMENT II

NBS 4: Aquaponics



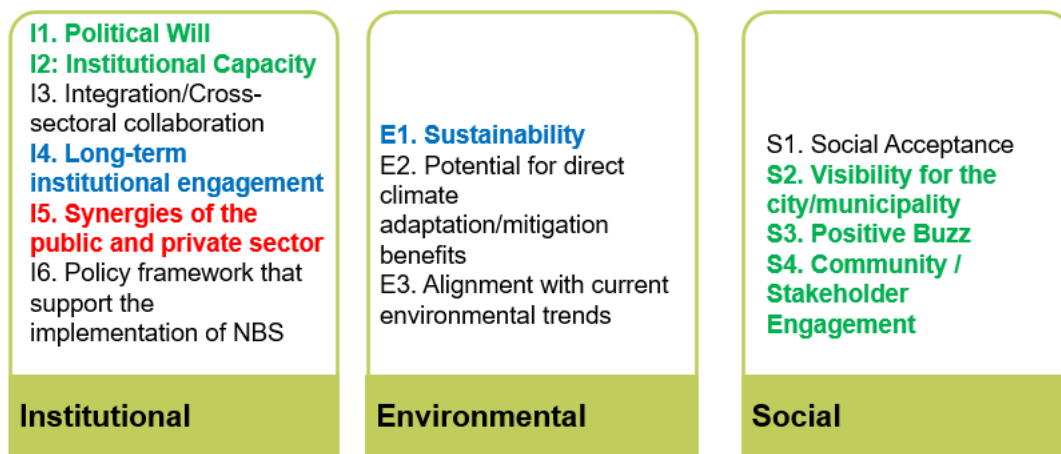
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 15 – NBS4 COLLECTIVE REPLICATION ASSESSMENT I

NBS 4: Aquaponics



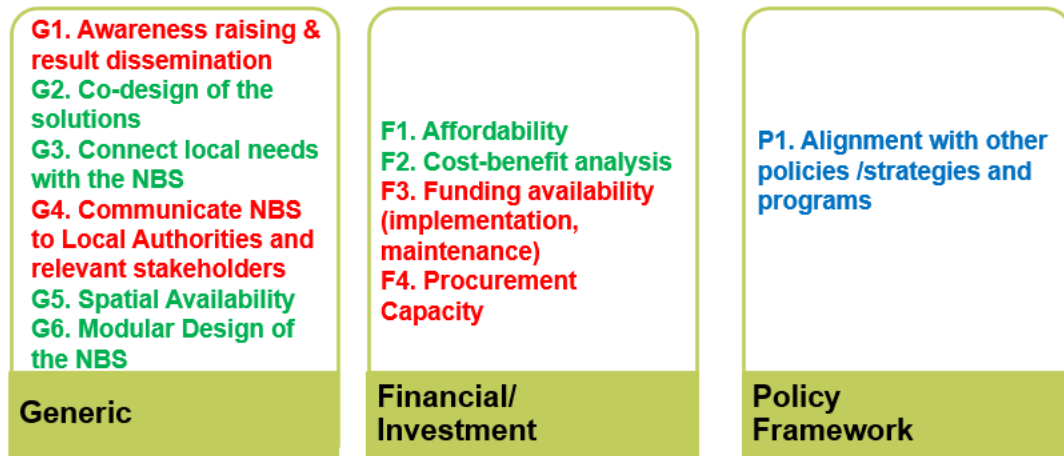
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 16 – NBS4 COLLECTIVE REPLICATION ASSESSMENT II

NBS 5: Green Walls and Roofs



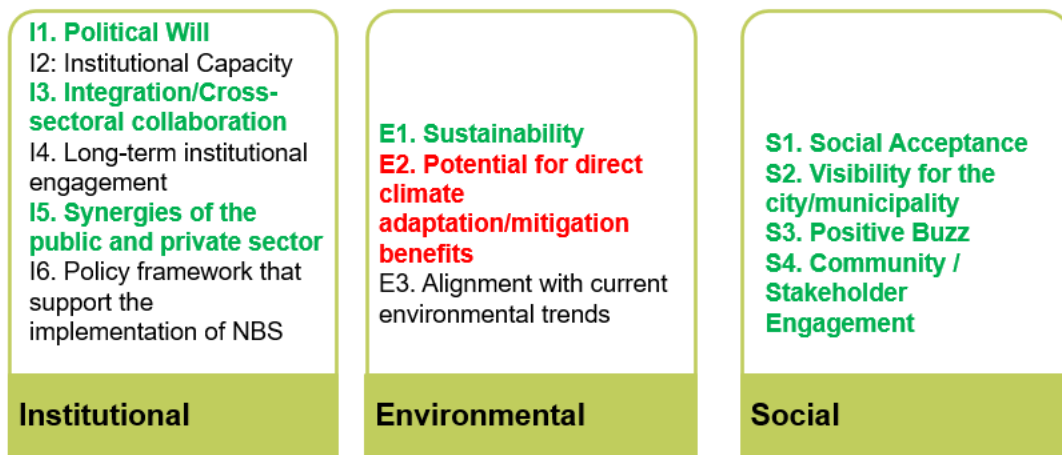
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 17 – NBS5 COLLECTIVE REPLICATION ASSESSMENT I

NBS 5: Green Walls and Roofs



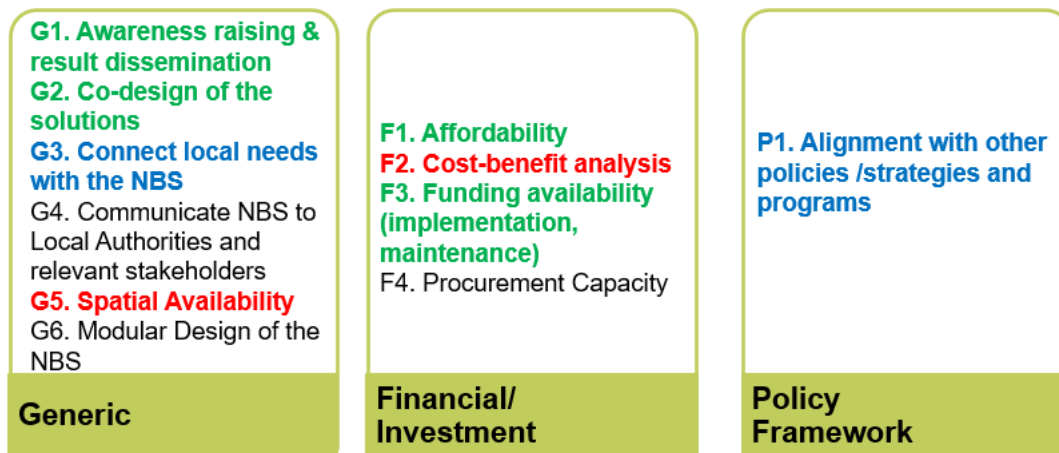
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 18 – NBS5 COLLECTIVE REPLICATION ASSESSMENT II

NBS 6: Accessible green corridors



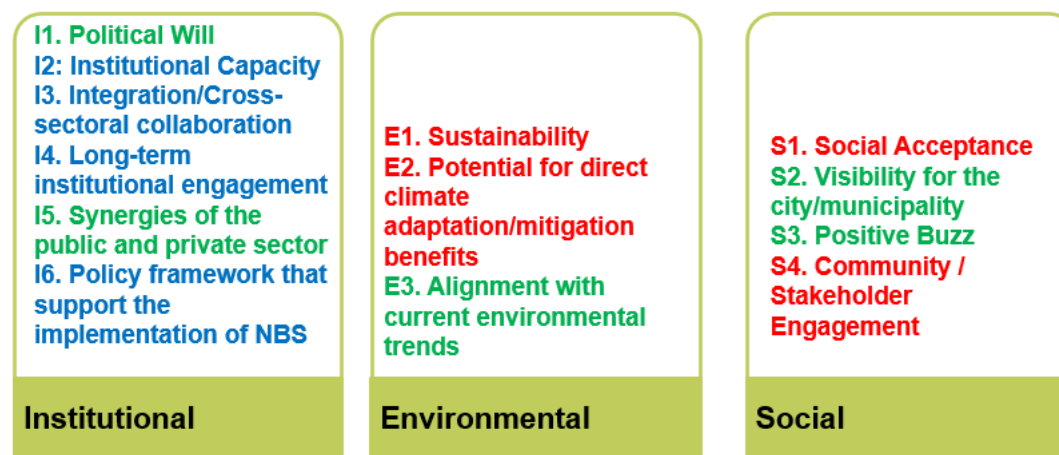
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 19 – NBS6 COLLECTIVE REPLICATION ASSESSMENT I

NBS6: Accessible green corridors



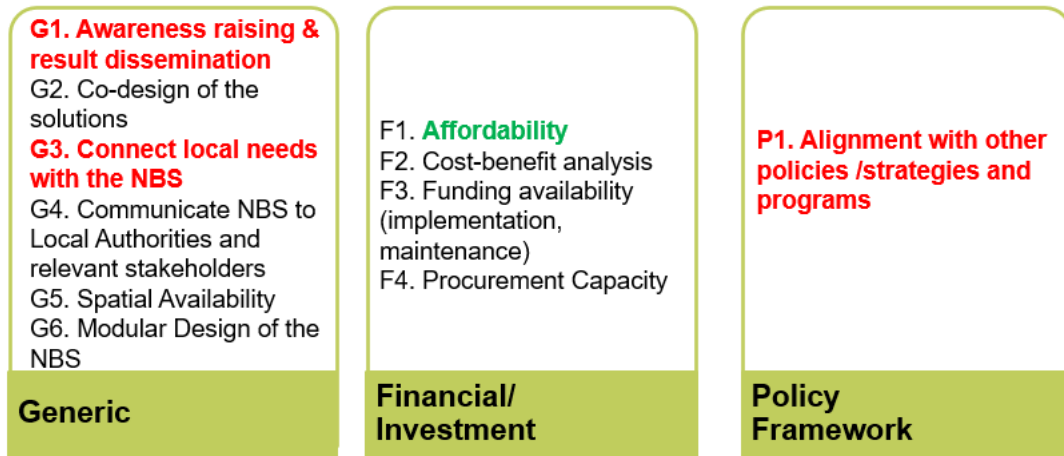
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 20 – NBS6 COLLECTIVE REPLICATION ASSESSMENT II

NBS 7: Local Environmental Compensation Processes



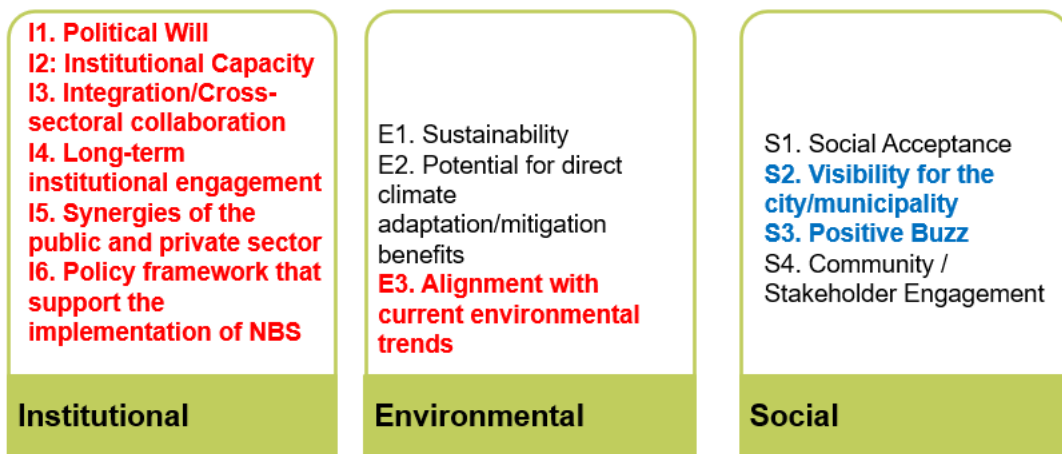
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is **not** possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is **easier**.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 21 – NBS7 COLLECTIVE REPLICATION ASSESSMENT I

NBS7: Local Environmental Compensation Processes



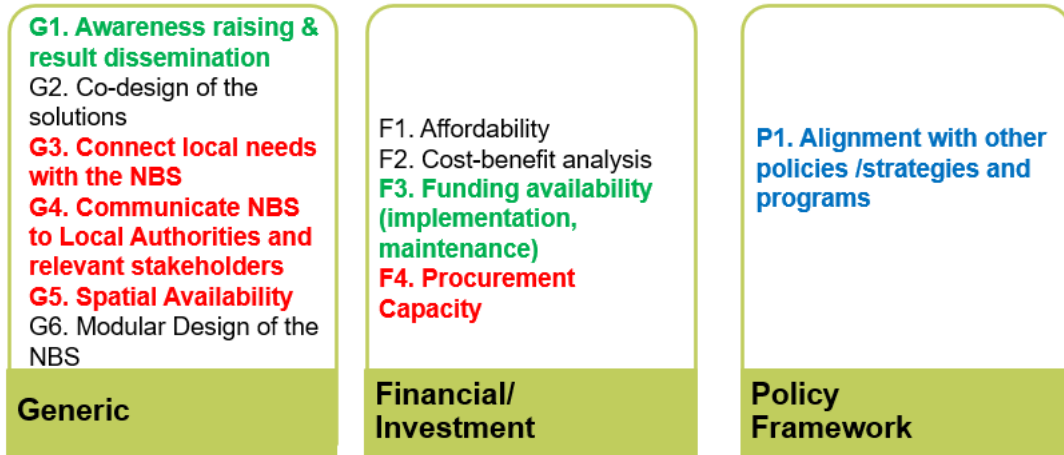
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is **not** possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is **easier**.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 22 – NBS7 COLLECTIVE REPLICATION ASSESSMENT II

NBS 8: Pollinator Biodiversity



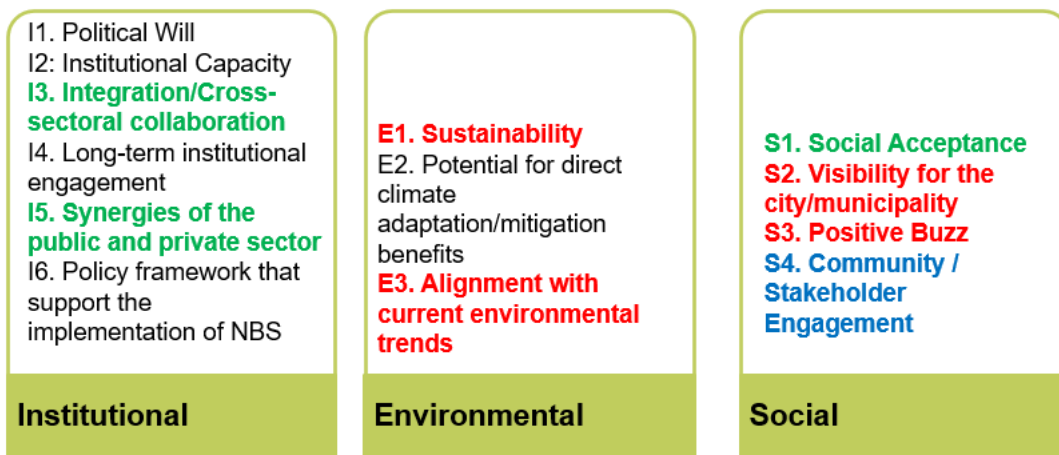
Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 23 – NBS8 COLLECTIVE REPLICATION ASSESSMENT I

NBS8: Pollinator Biodiversity



Enabling factor: It generates the conditions for successful replication of the NBS. If not considered the replication of the NBS is not possible.

Facilitating Factor: These factors facilitate the replication process. Taking these factors into consideration the replication of NBS is easier.

Low Influential Factor: If not taken into consideration that might affect slightly the replication process of the NBS.

FIGURE 24 – NBS8 COLLECTIVE REPLICATION ASSESSMENT II

The main key learnings and recommendations arising from this analysis are described in chapter 5 of this deliverable.

3.2. Turin Local Replication Workshop

3.2.1. Concept and preparation

The replication workshop with local stakeholders in Turin served to map and co-design opportunities for NBS replication in the Turin metropolitan area. ProGfreg cities Cluj-Napoca, Dortmund, Zagreb and Piraeus gathered in Turin to envision how great cities can be when nature-based solutions are used as building blocks. Representatives from Alba, Mannheim, Barcelona, Larissa and Lisbon joined to exchange knowledge.

3.2.2. Implementation of workshop

Day 1

Local proGfreg stakeholders gathered ideas for workshop sessions with external stakeholders by presenting general objectives and participants. Following a general introduction on the replication framework and its relevance at the metropolitan level to maximise local adaptation capacity, the workshop attendees participated in the World Café session divided into groups to debate the implementation of the three NBS that the participants identified as the most suitable for replication:

1. **NBS 3 - community-based urban gardens**
2. **NBS 5 - green walls and roofs**
3. **NBS 6 - accessible green corridors.**

ProGfreg partners in Turin identified these three NBS as key for the city's innovation and renewal process, including its environmental, cultural and transformational developments. Participants reflected on the main success factors for replication to be further discussed with external attendees.

In the afternoon, a group of stakeholders from possible replication areas in the metropolitan city of Turin joined the meeting. In particular, representatives from the Lingotto/MOI, Barriera and Valdocco neighbourhoods were invited because of urban characteristics and needs for NBS implementation. After an exercise aiming to getting participants know each other, proGfreg's NBS and replication framework were presented, as well as the activities developed in the Living Lab in Turin. To close the first day, a representative from the proGfreg partner University of Turin shared experiences and knowledge developed in proGfreg for addressing spatial analysis to identify the best urban locations for NBS implementation.

Day 2

The Living Lab site visit was organized around the green wall implemented inside a local school, to the green corridor and to the so-called “spazio WOW”, hosting different biodiversity projects. After the visits, participants from the different replication areas were separated into groups to identify local needs and NBS opportunities in Turin. In relation to NBS implementations, a SWOT analysis was done. Based on the results, success factors were discussed that enable replication at the Turin district scale. The results of the local replication workshop helped to identify key success factors and priorities for NBS replication. This helps defining enabling conditions for technicians interested in repeating proGREG NBS implementation in the Turin Living Lab, building on learnings. The critical success factors are summarised below:

- Financial factors:
 - combining private and public funds
 - allocating budget for both implementation and maintenance phases
 - attracting funding by ensuring a positive impact on schools, communities and visitors
- Institutional factors:
 - gaining political engagement
 - mainstreaming NBS implementation in planning and management
 - obtaining the required authorizations
 - implementing the NBS in the available spaces of the municipality.
- Social factors:
 - engaging communities in the project to develop a sense of ownership towards the project
 - involving citizens for the maintenance
 - responding to local needs.
- Environmental factors:
 - studying the local context and needs in order to choose correctly most appropriate plants
 - performing a spatial analysis to identify the best location for NBS implementation.

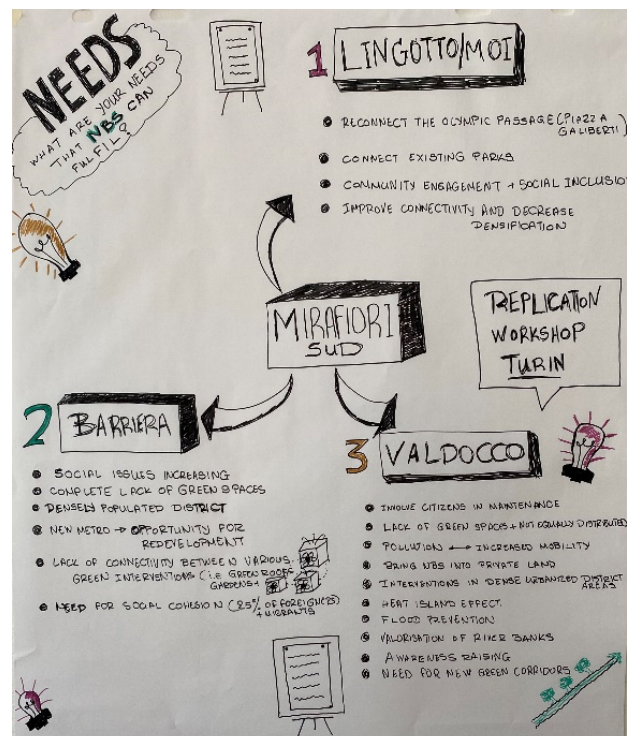


FIGURE 25: Turin workshop summary

Participants from replication districts brainstormed on the needs for NBS implementation in their specific context, highlighting the social importance of green solutions to tackle issues like social inclusion, extreme densification and lack of community engagement. Additionally,

environmental problems were another concern for the participants, who thought that NBS could contribute to avoiding heat island effect, reducing pollution and preventing floods.

3.3. Turin International Replication Workshop

3.3.1. Concept and preparation

The International Replication Workshop in Turin was held on the 16-17 June 2022. It aimed to gather participants from around Europe interested in repeating the NBS experience developed by the city of Turin, because of similar urban and environmental features. ProGREG Front Runner and Follower Cities attended the workshop including Cluj-Napoca, Dortmund, Zagreb and Piraeus to envision how great cities can be when nature-based solutions are used as building blocks. Representatives from Alba, Mannheim, Barcelona, Larissa and Lisbon joined to exchange knowledge.

3.3.2. Implementation of workshop

Day 1

The meeting started by welcoming and presenting the follower cities, who shared their NBS experience with the audience. After introducing the project framework and its activities in Turin by ICLEI and the city of Turin, participants were organised into groups to develop an activity aiming to explore opportunities for replication beyond the project. Front-Runner cities mentored participants in identifying needs and spatial opportunities for replication. In the afternoon, a first guided visit of the LL presented selected NBS implemented in Turin, including aquaponics, community gardens and indoor green walls and roofs.

Day 2

The second field visit offered the opportunity to learn more about Turin’s implemented NBS: NBS 2 - New regenerated soil, NBS 6 - Green corridor, NBS 5 - Outdoor green wall, NBS 8 - Pollinator biodiversity and more NBS 3 - Community-based urban gardens.



FIGURE 26: TURIN INTERNATIONAL WORKSHOP SUMMARY

Participants highlighted key needs for replication of the solutions previously visited. In particular:

- To explore the benefits and obstacles of NBS implementation and to mainstream them in a more complex legislative system
- To tackle social needs through NBS
- To involve citizens in place-making projects
- To learn on NBS implementation in order to engage in the international arena on this topic

The workshop served to shed light on important positive impacts of NBS implementation and upscaling about environmental, social and financial aspects. In particular, participants discussed their role in managing water scarcity, loss of biodiversity and extreme global weather conditions

The workshop participants explored the unique green roof atop Fondazione Mirafiori's (a local association supporting proGReg activities) offices that is utilised for events. The green roof's innovative design has seen it merged to a nearby hill, meaning one can just simply walk up to the roof from the park in front of the building. A small aquaponics factory growing leafy greens for sale in the vicinity proved there is untapped market potential for nature-based solutions - the innovative system allows for the sustainable circulation of water, with the fish providing fertilizers.

Spazio WOW used to be an abandoned lot, but urban farms and gardens were introduced to the site, and activities through the 'Farfalle in Tour' association, involved working with users of municipal mental health services to monitor pollinators with the support of proGReg. Fondazione Mirafiori and the municipality are also working with the people living in the area illegally to see where support and connections can be made. The municipality has built green corridors with pollinator friendly plants, and urban farming corners in marginalised neighbourhoods in the Living Lab to ensure everyone has access to green spaces. The municipality has also dedicated a site to regenerating soil with compost from inhabitants, which helps fertilise depleted soil that it can then be re-used for plants and commercial activities.

A green wall built in a local school has provided the teachers avenues for discussion on the benefits of nature, and also a welcome aesthetic addition to the school structure. Another Green wall was implemented at a homeless shelter providing much needed shade and cooling to the building.

Key take-away for a successful replication process is that cities need engaged partners to steer implementation and ensure raising awareness among stakeholders and citizens. The Orti Generali association is a pioneer of community-based urban gardens and collaborates with the city to implement proGReg activities. Orti Generali manages a large area which has allotments for rent, with reduced rates available to those with lower incomes, e.g. in exchange for work on site. The site is managed by an automatic irrigation system connected to the onsite weather station to ensure water is used consciously. The community gardens are open to all, with active users from the neighbourhood. The association has organised events such as

cooking- and circular economy classes. Special consideration has been taken to involve vulnerable populations and local schools.

3.4. Local replication workshop in Zagreb

3.4.1. Concept and preparation

The local replication workshop was the first workshop in the process, taking place in February 2022 when the Covid 19 restrictions started to ease. Therefore, local partners and stakeholders were carefully selected to ensure safety and health regulations are met. ICLEI and the city of Zagreb engaged in regular online meetings to prepare the successful workshop organization.



FIGURE 27: FIELD TRIP WITH LOCAL STAKEHOLDERS AT THE SESVETE LIVING LAB

3.4.2. Implementation of workshop

Day 1

The participants reflected on the replication framework and the respective successful factors in order to mainstream their interest and the objectives for the meeting with the local stakeholders. The first day concluded by discussing the results obtained in this activity between all the local project partners.

Key highlights of the workshop with the local proGIreg partners as follows:

- Important to engage with key stakeholders in the city to achieve successful co-design and implementation partners. In the case of the city of Zagreb, one of the key elements

that led to the successful implementation of the NBS projects was the cooperation with the implementation partners of the NBS in the Sesevete Living Lab area.

- One important element that played an important role in the successful implementation of the NBS projects in the modular application of these projects was the so-called Lego Concept, which could bring awareness to the market of the NBS and to be used for educational and awareness-raising purposes.
- Another point was the opportunity of replicating the community gardens in tandem with the social housing programmes. In this way, they would have not only biodiversity benefits but also social benefits in some of the deprived areas of the city.

Day 2

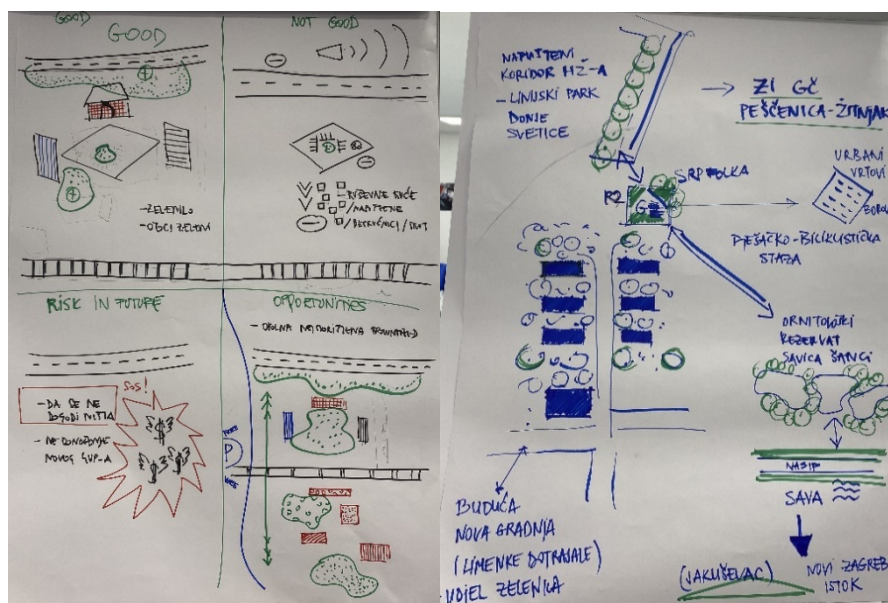
Following an introduction session, the proGReg replication framework and lessons learned through the activities the city of Zagreb has been developing was presented, followed by a Q&A session. Then attendees visited the proGReg Living Lab Sesevete to get to know NBS implemented in the area. For the last activity "Mapping opportunities of local replication" participants were divided into groups to identify needs or interests on NBS projects, map areas with opportunities or challenges and prioritise replication success factors of the NBS seen in the Living Lab. The meeting concluded with an open discussion about the topic exchanging ideas and knowledge among the local stakeholders.



FIGURE 28: GROUP ACTIVITY AMONG LOCAL STAKEHOLDERS, ZAGREB 2022

Numerous thoughts and proposals were collected to strengthen local co-creation. The attendees assessed the needs of NBS in Sesevete and Zagreb Centre. Following are key suggestions:

- Sesevete 2030: Implementation of vertical gardens, green roofs and green corridors and use of non-permeable materials.
- Zagreb centre: Reuse of space and implementation of rain gardens and pocket parks.



FIGURES 29 AND 30: OUTCOMES OF THE GROUP ACTIVITIES FROM THE EXCHANGE AMONG THE LOCAL STAKEHOLDERS, ZAGREB 2022

The spatial SWOT analysis was a useful tool for developing a comprehensive overview of the characteristics of the areas within the city, where there is a potential for replicating the NBS projects. These were the key factors pointed out:

Strengths	Weaknesses
Quality public park, multifunctionality and existence of greenery, rich natural sites and iconic buildings	<i>Bad condition of buildings and street proximity</i>
Opportunities	Threats
System of greenery, use of railway area and improvement of connectivity and social interaction	<i>Lack of acceptance of the project and lack of money and investment</i>

3.5. International Replication Workshop in Zagreb

3.5.1. Concept and preparation

The international replication workshop took place in Zagreb on the 26th and 27th of May 2022. The participants included FRC Dortmund and Turin, FC Cluj-Napoca, Zenica, Piraeus and Cascais and representatives from invited external cities Tirana, Velika Gorica and Murcia.

The workshop in the Living Lab info centre in Sesvete district was hosted by local association Udruga Zelene I plave Sesvete - ZIPS (Association of Green and Blue Sesvete). First, municipal staff working with urban planning and the office for strategic planning and development, alongside representatives from ICLEI Europe, Mali Dom (local institution working with children with disabilities) and ZIPS and Zagreb University, gathered to discuss replication of nature-based solutions and reflect on successes and challenges in the Living Lab. This was followed by the gathering of Croatian movers and shakers; educators, mayors, municipal staff, researchers and civil society, interested in nature-based solutions to learn about the experiences, with a visit to the Living Lab.

The aim of the workshop was to highlight both challenges in the process so participants could have a realistic picture of implementation, and to teach about how the city of Zagreb managed to integrate the work done in proGireg into larger infrastructure plans in the city and national/global environmental frameworks

3.5.2. Implementation of workshop

Day 1

The day started with an interactive session named “Where I’m from”. This provided the space for the participants to identify the important values related to the city that are present and absent in their hometowns. This activity gave the participants the opportunity to get to know each other better but also to understand what values are important to them, either to connect through them or to trigger discussions on the values that were different. This activity was adapted to the context of the workshop from the [Just City Index Methodology](#). Following this activity for familiarising the attendees with each other, the proGireg replication framework, the critical success factors for the NBS project replication and the activities that were being developed in Zagreb through the proGireg project and other initiatives, were presented. The workshop entailed a visual mapping of the values and obstacles of the cities on their path to becoming environmentally sustainable and resilient.



FIGURE 31: CITY OF ZENICA, PRESENTING THE VALUES OF THEIR CITY, DURING THE INTRODUCTION SESSION OF THE INTERNATIONAL WORKSHOP, ZAGREB 2022

The field visit of the Living Lab in Sesvete showcased NBS implementation to date. The six cities participating had the opportunity to discuss on the ground the challenges and opportunities these projects have brought to the city. The first day of the workshop concluded with the general impressions of the field trip.

Day 2

The day involved dividing participants into three groups for the development of the group activities. The group activities were structured in two parts. The first part was devoted to defining issues or risks whereas in the second part, the participants focused on choosing suitable NBS for this context. This activity gave way to a Round Table Discussion where conclusions and learnings were shared among all the participants.



FIGURE 32: GROUP WORK ACTIVITY AMONG THE DIFFERENT CITIES ON THE REPLICATION OF NBS PROJECTS, ZAGREB 2022

All those activities brought to light several ideas. Regarding the values present and absent in the cities, the participants focused mainly on aspects like green spaces, quality and distribution of buildings and infrastructures, quality of life and health of citizens, culture and means of transport.

The group activity of the workshop showed there was a great variety of issues covering the defined six areas. The participants concluded that the common issues were the lack of holistic planning for green infrastructure, the discrepancy between needs and plans and the lack of flexibility. In order to improve that situation, the attendees established long- and short-term objectives:

- Long-term objectives: strengthen collaboration between departments and institutions, combine projects and frameworks for common work and planning and match activities with objectives.
- Short-term objectives: combine synergies and funding, allocate more human resources to the cause and further exchange between REGREEN and proGReg.

Finally, the three groups proposed different NBS that could be implemented in the cities. Suggestions like community garden, green roofs, green walls, green corridors, connectivity of green infrastructure and urban gardens were analysed between the participants. The driving forces of those NBS were mostly related with the positive impact in quality of life and support to social groups, while the restraining forces centred on urban design problems and maintenance issues. To ensure the positive impact of those proposals, the participants saw the necessity of engaging local authorities, the importance of spatial availability and the need of regulation, policies and funding, among other ideas.



FIGURE 33: FINAL REFLECTIONS DURING THE OPEN DISCUSSION WITH ALL THE INVITED CITIES ON THE REPLICATION OF NBS, ZAGREB 2022

The second day concluded with the field visit to the Faculty of Agriculture and Forestry. The Chief Architect presented the NbS projects the Faculty is developing on their ground as well as other initiatives in collaboration with other partners in the city of Zagreb.



FIGURE 34: FIELD TRIP, FACULTY OF AGRICULTURE AND FORESTRY IN ZAGREB

3.6. Local replication workshop in Dortmund

3.6.1. Concept and preparation

The first workshop was supposed to take place on 21st of March 2022 – due to Covid 19 still during lockdown times with meeting restrictions which lasted in Germany until April 8, 2022.

Given this, for all employees of the City of Dortmund the requirement was defined that no in-person-meetings should take place under these circumstances. As a consequence, the local replication workshop was planned and organized as an online meeting.

In Dortmund, many volunteers engage in green infrastructure projects like establishing flowering meadows, school or community gardens. Especially people who start “green” projects from scratch know that during preparation and implementation certain resources often are missing – either project areas, specific knowledge, personal support, money, or helpful networks. This lack of resources costs time, energy and enthusiasm. Especially during a project start, support is helpful – but the challenge was about where to find these resources. On the other hand, there is a vivid, knowledgeable “green community” in Dortmund and surroundings which is pleased to share knowledge, give money or actively assist in implementation. These persons were invited to the first replication workshop to network and to identify resources to offer or to gain for/from third parties who also intend to realize green infrastructure projects.

ICLEI and the City of Dortmund prepared the moderation and presentations of the workshop. All Dortmund proGInreg partners as well as selected guests supported by presenting projects. The workshop took place as a zoom meeting. Parallel to the program/ presentations a chat board was open and actively used. The information exchange was in German language.

3.6.2. Workshop implementation

Target groups for the first replication workshop were representatives from local organizations, city administration, NGO’s and trusts – all active in the field of green infrastructure. By using the network of the City of Dortmund and after internet research about 40 external persons and 12 proGInreg project partners were called: proGInreg and the intention of the workshop were briefly introduced.

The agenda concept was cooperatively worked out by ICLEI and the City of Dortmund during online meetings. The agenda of the workshop was split into information about proGInreg (morning) and an information exchange with invited guests (afternoon). Focus was on their introduction, their link to green infrastructure projects and their possible resources to offer to third parties.

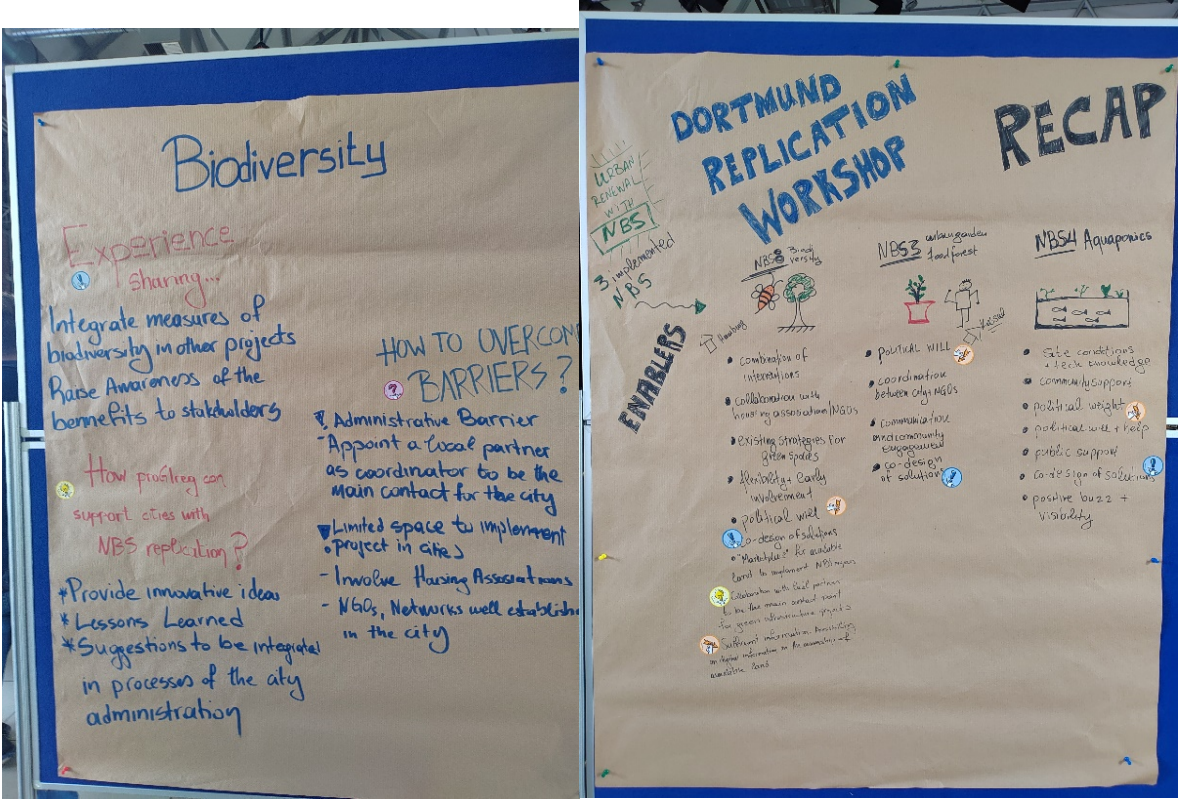
3.7. International Replication Workshop Dortmund

3.7.1. Concept and preparation

The second replication workshop was held in person in the Dortmund Living Lab at the Alte Schmiede in Huckarde, an old renovated smithery building which is close to all NBS sites. NBS and comparable green infrastructure projects are also realized in other German and European

cities, always within different project settings. An information exchange with invited practitioners was focused on working out general structures and patterns which are necessary to successfully repeat green infrastructure projects in other local contexts and to avoid failure. To get more into depth, information exchanges for three NBS based groups were formed (urban gardening, aquaponics, biodiversity) taking into account that each NBS has specific requirements.

The City of Dortmund project partners provided an overview of recent developments in the Dortmund LL. FRC Dortmund has utilised innovative NBS to support the regeneration of the post-industrial district of Huckarde, a former coal hub. Invited German cities and project partners visited the Living Lab to learn from the innovative NBS such as a food forest and perma-culture orchard, aquaponics greenhouses, biodiverse pollinator habitats, outdoor activity park and green corridors that have transformed the post-industrial neighbourhood around the Hansa Coking Plant and the former Deusenberg landfill. The participants of the workshop received a lot of information around the decline of the heavy industry in the Huckarde districts, which resulted in a lot of degraded and polluted areas and high-unemployment, however this opened new avenues for industries in the 60's such as technological innovation, and in recent decades, green innovation through innovative projects such as proGReg, with more to come in the future in the area.



FIGURES 35 AND 36: SUMMARY OF THE RESULTS OF THE INTERNATIONAL WORKSHOP IN DORTMUND

3.7.2. Workshop implementation

The target audience was national and international guests with a practical background in urban gardening, aquaponics, and biodiversity projects. Persons with a research background were also welcomed. A group of 30-50 guests was aimed for. Both, Dortmund and ICLEI, worked out a list with invitees (own networks, EU sister projects, internet research). ICLEI was spreading 38 invitation letters by mid June 2022 to external guests with a deadline to register by the end of July 2022. 33 guests participated (18 German proGReg partners, 4 international proGReg partners, 9 German guests, 2 international guest).

Day 1

The workshop started with an overview about proGReg and Dortmund Living Lab before a field trip took place until late afternoon. By visiting all Dortmund NBS the guests were able to receive first hand information from experts who realized them. The replication workshop took place as group work (separated in three NBS based groups of gardening, aquaponics, and biodiversity projects). Spontaneous information exchange as well as exchange of results of work papers (challenges and needs that can be addressed by NBS/ stakeholders to be involved in co-creation of NBS/ enablers for NBS) enabled vivid and structured discussions. The workshop ended with the summarizing question “Which aspects are crucial for replication?”

Attendees included representatives from cities and institutions in Turin, Zagreb, Cluj-Napoca, Kassel, Essen, Heidelberg and Hamburg. Over two days the participants got to visit and learn from the nature-based solutions implemented on site. Some highlights from this visit:

- NBS 3 - Food forest ‘Waldgarten’ consists mostly of edible plants and perennial vegetables, that are easy to maintain together with the local community. The forest was co-designed with local stakeholders, with paths cleared, various plants introduced and a beekeeper included to support pollinator biodiversity. The local association ‘die Urbanisten’ continues to engage with and support the local citizens on the management of the site.
- In the context of proGReg, a popular local neighbourhood park is being enhanced with an outdoor ‘gym’, encouraging physical activities, with flower meadows adjacent to attract pollinators.

There was a lot of discussion around the fact that a food forest can be designed and implemented at almost any scale. Even an area of 50 m² is sufficient to apply such an idea. The effort invested in the design of the food forest does vary depending on the desired goals and abilities of the implementers.

As most attendees were practitioners, the peer exchange gave everyone the opportunity to learn from each other. Feedback from guests highlighted the excursion had given them the opportunity to see projects in reality and listen to explanations from experts. The structured discussions were helpful for everyone to reflect on various aspects for project implementation.

The Dortmund workshop participants used the event to network and to learn about activities of other guests. They shared expertise and identified possible support options for third parties which were merged in the publication “Networking contacts – more green in the city”. It contains

contact data and non-profit cooperation offers classified into the categories of project areas, specific knowledge, personal support, money, or helpful networks as well as helpful literature and project information. All workshop members received the paper with the request to spread it within their networks and to persons who actively work on green projects. In addition, it was published at Dortmund's proGReg webpage (www.progireg.dortmund.de).

4. Lessons learnt and important outcomes from replication process

The two rounds of replication workshops showed that there are various parameters influencing replication of NBS, which can vary from the specific features of the local landscape in the implementation sites that are selected by the cities (geography, landscape, land ownership etc.). The specific characteristic of each implemented NBS, included their spatial and technical features, the various identified sociocultural, institutional, financial and market barriers (check proGReg report D5.2 Report on technological barriers, D5.3 Report on non-technological barriers and D5.4 Report on non-technological barriers beyond the project), and, of course, the potential of NBS integration into traditional planning processes, strategic urban plans, programmes and developments at city level.

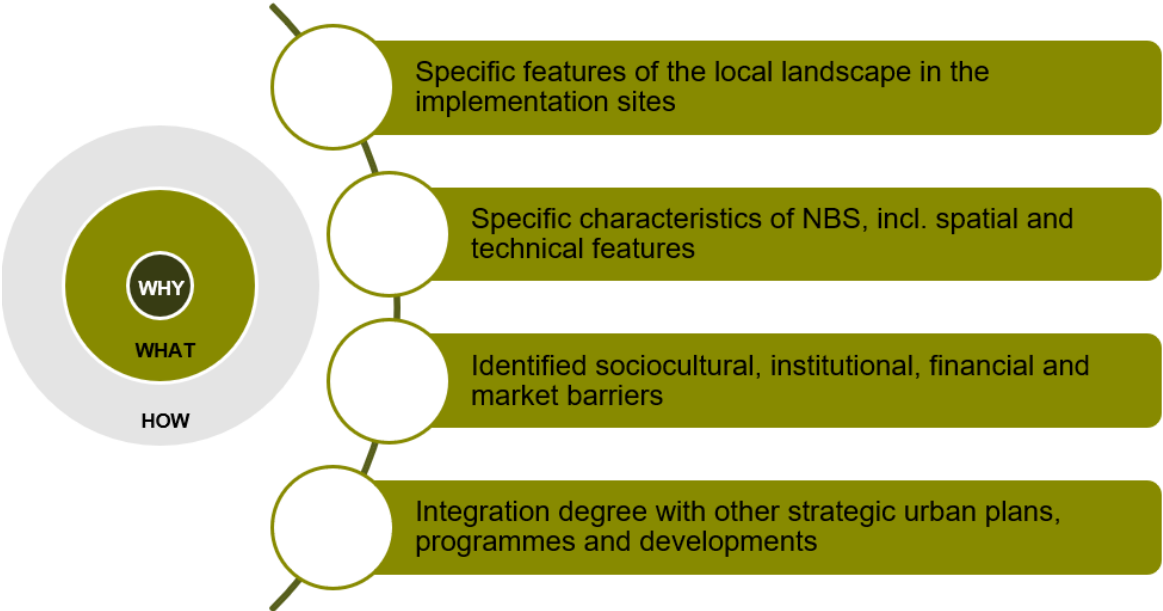


FIGURE 37: PARAMETERS THAT INFLUENCE REPLICATION OF NBS IN CITIES

Throughout proGReg, innovative nature-based solutions have been harnessed to revive post-industrial districts for multiple benefits, such as addressing pollution, improving wellbeing and building resilience. According to the proGReg FRC discussions in the replication workshops,

having plans for the maintenance of NBS from the get-go, is crucial to ensure that the solutions are sustainable in the long-term. The below key components are increasingly crucial for the success of NBS replication:

<p>Harnessing synergies between NBS types</p>	<p>Effective collaboration with local citizen associations, bottom-up initiatives and NGOs</p>	<p>Increased political will and trust in value of NBS</p>
<p>A well planned and well-thought co-design approach</p>	<p>Community support and increased citizen engagement</p>	<p>Visibility that is provided to the city or community</p>

TABLE 1: KEY COMPONENTS FOR NBS REPLICATION

Experiences of the Zagreb Living Lab have proven that stakeholder engagement is crucial for success. **NBS 3 - The Living Lab’s mini-farm, with its modular ‘LEGO-Concept’** was analysed in the workshop to assess the building blocks of successful NBS. The mini-farm has proven able to connect citizens with nature and educating about its potential in cities. Its innovative modular design also means less bureaucracy, as it requires no permits and can be moved to other sites, e.g. schools. This simple modular system offers an opportunity for municipalities to copy. Also, the mini-farm provides sustenance; the aquaponics system inside the mini-farm contains Tilapia fish that provide nutrients to the vegetables and herbs grown inside and on the green roof and walls of the mini-farm. **NBS 5 - Green walls and roofs** feature mostly perennial plants and herbs (chives, rosemary, basil, thyme etc.) that can potentially last several seasons.

The city of Zagreb has emphasized how the engagement of local associations working with people with disabilities has enabled the city to design an accessible garden that serves the needs of various user groups. This has been a tangible and concrete way to teach about the potential of NBS and for the organising team to gain new ideas from the inspiring youth.

Importance of flexibility in NBS design and implementation

Processes are rarely as streamlined as imagined. For example, FC Cascais has successfully engaged citizens to understand their needs, to ensure community involvement. The city has excelled by way of giving citizens agency to ensure they feel ownership of the community

gardens they manage – the citizens are responsible for maintaining equipment together and they use a common water point for several gardens.

Collaboration and communication

Engaging decision makers by highlighting existing results and benefits, is key. Getting around bureaucratic regulations calls for flexibility to adapt plans – and patience. In addition, to get funding, those working to spread NBS in cities should consider sourcing from a variety of places, e.g. grants, EU, municipal or private.

Value of small-scale interventions

Relatively small-scale interventions can hardly fully transform whole post-industrial districts. Cities have agreed **that small NBS intervention can have incremental trajectory.**

Effective learning process

For the implementation of green walls in schools, the **learning process** can also be employed in other schools and with a small budget, the provision of nature-based solutions teaching and practical experimentation can be put into practice to help students of all ages to learn about the role of nature in our daily lives and its importance for society. **Learning scenarios can be highly inspirational** for any school in any country to adopt to teach and encourage students of all age groups to learn about sustainability and the underlying importance of nature in our surroundings.

Public communication

Ongoing public communication is key to the project becoming a success. Communication and explanation of landscape management changes to the wider public, elected members, and the technical skills of assigned staff have proved crucial. In addition, public engagement and consultations have to be constant. Community engagement from community groups, schools, and individuals has to be prioritized. Training of the staff is another important factor to take into account in order to increase the green areas maintenance expertise.

Any city that wants to introduce nature across their neighbourhoods can develop a network similar to the proGReg FRC green spaces network. Actions such as, maintenance of wildflower meadows and management of grassland areas' cutting regimes can be replicated in other metropolitan areas and receive very positive feedback from the general public, thanks to **good communication and engagement strategies.**

Experiences in the Zagreb Living Lab have proven that **effective and ongoing stakeholder engagement** is crucial for success. The Living Lab's mini-farm, with its **modular 'LEGO-Concept'**, was analysed in the workshop to assess the building blocks of a successful nature-based solutions. The mini-farm has proven great in engaging people with nature and educating about its potential in cities. Its innovative modular design also means less bureaucracy, as it requires no permits and can be moved to other sites, for example schools. Other municipalities, such as Dortmund and Cascais have shown interest in copying these elements, as they are

simple. The mini-farm provides sustenance; the aquaponics inside the mini-farm host Tilapia fish, to provide nutrients to the vegetables and herbs grown inside and on the green roof and walls of the mini-farm. The green wall features mostly perennial plants and herbs (chives, rosemary, basil, thyme etc.), that potentially can last several seasons.

In Zagreb, **the successful Therapeutic Garden in the LL** saw thorough planning from the municipality and university, with analysis of several locations within the Living Lab, that were assessed for being accessible, without development plans, owned by the city and the connections to other natural areas to ensure its longevity. Many schools have contacted ZIPS and Mali Dom proactively to have children come in the garden, and the innovative garden has garnered a lot of local media attention and created a need for ‘therapeutic gardeners’. Especially for children with disabilities, the garden has been sought out by parents to allow a safe public space for activities such as urban farming. The therapeutic garden is in use year-round use, with some features such as the urban farming work continuing as spring commences. The sensory path in the garden has been well used, which invites users to touch with feet or hands the different surfaces for some tactile mindfulness. The garden allows for spaces for respite, contemplation and activity.

In addition to the environmental, educational and social benefits, there is economic potential in implementing nature-based solutions, such as touristic value. Especially as Croatia and Italy are both ‘tourism’ oriented countries, there is an increasing recognition in the value of sustainable tourism. Further, the aesthetic benefits can help inspire green development in other parts of FRC Zagreb and FRC Turin is truly leading by example, the key lesson from the Living Labs is not to be deterred by the sheer amount of transformation needed, and how it is ok to work on things little by little. The local partners advised participants to think about existing resources – whether its land, existing green space, funds or innovative idea. Then once there is a plan for a solution, one should look into how it fits into existing frameworks. Throughout it is crucial to consciously manage risks, take into account barriers (technical, institutional, socio-cultural, and financial) and to have the means to address difficult situations and unplanned obstacles. However, the most important thing is to **see arising opportunities**, where others see challenges, e.g. as is with the case of the existing brownfield site of the Living Lab. Cities need to take note of the existing resources and see opportunities instead of challenges.

The implementation of NBS in Dortmund and Turin has shown that **GI can be divided into layers:**

- the base layer is the green spaces and water ways, plus greenfields/un-built areas,
- the second layer is composed of urban gardens, green corridors and capillarity in buildings (actually in the two FRC, this second layer was the one to be mostly implemented successfully) and
- the the third layer includes pollinator biodiversity, energy production, circular economy of natural materials etc.

Building communities of practice around NBS

Finally, Dortmund and Turin strongly agree that such NBS knowlegde hubs can leverage NBS

replication, notably driven by bridging cross-disciplinary expertise and with contextualised local knowledge and relationships with different actors to ensure sustainability of NBS interventions.

5. Replication of NBS in proGfreg FC

Developing replication strategies in proGfreg FCs represent a key milestone in testing and validating the replication potential of NBS that have been implemented in the FRC. Applied methods during this process may serve other European cities interested in replication or upscaling NBS as starting point and guidance.

Based on the continuing exchange between FRC and FC and collaborative local co-creation processes, two NBS emerged as having the greatest potential of replicating while offering multiple benefits for local communities are (see table below):

TABLE 2 - SELECTION OF PROGIREG NBS BY FC

FC / NBS	NBS ¹							
	NBS1	NBS2	NBS3	NBS4	NBS5	NBS6	NBS7	NBS8
Cascais			2			4		2
Cluj-Napoca			4		2	3	1	
Piraeus			2			2		3
Zenica	1		2		2	3		

1. NBS 3 - Community-based urban farms and gardens

A total of 10 proposals were received across FCs to transform neglected sites into various types of community gardens, including urban farming, urban orchards, therapeutic gardens, and multifunctional community gardens. Benefiting from a fairly low degree of technological complexity when implementing community gardens and the potential to empower citizens to co-create and co-manage in shared governance and operational models, NBS 3 also offers high flexibility to be adapted to different needs and contexts. All FCs recognise and appreciate the social, environmental, and economic impacts of urban community gardens in urban regeneration and hence raise awareness

¹ NBS 1 - Renaturing landfill sites for leisure use and energy production / NBS 2 - New regenerated soil thanks to biotic compounds for urban forestry and urban farming / NBS 3 - Community-based urban farming and gardening on post-industrial sites / NBS 4 - Aquaponics as soil-less agriculture for polluted sites / NBS 5 - Capillary GI on walls and roofs / NBS 6 - Making post-industrial sites and renatured river corridors accessible for residents / NBS 7 - Establishing protocols and procedures for environmental compensation at local level / NBS 8 - Pollinator biodiversity improvement activities and citizen science project.

of the benefits using nature to improve living conditions on a wider scale and diverse civil society groups.

The following criteria highlight the replication potential and co-benefits of establishing community gardens for strengthening the productive GI system and community building:

- Early co-design processes possible
- Open to all/socially inclusive (vulnerable groups benefit)
- Co-ownership by citizens incl. co-management and co-maintenance
- Effective land use - unused spaces converted into productive green infrastructure
- Fostering biodiversity
- Supporting physical and mental health and well-being
- Providing food security to vulnerable groups in the city

2. NBS 6 – Accessible Green corridors

Improving green corridors is also a popular NBS choice in FCs, primarily due to its design flexibility, suitability for enhancing local landscape conditions, meeting citizen demands for increased interaction with the natural environment and its synergetic effect with other NBS such as urban gardens, pollinator corridors etc. Green corridors are highly adaptable solutions in different urban tissue configurations, e.g. from improving access to river areas as a pedestrian pathway (Cascais – see C6.2+8.2 – Pollinator Friendly Pedestrian Trail along the River) to regulatory measures designed to facilitate the creation and development of inclusive and ecologically sound green corridors, particularly in the context of industrial area conversion projects (Cluj-Napoca – see CJ6.3 – Green Corridors in former Industrial Areas).

The following criteria summarise the replication potential and co-benefits of creating accessible green corridors for enhancing the urban quality and living conditions of residents and creating pollinator networks:

- Flexible solution for different site configurations and urban contexts
- Co-design with local actors, complexity easily grasped by any group of people
- Providing access and corridors for residents and pollinators
- Environmental services , e.g. riverbank restoration
- Harnessing synergy with potential for other NBS, notably NBS 3 and NBS 8

The table below the replication prospects and considerations in the four proGIreg FC

Follower City Urban Plans for replicating & adapting nature-based solutions

Below is an overview of the plans developed by the Follower Cities. For a more visual impression, view the maps of the Urban Plans for [Cascais](#), [Cluj-Napoca](#), [Piraeus](#) and [Zenica](#).

Piraeus

- Guidelines for future greening policy
- Primary and secondary school gardens
- Marias Kiouris (MKR) pedestrian road – green corridor
- Green corridors in Piraeus City
- Marias Kiouris pollinator-friendly route

Cascais

- Brejos Community Garden
- Multi-use green areas
- Urban agricultural areas
- Pollinator friendly green trail
- Pollinator friendly pedestrian trail
- Greening the parking lot
- Walkway by the vegetable garden

Cluj-Napoca

- Community gardens in Mânăștur
- Multifunctional public space and green corridor Nădășel
- Multifunctional public space Timișului
- Community gardens in collective housing neighbourhoods
- Green roofs on collective housing unit
- Green roof rehabilitation programme
- Someș river green pathway
- Green corridors development programme
- Green corridors in (former) industrial areas

Zenica

- Landfill Crkvicko Brdo
- Therapeutic Garden
- Urban Gardens
- Green Roof on Underground Parking
- Green Roofs on private garages
- Bicycle Path Blatusa Banlozi
- Regeneration of Babina Rijeka
- Plateaus on the River Bosna

TABLE 3 – REPLICATION PROSPECTS IN FC

The urban plans outlining each FCs replication strategy and planned NBS can be accessed in two different formats:

- D2.9 as PDF on the EU platform and proGireg website: www.progireg.eu
- FC Urban Plan of the URA showing all NBS intervention sites as an interactive map on the proGireg website under the following links (see table 1):

TABLE 4 - FINAL URBAN PLANS LINKS

Follower City (FC)	Urban Plan links to proGireg website
Cascais	City Page: https://progireg.eu/cascais/ Interactive Urban Plan: https://progireg.eu/cascais/urban-plan/
Cluj-Napoca	City Page: https://progireg.eu/cluj-napoca/ Interactive Urban Plan: https://progireg.eu/cluj-napoca/urban-plan/
Piraeus	City Page: https://progireg.eu/piraeus/ Interactive Urban Plan: https://progireg.eu/piraeus/urban-plan/

6. Outlook

Throughout proGireg innovative nature-based solutions (NBS) have been harnessed to revive post-industrial districts for multiple benefits, such as addressing pollution, improving wellbeing and building resilience. The project findings were showcased in a session and a marketplace stand at the premier resilience event in Europe: [The European Urban Resilience Forum](#). More information on the session can be found [here](#).



FIGURE 38: PROGIREG AT THE EUROPEAN URBAN RESILIENCE FORUM IN ATHENS, SEPTEMBER 2022 (SOURCE: ICLEI EUROPE)

In this session, representatives from Zagreb (Croatia) and Cascais (Portugal), as well as urban restoration experts, met to discuss about how post-industrial districts can be revitalised using nature-based solutions (NBS), making cities not only more sustainable, but also more attractive, healthy and inclusive.

The post-industrial development of an area depends on the city’s specific needs. In Zagreb, the implementation of green solutions made the areas accessible to the citizens, who showed great dedication in developing the project. Small changes, such as creating therapeutic gardens or designing zones to socialise and enjoy, generated numerous benefits for children, parents and the whole society. In Cascais, the implementation of community gardens brought an opportunity of integration for different social groups, e.g. immigrants and young people in school or university.

In addition to citizens’ involvement, it is also necessary to have the means to finance the project so that it can be maintained and upscaled. As highlighted by the Cascais representative, it is key to show the need for the renovation of this type of area: citizens made their voices heard for converting a new urban park into a vegetable garden, which convinced the municipality to finance the project. As the representative of Zagreb then said, if the cities start demanding these NBS, the municipalities have to respond. Hence, raising awareness among the citizens is essential.

Nevertheless, some issues need to be properly managed: on the one hand, it is not easy to obtain land where NBS like gardens can be implemented. Since abandoned land is mostly not suitable for agriculture, money has to be invested in adequate land acquisition, which are not available for free; on the other hand, the quality of land and water must be guaranteed at all times. Zagreb and Cascais test the area used frequently in order to avoid any sanitary disorder. Greywater used for irrigation, which can be sometimes contaminated, must also be treated. After all, there is no green without blue and the reutilisation of greywater and wastewater can be a solution for water scarcity.

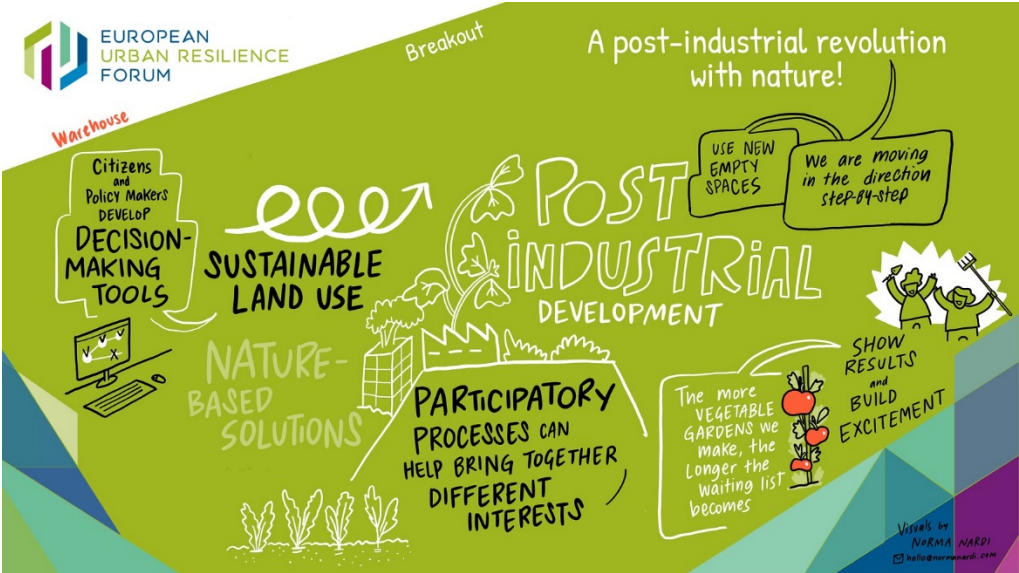


FIGURE 39: SUMMARY OF PROGIREG SESSION ‘A POST-INDUSTRIAL REVOLUTION WITH NATURE’ AT EURESFO22 (CREDIT: NORMA NARDI)

The positive formal feedback from session participants indicated that the work done by the project is motivating a shift in attitudes, improving participants’ knowledge of wildlife habitat

creation techniques, providing skills, and generating awareness. This increase in motivation also allowed all the participants to take measures in their gardens or encourage other citizens to act. The outcome was a greater demand in local communities for neighbourhood improvement support. ProGReg's work in engaging the Front-Runner and Follower cities – and those external to the project - in workshops for sharing knowledge, aimed to ensure the knowledge generated is not lost but built upon, even beyond the project. In addition to the planning, consultation and construction of NBS – monitoring and implementation of the solutions is at the heart of work in proGReg. The data will be shared to support gathering scientific evidence for the impact of nature-based solutions in the proGReg database, hopefully ensuring these sustainable and successful building blocks will be utilised in cities across Europe.

More information to gain insights into the inclusive implementation and replication of nature-based solutions in the FC can be found in the **'Mid-term report on the implementation process of the urban plans in Follower Cities'** [here](#).