# D4.1: New NBS
# Co-Creation of URBiNAT NBS (live) Catalogue and Toolkit for Healthy Corridor

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# Acronyms

NBS (Nature-Based Solutions)
TRL (Technology Readiness Level)
SDG (Sustainable Development Goals)
CoP (Community of Practice)
EC (European Commission)
UN (United Nations)
WHO (World Health Organization)
SE (Solidarity Economy)
SSE (Social and Solidarity Economy)

# Purpose of the deliverable

The aim of this deliverable is to define and explain the URBiNAT NBS “living” Catalogue and to introduce the New NBS that have been co-created in frontrunner cities. The document describes the rationale behind the development of the URBiNAT NBS “living” Catalogue and the connection between the latter and the process for the co-creation of a Healthy Corridor. It also describes each NBS of the catalogue according to the research carried out so far, as part of the project. This information aims to generate a reference document that can be used as a tool by municipalities (e.g. follower and observer cities) that plan to regenerate urban areas using a catalogue of NBS.

Due to COVID19 pandemic, task 4.2 and 4.3 are still under development. In this sense, further guidelines, characterization and performance information about the NBS will be provided in a revised version of this deliverable to be submitted after the implementation of the New NBS in the frontrunner cities. Nevertheless, a description of the New NBS is included in the Deliverable 4.2 Healthy Corridor Concept, that will be submitted on the same date of this document. These two deliverables are complementary.

# Roles and objectives in relation to other work packages

The deliverable represents the main output of the work carried out as part of Task 4.1, but it also establishes links with other WPs according to the NBS pathway throughout the project’s implementation:

WP1| URBINAT NBS: NBS are common goods that need to be created, developed, implemented and evaluated in a participatory process within the URBINAT consortium as well as by communities, stakeholders, municipality staff, experts and researchers involved in the project. This is achieved by integrating and harmonizing participatory concepts and methodologies across every WP. This process requires an analysis of topics about ethical and Intellectual Property Rights (IPR) considerations around NBS that have been addressed in this work package.

WP2| Framing local contexts for NBS: participatory diagnostics are elaborated within Living Labs and complemented with other technical analysis carried out by URBiNAT local taskforces, in order to identify the types of NBS that are needed. This is achieved by scanning for NBS culture within each (frontrunner and follower) city and community, and creating new collective interaction codes for the role of NBS within public space and urban life. The Community of Practice (CoP) activates coaching and mentoring on NBS between frontrunner, follower and observer cities (EU and non-EU).

WP3| Citizens engagement to co-create NBS - NBS design is driven by implementing and replicating methodologies for inclusive active citizenship. These methodologies are themselves solutions included in the URBiNAT NBS “living” Catalogue as participatory solutions. Furthermore, dialogue among experts and non-experts taking place in this work package offers guidance to create a matrix of different types of NBS, to develop prototypes, validate and systematize co-created NBS. This WP also promotes the empowerment of vulnerable groups, gender mainstreaming and human rights in the co-creation of NBS.

WP5 | URBINAT Observatory to monitor and evaluate NBS and the Healthy Corridor - The Observatory will pursue and support the monitoring of NBS and Healthy Corridor

implementations, and the evaluation of its impact on the regeneration of the urban areas, namely on health and wellbeing, on economy and social welfare, and on local governance. It will provide content for the improvement of knowledge sharing among partners and serve to monitor the impact of Healthy Corridors on citizens' daily lives based on indicators measured within the Living Labs in different climate zones, cultural settings and socio-economic situations. Ultimately, it will serve to ensure the sustainability of URBiNAT's results beyond the project to contribute to the establishment of an EU-wide reference framework for NBS.

WP6 | Widespread dissemination of NBS – This WP will support the dissemination of the URBiNAT NBS "living" Catalogue among citizens and local communities but also policymakers, international scientific communities, relevant international networks (e.g. International Observatory on Participatory Democracy (IOPD), United Cities and Local Governments (UCLG), Sustainable Cities etc.), corporate actors, and disrupter groups. WP6 will integrate the NBS catalogue in the website and support the development of a toolkit.

WP7 | NBS value creation and up-scaling - The most marketable and bankable NBS will be studied in this work package to develop business cases, outlining costs, benefits and market potential along with policy recommendations.

# Main Findings

The main outcome of this document is the definition and description of the URBiNAT NBS "living" Catalogue and the co-selection of New NBS. The NBS catalogue, already presented at the proposal stage (See Grant Agreement, part B, p.1 or visit the link: http://ces.uc.pt/temp/NBS_long_table.pdf), has been reviewed and enhanced during the implementation of the project so far and it has been used to co-create New NBS in each frontrunner city, under Task 4.4 - *Healthy Corridor concept. Urban co-planning methodology for territorial and technological NBS* and Task 4.5 *Models, diagrams, and technical drawings to characterize / define urban planning*.

The four typologies of NBS (Technological, Territorial, Participatory, Social and Solidarity Economy) have been defined in detail and the level of information initially provided for each NBS included in the catalogue has also been enriched. In addition to a general description, specific information is now included about the innovation potential of the NBS, its relation with the co-creation process, the synergies existing with other NBS, the replication, scalability and optimization potential of the solution, the challenge addressed, the level of implementation complexity, a qualitative estimation of the investment needed, and of the amortization period.

Three different graphic templates have been created for the systematisation of information and sharing the catalogue in a user-friendly format: NBS cards, NBS factsheets, NBS protocols. Among these, the NBS cards have already been used in workshops with frontrunner cities to co-design the Healthy Corridors. The analysis of its implementation in terms of experience gained in each frontrunner is also another relevant finding of this deliverable. This self-validation demonstrated the flexibility of the process to each local culture, in terms of participation and governance.

Due to the COVID-19 pandemic situation, the testing of NBS prototypes and NBS co-design and co-implementation activities in frontrunner cities has been delayed. Consequently, further research on NBS (e.g. characterizing NBS performance or completing the study of challenges for NBS implementation, innovation and marketability) have not been carried out at the time of writing. A

second version of the document will be submitted after testing and implementing NBS prototypes. The information obtained will constitute a further outcome of the second version of this document. As a living document the URBiNAT NBS Catalogue will be maintained and updated until the end of the project, and beyond.

# Executive Summary

The NBS catalogue developed by URBiNAT partners aims to emphasize its innovative character by combining material and immaterial NBS (territorial, technological, participatory, social and solidarity economy) and also its operational dimension, offering several solutions that can inspire and support the co-creation of NBS in each city according to its local reality, needs and ambitions. The goal is to bring these two dimensions of the public space to a living interaction. On one hand, collective awareness on commonalities, both material and immaterial will be built. On the other hand, the collective understanding of the human and non-human urban dimensions, will be raised through promoting the co-creation, co-diagnostic, co-design, co-implementation and co-monitoring - of solutions inspired by nature and in human-nature.

During the proposal phase, URBiNAT members compiled an initial set of solutions (http://ces.uc.pt/temp/NBS_long_table.pdf) for inspiration or application in URBiNAT cities. These solutions form the basis of the URBiNAT NBS "living" Catalogue, a fundamental tool that has been (and will be) used to (1) discuss with communities which are the solutions framed by the project, (2) serve as a basis to inspire the development of new NBS, (3) support the co-selection of NBS to be integrated in the Healthy Corridor, as a cluster of NBS and (4) feed the Observatory's monitoring task.

The innovative character of the URBiNAT NBS Catalogue is the articulation between natural and social solutions to promote impacts in the environment and on the well-being of citizens, as a preventive healthy strategy, and also in everyday life, by creating conditions for the reorganization of a more supportive economic system.

The URBiNAT NBS Catalogue defines four categories of NBS: Technological, Territorial, Participatory and Social & Solidarity Economy. **Technological and Territorial solutions**, inspired by nature, will result in products and physical interventions in support of the well-being of communities and the enhancement of living conditions in neighbourhoods. **Participatory and Social & Solidarity Economy solutions**, inspired by human-nature, will not only support the processes of co-creation (co-design, co-implementation and co-evaluation) of the technological and territorial NBS, but will also have a fundamental role in: (1) focusing on what communities can do for themselves with available resources; (2) mobilizing and building collective motivations and imagination; (3) bringing together individual and social dimensions, nurturing a sense of identity and cohesion; (4) addressing the complexity and symbolic dimensions of sustainable urban development, motivating public discussion on collective issues and catalysing action on alternative and more sustainable trajectories; and (5) expanding civic urbanity, raising civic pride and building collective memories as a fundamental way to reconcile tensions and conflicting interests in cities.

This document describes in detail the URBiNAT NBS "living" Catalogue, starting from the definition of the Nature-Based Solutions (NBS) as conceived by the URBiNAT project to the implementation of the catalogue during the co-creation process carried out in front runner cities. The document starts by presenting the methodology for the co-creation process used to develop the URBiNAT

NBS (Chapter 1). It goes on to outline the definition of NBS according to scientific literature and according to the interpretation given by the URBiNAT project (Chapter 2). In this chapter, the four-part typology used to classify the NBS (i.e. Technological, Territorial, Participatory, Social and Solidarity Economy) is also explained.

Chapter 3 gives an overview of NBS repositories developed by other EU-funded projects and goes on to explain why the URBiNAT catalogue is “living”. The structure of the catalogue and tools used to collect the information about the NBS are also presented in this chapter that ends with an analysis of the contribution that the URBiNAT catalogue can make to the achievement of Sustainable Development Goals as defined in the 2030 Agenda for Sustainable Development and to the programme of World Health Organization.

Chapter 4 includes the description of each NBS therefore representing the whole URBiNAT NBS “living” Catalogue. Before the Conclusions, the Chapter 5 illustrates how the URBiNAT NBS “living” Catalogue has been (and can be) used during the co-creation process for the development of the New NBS, that are also listed in this chapter for each frontrunner city.

# 1 - Introduction

## 1.1 - URBiNAT Concept and Methodology

URBiNAT has three major objectives corresponding to three levels of action, namely to co-create nature-based solutions:

1) at a local level, to promote social cohesion through the activation of a Living Lab and engagement of a Community of Practice. Citizens and stakeholders are challenged to identify their needs and design together with the URBiNAT team innovative NBS solutions in dialogue with the other cities;
2) at a transversal level, to achieve new models of urban regeneration through the creation of innovative public space. The Healthy Corridor, as a cluster of NBS, is not only a green but also a social and cultural infrastructure creating benefits for the wellbeing of citizens;
3) at a worldwide level, with the monitoring, dissemination and market replication of the knowledge produced and demonstrated in each city, through the website and the observatory digital platform.

Under these three objectives, URBiNAT promotes a multi-pronged approach, in the frame of the co-creation process. Quantitative and qualitative methods are combined to analyse the intervention areas, to identify needs and challenges with citizens, to design together NBS and the urban plan for each Living Lab, to implement material and immaterial solutions, and to monitor and evaluate the activation of the Healthy Corridor. URBiNAT is a research in action, where the researcher is immersed in the community to develop the "knowledge from inside" (Ingold, 2013) as a "reflective practitioner" (Schon, 1983) through participatory methods.

## 1.2 - NBS and Inclusive Urban Regeneration

Using Richard Sennett's schema (2018), we can place URBiNAT at the centre of the challenge of *doing* and *living* the city as an open system with diverse values of society, culture, religion, ethnicity and environment. After decades of urban planning, that challenge is still a mirage, blocked for two reasons; the first related to democratic and political fragilities in decision-making processes (Fainstein, 2010 apud Fortuna, 2019), the second with incoherencies of urban plans.

Taking seriously the complexity of a fair and **open city** requires a recognition of the need to overcome the failures of urban planning "*which results from the absence and disregard of informal ways of inhabiting and living the city, in the technocratic judgment of its professional makers: architects, urban planners, engineers*" (Sennett, 2018). Maria Kaika (2017) attributes this analysis to the "**usual suspects**" of urban planning: "*We need to erase assumptions of primacy, and listen to, and engage with, subjects beyond the usual suspects of urban environmental change; beyond consultants, planners, designers, policymakers, market, advocates, technocrats and NGOs.*". The author also suggests that urban planners need to pay attention to the questions raised by dissensus practices. In fact, building consensus within participatory processes led by these "usual suspects" can have the opposite of the desired effect by reproducing and legitimizing social exclusion.

The review of several EU-funded projects dedicated to NBS, led by Harriet Bulkeley (2020) **questions the efficacy of participation to address inequalities under NBS projects** by alerting

to four dangers: 1) reducing it to “working towards consensus and minimising conflict”; 2) the fact that participatory methods are themselves exploitative by legitimizing solutions that provide little contribution to the needs and ambitions of the communities, 3) the risk of entrenching or widening social inequalities and 4) crystalizing institutional practices in a way that limits the desired effects of NBS in terms of social cohesion.

These warnings stimulate URBiNAT to continue its efforts to assume and design the co-creation of Healthy Corridors with a much broader focus on the process, **putting citizens as the main beneficiaries not only of the physical public space and its NBS but simultaneously as the drivers of its co-design, according to their aspirations, agendas, interests and needs**. To do so, on one hand, it is important to continue efforts of enabling participatory environments for citizens to really own and exercise their citizenship rights over (their) public space and city. On the other hand, it is a cornerstone of the process to address the challenges and opportunities that URBiNAT opens to its municipal partners by including their visions, interests and concerns and, with them, looking forward to introducing innovation in the urban planning practices within the **municipal governance framework**.

The URBiNAT approach followed to design a co-creation process that can improve inclusivity in the urban regeneration of the URBiNAT cities’ areas is described in the following chapter.

## 1.3 - Co-creation of NBS

Co-creation tends to be discussed with reference to different parties coming together in one or more stages of an innovation process. The term co-creation is used in URBiNAT with reference to the specific case of citizens and stakeholders taking active part in the process surrounding the application of NBS, and the wider framework of Healthy corridors, in the urban environment. Here, co-creation serves as an umbrella term for the more specific components we associate with the five stages in the implementation of NBS: co-diagnostic, co-selection, co-design, co-implementation and co-monitoring. It is not limited to the action of “jointly creating” but also includes a freedom of choice to interact with residents, companies, organisations, etc. for the purpose of framing joint solutions by way of products, services and/or concepts (Mateus et al., 2018). One can further distinguish between co-creation of new ideas and the co-production/delivery of public services. Co-creation may further generate new domains of collective activity (Trischler et al., 2017).

Conventional methods to activate citizen participation arose in the 1960s, making use of public hearings, public surveys, conferences, town hall meetings, public advisory committees, focus groups, etc. (Rowe and Frewer, 2000). Gradually, issues arose, however, including lack of information or motivation among citizens and, in particular, difficulties of effectively engaging socioeconomically disadvantaged and less articulate groups (Seifert and Peterson, 2002; Irvin and Stansbury, 2004; Shipley and Utz, 2012). Other problems had to do with distortions introduced by administrations and the arbitrary influence by messengers/experts (Carp, 2004).

Various observations have been made of ways in which **the involvement of non–expert knowledge can help improve urban planning**. Insights into what is relevant on the ground have a greater chance of being raised and acted upon (Burby, 2003; Laurian, 2003). On a related note, citizens' satisfaction tends to be enhanced by a sense of influence on **decision-making** (Brown and Chin, 2013). At the same time, the public may gain a better understanding of urban planning, including the role of urban planners, and they may develop **greater awareness and appreciation**

**of various elements, including public areas** in the form of green space or other manifestations of nature (Hawxwell et al., 2018). Future citizens may also gain greater respect for the city and **become more active users of assets** they have "inherited", due to a sense of belonging to space, facilities and living eco-systems as co-created (Brody, *et* al., 2003; Miraftab, 2003).

Hence, what matters is not the mere scope of cooperation, in technical terms, for citizens and other key actors to engage and take part in shaping NBS and Healthy corridors, but whether they actually do so in practice, and with what results. Key considerations when working out **a way of increasing and improving collaboration, communication and interaction** between decision-makers, experts, and "people", thus have to dwell on "how", "for what purposes", including with a view to raising the quality of public decision-making (Patten, 2001). Meanwhile, the participation of citizens, especially from disadvantaged groups in deprived areas, in defining the issues and implementing solutions, needs to entail a shift in mind-set on the part of all, **from them being "bystanders" - part of the problem - to becoming part of the solution.**

Whether arising at the request of citizens themselves or instigated by authorities, sound participation should be crafted with a view to ensuring certain fundamentals. There is the task of achieving the relevance of local policy initiatives, including NBS, from an early stage, as well as their long-lasting value-creation in harmony with local conditions (economic, social, environmental). Again, in some ways, **citizen participation may be seen as a human right, and as inherently beneficial, as when combined with empowerment**, i.e., allowing and enabling citizens to "have a say" and play a role in shaping their own environment and how they interact with it. In the present context, emphasis is on participation as a means – the benefits it can generate by wielding greater support for and engagement in NBS.

Notwithstanding, participation does not equal a mandate to co-create. Participation and inclusion need to go hand in hand, thereby contributing to a diversity of perspectives; involving and drawing upon the stock of collective knowledge held by people in a particular setting. The important role of technocrats, the influence of vested interests and organizational procedures inherent in the way urban development is conventionally performed, in effect tends to favour other priorities and present hurdles to inclusion and co-creation (Carp, 2004; Puerari, et al., 2018). This leads over to the fundamental role of governance.

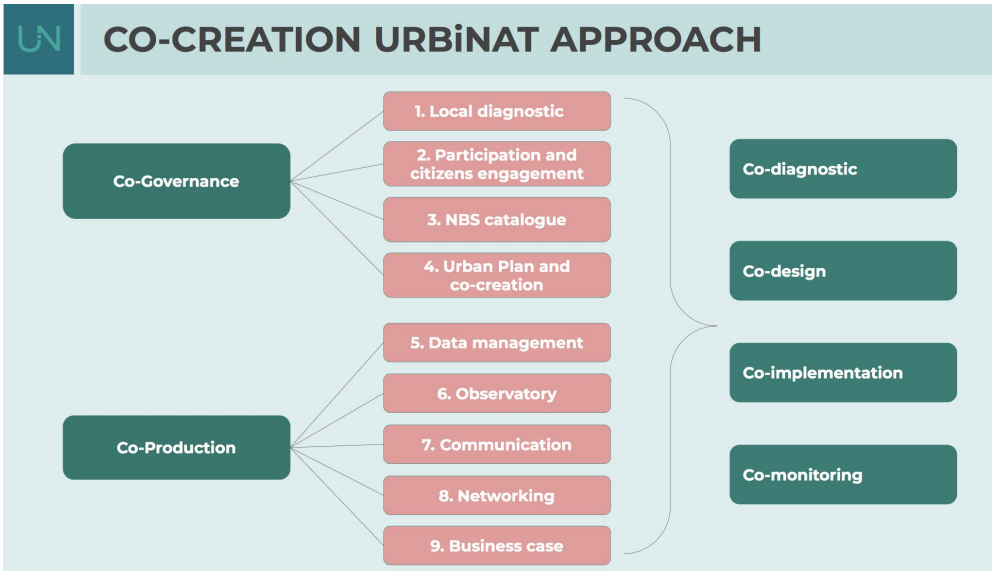



Figure 1. *URBiNAT co-creation approach scheme*

### 1.3.1 Co-governance

Co-governance or collaborative governance is an example of democratic innovation (Smith, 2009; Elstub & Escobar, 2019). The field of democratic innovations tries to overcome a series of dualisms seeking their compatibility, including participatory and deliberative democracy, between representation and democratic practices, between politics and policy, between state and civil society, between normative and empirical concerns. Democratic innovations are defined as "processes or institutions that are new to a policy issue, policy role, or level of governance, and developed to reimagine and deepen the role of citizens in governance processes by increasing opportunities for participation, deliberation and influence" (Elstub & Escobar, 2019: p. 11). This signifies that participatory strategies are not inherently valuable, nor do they represent consensus in themselves. By the same token no actor is, in him or herself, a good or bad participant. Introducing innovation in governance practices requires a clear intention to reimagine and deepen the role of citizens in urban governance processes.

At the same time, measuring the meaning and value of participatory processes requires analysis of participating actors, the relationships between themselves, and with the context in which they are integrated, as much as of the content under discussion (Guerra, 2006). While the co-governance process is quite diverse, ranging from public forums and various participatory arrangements, it has a number of criteria that informs its scope (Elstub & Escobar, 2019):

1) **processes that "seek to enable cooperation and coproduction between citizens, public authorities and stakeholders";**
2) **self-selection or intentional selection of participants;**
3) **participation mode is fundamentally based on discursive expression and, last but not least,**
4) **"consensus building articulated through either bargaining/negotiation or deliberation".**

As they have been designed, participatory processes in URBiNAT aim to raise the level of influence of citizens in the co-creation of NBS and, by doing so, leveraging a governance context into a co-governance context. Some of these criteria have already been accomplished in the participatory processes of URBiNAT cities. However, the level of influence is still not obvious and the process of including negotiation, consensus building and deliberation is still very variable among URBiNAT cities. While it was initially deemed necessary to mediate the co-creation process of NBS between citizens and municipal actors more directly, the time has now come, as planned, to work on spaces for setting the consensus building, negotiation and deliberation directly among citizens and municipal actors.

Much effort has been invested in creating spaces for citizens to participate in the co-design process, in order to overcome the dangers identified in the EC report (Bulkeley, 2020, mentioned above) and preliminary results are promising (presented at D3.2). To address the challenges of introducing innovation in the governance framework of each city, the strategy for the creation of a municipal roadmap (developed under D3.2 as a result of the preliminary analysis on the local participatory culture) establishes 3 key prerequisites:

**1) creating a municipal roadmap for proposals** created by and with citizens in order to reveal the complexity of a decision-making process within the municipal governance structure;

**2) Improving the level of understanding and commitment** among municipality/citizens/stakeholders by encouraging formal commitments from participating citizens, politicians, staff, researchers and practitioners; and
**3) Creating new governance structures for co-creation**, granting a clear commitment from the municipal decision-makers (political and technical) to leverage the participatory experiences under URBiNAT to concrete contributions to public policies on citizens' engagement.

While the strategy of developing municipal roadmaps proved to EC reviewers (General Project Review Consolidated Report, 2020) that URBiNAT is working on solutions to address the commitment of advancing innovation in decision-making processes in each city, in a manner that reflects local participatory culture, it was also clear to reviewers, as it is for many URBiNAT partners and participating citizens, that this is still a significant challenge. The following extract from the EC's review report (ibidem), on the risks and mitigation actions and recommendations on how to address them, **reveals the risks that the co-creation process entails requires particular attention from all actors involved on a robust process not only in the co-design of NBS, already under way, but particularly in the co-design of the co-creation process.**

Risk Number 3: "Weak engagement of citizens in participative process and civic engagement, measured through evaluation and baseline."
Risk Number 5: "Weak impact in local public policies."
Risk Number 7: "Lapse risk of municipalities partnership agreement to create healthy corridor (infrastructure) in the public space."

The overall risk which is linked to these specific risks is not to achieve an enduring substantial commitment of different actors (local administration, policy and decision-makers, business, and citizens) to actively contribute to the Living Labs and to agree on the corridor idea and the co-working process along different steps (diagnosis, design, implementation, evaluation). Hence, the local teams should actively engage with these different groups and actors mentioned above. The other risks identified are still relevant and should be managed properly.

Figure 2. *Extract from the EC URBiNAT' review report*

In the context of URBiNAT, although participation by irruption (Blas and Ibarra, 2006)[1] is welcome, **it is predominantly participation by invitation** (ibidem) **that is taking the lead**. The approach to NBS takes place within an urban governance context which sets a particular context to its implementation. So, talking about co-creation in URBiNAT means to co-create within a municipal governance context. While URBiNAT has a clear mandate from the outset to focus on processes that sustain the design of NBS, the highest priority now is to address the perspectives of municipal actors. Co-creating new governance structures that pursue the integration of channels of participation within local governance is the challenge that needs to be addressed, using the opportunity that URBiNAT has opened to unpack the complexity of the municipal decision-making process and identify **what are the political, administrative and technical aspects that block the advancement of stronger and more sustainable innovations that go beyond the project lifetime and beyond the timeframe of co-design and co-implement Healthy Corridors.** While there have certainly been many attempts from political and technical actors to establish those governance structures over the course of municipal governance, the resulting frustration has not diminished the resolve and ambition of URBiNAT's partners to integrate citizens in the co-creation process.

[1] The initiative of participatory strategies by public institutions or by citizens generate two broad families of participatory practices, as classified by Blas and Ibarra (2006): participation by invitation, in which public institutions or political and/or administrative authorities open arenas for consultation, discussion, planning or joint implementation with citizens of policies or projects; and participation by irruption, in which citizens, organized and unorganized, make room in the public space to claim their rights.

At present the same resolve and ambition needs to be focused on **institutional changes that allow the consolidation of channels of participation**, as proposed by the strategy of the municipal roadmap. This is, of course, is part of the co-creation process: to use the special context that has been produced under URBiNAT to transform participation processes into participation institutions. What are the main challenges to transform participatory processes into participatory institutions? What technical and political obstacles and opportunities come with that possibility? How to give more visibility and voice to municipal actors in the process of criticizing and reforming representative democracy in order to defend and reinforce it? How much and in what ways can participatory and deliberative practices weaken or strengthen representative democracy? These are some of the questions that the project needs to address in order to pioneer participatory processes in municipal governance contexts and, throughout the process, resulting in democratic innovations.

### 1.3.2 Co-production: interaction between technical-scientific and non-technical-scientific knowledge(s)

The limitations of manufacturer or service centric models into the public services or industrial processes moved the position of citizens or users into the production of services and goods. Changes in the way knowledge is produced are evident. In the industrial context users develop their own products or develop customized solutions, in some cases they may pay to obtain exactly what they need. Products are created or modified by users seeking to reach their desires and needs, taking advantage of the fact that they have more accurate information than conventional manufacturers (Hippel, 2005).

In the case of the public sector, past experiences claim for the recognition of the role of citizens and the social sector in their active citizenship and in the provision of public services and shared management (Bovaird, 2007; Pestoff, 2011; Pestoff, Brandsen, Verschuere, 2015; Salm, Menegasso, 2010; Vershuere, Brandsen, Pestoff, 2012). The mixture of activities in which public agents and citizens have a centric (although voluntary) role in the provision of services to ensure its quality and quantity is defined as co-production (Vershuere, Brandsen, Pestoff, 2012). This approach blurs the boundaries between consumers and providers of services by mixing roles between professionals and users since the beginning of the process. Yet, co-production is not only referred to the service or product development process, but it promotes participatory democracy and expands the institutional frameworks of social participation (Vershuere, Brandsen, Pestoff, 2012).

In academia, the production and dissemination of the knowledge is systematized in modes 1 and 2 (Gibbons et al. 1994), and most recently mode 3 (Carayannis, & Campbell, 2012). In mode 1 problems are settled and solved in a context largely governed by academia, circumscribed in the interest of a specific community, and they have a disciplinary approach. Mode 2 of knowledge production emerges as an alternative to the exclusivity of mode 1. Knowledge production is no longer based on hierarchal university autonomy, but emerges in an application context, and involves an increasingly diverse and heterogeneous range of actors such as government agencies, research institutes, companies, laboratories, technology parks, technology-based incubators etc. (Gibbons et al. 1994). Mode 3, is considered the innovation system of the 21 century, which creates spaces to catalyze creativity, and to accelerate scientific innovation and technology through the interaction and combination of people, culture and technology.

Under the umbrella of this mode 3, there is the most recent so-called “quintuple innovation helix” model, in which emphasis on the socio-ecological transition of societies is highlighted. It is not by

chance that traditional models are now opening up to the introduction of natural and green environments as drivers of knowledge innovation, but also the opportunities for society, economy and democracy (Carayannis et al., 2012). In the context of URBiNAT, by definition, it recognizes nature as the fifth actor and source of innovation and active influence.

Beyond the recognition of the natural environment as a new actor, URBiNAT seeks to promote inter-knowledge based on the paradigmatic changes of criteria of rationality and objectivity (Santos, 2003). In other words, the social sciences and humanities are placed in an important position (Escobar, 2006) which supports greater interaction between technicians, scientists and citizens, and where all scientific and technical knowledge is also social, cultural and political; historic and socially situated. Despite the co-production, as referred under mode 3, to aim at the active involvement of all interested parties in order to emerge new and hybrid knowledge and practices, its application faces numerous challenges. Till (2005) further argues that full participation would be impossible to achieve because each party would need to be in equivalent conditions in terms of knowledge. In architecture, for example, the specialist knowledge of the architect within the final decision becomes more relevant than the tacit knowledge from citizens (Till 2005 *apud* Caitana da Silva, Ferreira and Fonseca, 2020).

In the case of URBiNAT, there are a plurality of knowledge, actors and networks operating at the same time within the cities during the NBS co-design process. Which makes co-production more organic than linear, and closer to an open logic. Many times, to adapt and situate to the demands of the context, the process leads to identifying different roles at different points in the process of designing NBS. The strategies adopted by the municipality of Porto, for example, reveal these different roles. During the first phase of the implementation of the project, the Municipality of Porto assumed a more managerial, backstage role, as opposed to direct interaction with participating citizens and associations.

On the other hand, for the co-production of NBS to happen it is necessary to undertake several backstage tasks, which are sometimes not properly accounted for in the process. Considering turnover strategies to guarantee all partners the opportunity of quality interaction could be useful to foreseen and plan these backstage tasks. The Porto experience reflects the dimensions of the co-production process, not only with the citizens *per se*, but also on translation, observation and material support, among others.

Co-production is also part of the participatory process based on interaction among different types of knowledge, which can diverge, converge or generate new hybrid knowledge. Co-production reveals the extent to which the plurality of information can make the final result more applicable to the needs of target audiences or users. The greater the degree of participatory democratization, the greater the possibilities for displacing the frontier between technical and non-technical knowledge. Even the inequality conditions in terms of knowledge and communication will continue to exist.

# 2 - URBiNAT NBS

## 2.1 - What is a Nature-Based Solution?

The NBS concept emerged in the 2000's (Potschin et al. 2016) but has been more widely used in scientific literature since 2014-2015 (Mendes et al. 2020). Its widespread use is largely due to the promotion made by several institutions such as the World Bank, the United Nations and the European Commission (EC). The NBS concept complements pre-existing environmental concepts like Ecosystem Services, Green Infrastructures or Natural Capital (Editorial Nature 2017). It is distinguished by a strong operational dimension, being developed at the science-policy-practise interface (Nesshöver et al. 2017). At the interface of multiple actors and disciplines, the NBS concept has multiple definitions and interpretations, but the guiding principles that outline the concept are widely shared.

Nature-based Solutions (NBS) are defined as solutions that use nature features and processes to address societal challenges (European Commission, 2015). The strength of the NBS concept is to simultaneously address multiple environmental and socio-economic challenges (Cohen-Shacham et al. 2016; European Commission 2015) and to provide co-benefits. Compared to conventional technical solutions, NBS aims at protecting the ecosystems, to be more resilient to change, as well as energy and resource efficient (Everard et McInnes 2013).

NBS implementation models are generally not presented as NBS themselves (as is the practice in URBiNAT – see 2.2). They are, nevertheless, a cornerstone of the concept, because NBS do not refer only to manufactured solutions, rather they are an open innovation process (Jeuken, Breukers 2018) The successful performance of NBS is, therefore, highly dependent on their practical implementation (Raymond 2017; Haase 2017; Kabisch 2017; Nesshöver 2017). The implementation of NBS implies new ways of doing at different levels: governance, financing, business model (when required), and the management strategy (Egusquiza, 2017).

NBS can address a wide range of challenges, potentially in line with the "Sustainable Development Goals" identified by the United Nations (U.N., 2015).

NBS are especially strategic for cities in view of growing urbanization and population growth, and considering that the urban environment significantly affects other environments (Keivani 2010). Cities face a lot of different and sometimes specific challenges. For instance, N4C project (Green4Cities et al., 2017) defines 5 main topics, containing 11 Urban Challenges and 26 Urban Sub-Challenges.

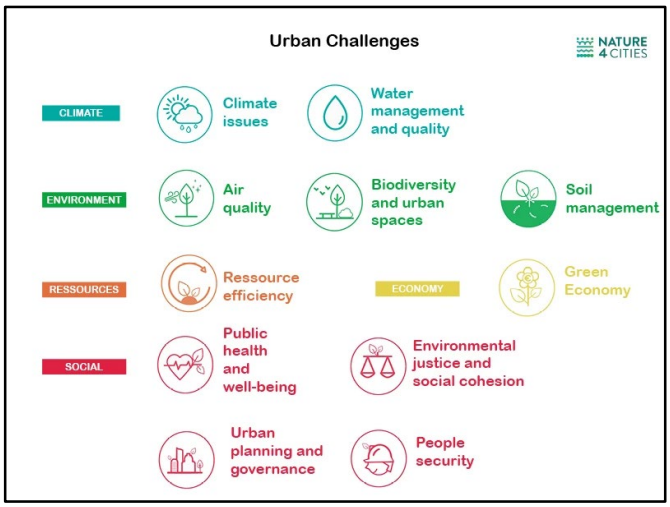



Figure 3. *Classification of Urban Challenges in 5 main topics according to N4C project.*

NBS can be implemented in various urban contexts. Some of these already have a connection with NBS like eco-district projects. The challenge of introducing this kind of solution in densely populated districts, e.g. in the city centre, is also well documented (cf. literature on green roofs and green walls). Urban regeneration projects in social housing neighbourhoods are currently rarely approached by NBS studies and projects. There is, nevertheless, a great potential for NBS in these districts considering that social housing estates are among the greenest areas in cities (Guet, 2011).

In practice, urban NBS can be tangible physical actions like urban projects or management interventions but they are also, at strategic and discursive levels, like plans. In the city context, NBS are connected with (i) traditional fields of intervention in urban areas such as architecture and civil engineering, landscaping intervention and urban planning, but also land and nature management fields such as ecological engineering, bio-technologies and agriculture interventions. Several typologies of NBS have already been proposed through EC research projects and are usually collected into repositories.[2]

## 2.2 - What is an URBiNAT Nature-Based Solution?

The URBiNAT understanding of NBS is in line with the definition and key principles of NBS previously developed in literature (cf. section 1.2 and 2.1). Nevertheless, URBiNAT proposes an innovative expansion of the NBS concept by presenting as NBS in their own right, certain NBS implementation models (i.e. participation - social and solidarity economy). The aim is to emphasise the core importance of these implementation models in the development of NBS, by putting them at an equivalent level, as technical and design developments. Indeed, the implementation of NBS is not limited to the selection of adapted and pre-existing methods, but involves profound changes and innovations in the ways of making and managing the city.

Accordingly, the URBiNAT NBS catalogue challenges conventional NBS definitions by not only integrating solutions inspired by nature, including territorial and technological solutions, comprising products and infrastructures, but by also including participatory and social and economic solutions, comprising processes and services, that reinforce the dialogue between the physical structure and the social dimension of the public space. The goal is to bring these two levels

[2] Further information about existing repositories can be found in section 3.1

of the public space into a living interaction, building collective awareness around commonalities, both material and immaterial and, by raising the collective understanding of human and non-human urban dimensions, promoting the co-creation, co-development, co-implementation and co-assessment of solutions inspired by nature and in human-nature. For the sake of clarity, these different types of NBS will be presented individually, but, in real urban projects, they are interconnected (different NBS types and even between different NBS of the same type). This interconnection is presented by the Healthy Corridor concept that is further developed in Deliverable 4.2 (available on the URBiNAT webpage) and introduced in section 4.2 of this document.


Figure 4. *NBS typologies developed in URBiNAT*

### 2.2.1 Technological

The marriage between nature and technology opens new opportunities to address the latest challenges in the design of urban space and facilitates the integration of NBS in the urban environment. Technological Nature Based Solutions are characterized by the use of advanced techniques and materials for their design and manufacturing processes and by the integration of ICT systems for their maintenance and monitoring.

The term “technology” is considered here as a support tool for nature. It indicates that the solution is conceived following a technological approach, but it does not mean that, to be used and maintained, the NBS will require technological expertise or knowledge. Clarifying the interpretation and meaning of the term “technological” during the dialogue with stakeholders involved in the co-creation process is important. It represents a challenge since the scientific language for the explanation of the solution should be simplified and tailored to the audience and target groups involved in the co-creation process. The technology, in this case, has not to be sought as an obstacle, but it has to be perceived as an enabler that enlarges the stakeholders’ possibilities for expressing and realizing their desires during the co-creation process. Technological NBS use technology for the design, construction and monitoring of solutions.

The design phase is carried out by means of simulation and advanced tools (e.g. parametric design software) that allows the generation of a huge amount of design solutions. Marcos Cruz affirms that advanced software is helping to predict very complex growing and emerging systems, and it is starting to open the doors to a type of design sophistication that we didn’t deal with before (Cruz, 2019).

The use of these tools following a data-informed design approach makes it possible to optimize the performance of the NBS, hence increasing the number and quality of ecosystems and social services provided. Data-Informed design makes use of data-sets to improve the decision-making

process related to design, to process information related to the environment and social behaviour, and to combine them creating a physical space that is responsive both to climatic conditions and to human activities. As a result, the creation of NBS through a Data-Informed design approach generates projects (e.g. building facades or public space surfaces) that are inspired by and make optimal use of local conditions (e.g. humidity, rain, etc.) with the aim of supporting living systems growth in the urban environment.

The design obtained can generate complex shapes and forms that would be very hard to achieve without the use of digital fabrication techniques such as additive and subtractive manufacturing. High-tech tools (e.g. 3D printers and milling machines) allow the production of non-standardized elements that can be specifically tailored for the needs of local living systems. Therefore, applying these techniques to the construction of NBS offers a large flexibility (also in their design). As a consequence, the technological NBS can be easily adapted not only to host and support living organisms but also to satisfy stakeholders' preferences, hence incorporating a high level of compatibility with the different stages of a co-creation process.

In addition to advanced design tools and construction techniques, the technological nature of these NBS is also represented by the integration of advanced materials and processes in the solutions. For instance, bio-photovoltaic systems to produce energy from plants and the use of mycelium to produce both food and construction materials are among the technological NBS used by URBiNAT. The integration of new types of biological, living, and intelligent materials, can transform solutions into metabolic, breathing and productive organisms. Furthermore, the convergence between biotechnology and the use of sensors or information technologies (e.g. to detect temperature, moisture and pH of the soil or to manage and visualize data) applied to landscape and urban design can create powerful synergies.

This new multidisciplinary approach, at the intersection of design, technology and biology is at an early stage of research development and, currently, most projects working on this approach are developed in the form of prototypes in academic or research institutes and presented in exhibitions or expos. The URBiNAT project offers the opportunity to scale up these prototypes and integrate them in a real environment, the Healthy Corridors. The integration of technological NBS in the public space will give a boost to the transformation of cities in healthy, productive and collaborative environments, while supporting plant-based material or social activities (i.e. Territorial NBS or Social and Solidarity Economy NBS), addressing social, economic and environmental challenges simultaneously.

### 2.2.2 Territorial

Territorial NBS are actions sustained by nature that will make a significant contribution towards urban biodiversity, urban resilience to climate change, and storm-water management. These solutions promote urban regeneration and entail social and economic benefits through locally adapted implementations of a wide range of ecosystem services. URBiNAT further develops the concept of territorial NBS, proposing a set of innovations, such as:

- A systemic approach, Territorial NBS are planned, designed and implemented in articulation with and integrated into a Healthy Corridor. Thus, each specific solution will be part of a continuum naturalle taking full advantage of its integration into it. This approach aims to explore the potential of a single NBS by associating it within a cluster that combines complementary NBS. The systemic effect is bigger than the sum of its parts.

- The design of the Healthy Corridor and territorial NBS are the result of an in-depth, specific site analysis and a participatory process. This dual approach will identify local needs and the most suitable locations for the corridor and each specific NBS. Sites will be sought where positive impacts of the corridor are expected to be greater at the social, economic and environmental level.
- Although URBiNAT proposes a catalogue of NBS, each territorial NBS will be tailored according to the site and the co-creation process. For each solution there are a set of principles, design guidelines and technical details to assure their correct implementation. They are intended to be customized, designed and developed according to the potential of the site and the needs and expectations of the users that will benefit from the corridor.
- Territorial NBS promote urban regeneration and social cohesion. They are also expected to make a significant contribution to pedestrian mobility, urban biodiversity, urban resilience to climate change and storm water management.
- They deliver and implement a set of ecosystem services in the urban context. They are cost-efficient solutions that use the nature of healthy ecosystems to promote urban resilience and well-being.

Territorial NBS use living materials and are implemented on different organic supports:

**1) Plant-based material**

From a planting design perspective, URBiNAT NBS will encourage the use of autochthonous plants, and ornamental plants (non-invasive species). The design strategy addresses the design of urban habitats, using a systematic approach that includes a multivariate analysis of climate, soil, water and plant species. At a local level, the planting design will contribute to the preservation of existing non-invasive tree species with ecological or ornamental value and will promote the removal and control of invasive species propagation.

Each territorial NBS from the URBiNAT catalogue features a set of planting design principles and guidelines. From an ecological perspective, each solution will be tailored to the environmental conditions of each city, given that urban habitats, such as fauna and flora, will vary in each city and at each local development site. After the participatory process for co-diagnostic and co-selection, the municipality, local partners and strategic URBiNAT partners will play a key role in identifying the most suitable and appropriate habitats, plant species and design solutions. An ecosystem services approach will be developed, as a way to relate environmental issues with social and economic needs, and assess the services provided by an ecosystem to human populations.

**2) Soil**

NBS from the URBiNAT catalogue aim at improving and preserving soil ecosystem services, in particular, soil fertility, water storage and soil biodiversity (micro-fauna, fungi, bacteria, etc.). These are basic soil characteristics needed for the development of vegetation, either in open land or in technosols (Bouzouidja et al 2020). In that perspective, URBiNAT will encourage best-practices in soil management like composting (to improve the organic matter content) and the use of natural/biological products instead of using chemical products, etc. It is important to underline that any URBiNAT intervention on existing soil will require preparatory measures that will, in the short term, alter soil characteristics. The challenge will be the selection of plots in the study areas, where soil properties are suitable for the foreseen land-use. This means that the implementation sites should be selected to preserve the most versatile soil from heavy disturbances. The interventions may then require restoration of soil properties. In case of soil pollution,

phytoremediation will be a challenging solution for soil quality improvement in the medium to long-term.

3) **Water**

NBS from the URBiNAT catalogue favour the natural flow of waterways (open-air streams, streams not interrupted by dams, etc.). This targets the preservation and improvement of the biodiversity of aquatic life (fishes, aquatic birds and plants), to maintain ecological continuity and control flooding.

The following criteria were adopted for the definition of an URBiNAT Territorial NBS:

- Promote the development of living materials: plant-soil-water
- Have a geographical scope and be defined by physical boundaries
- Be part of a systems vision, developed in articulation with the Healthy Corridor concept
- Allow customization, according to each site characteristics (biophysical and/or anthropical)
- Promote human use (active/passive use; recreational; contemplation; etc.)
- The implemented solution must anticipate different time-scenarios, following and embracing the challenges arise from working with living material and also, as much as possible, from climate change and consequences in urban areas.

### 2.2.3 Participatory

Participatory NBS are solutions that aim to address needs, aspirations and knowledge of residents and users of public spaces in URBiNAT intervention areas. The aim with Participatory NBS is to operationalize the co-creation process by putting in dialogue those needs, aspirations and knowledge with political, technical and scientific views. As URBiNAT operates within an urban governance framework, the main actors to design and implement participatory NBS are residents and users, municipal actors and academic practitioners. But conceptualizing participation as an NBS and enlarging its meaning requires a grasp of the role it plays beyond its use as a strategy to the use of natural features and processes for addressing societal challenges. In this section, three main arguments are used to address participation as an NBS: 1) overcoming the artificial separation of humans and nature, 2) its implications in citizenship status, and 3) use of participation as a natural interaction strategy that advances the process of horizontalization and reconnection between humans and nature.

The first argument uses ecological and philosophical interpretations of the artificial separation of humans and nature. The philosopher and cultural ecologist David Abram reflects on the origins of the word *human* to illustrate the artificial separation of humans from others living beings. Adam is the Hebrew word for human, also related to the term adamah, Hebrew for “ground” or “earth”. “For the ancient Hebrews, to be human was to be an earthling (as in Genesis, where the first human - *Adam* - is a creature fashioned from the soil who will ultimately return to the soil)”. In English (and all Latin languages), the word *human* is related to humus (or soil), both derived from the proto-Indo-European root meaning earth or ground, “which suggests that in English, as in Hebrew, what most deeply defines the human is our own derivation from (and kinship with) the ground underfoot” (Abram, 2012). The philosopher Adela Cortina has ethical or eco-ethical reasons to refute the artificial separation between human and non-human beings and for adopting a relationship with nature composed of living beings of which humans are a part. The solutions are therefore inspired by nature, as they are also composed of human nature. This holistic view also offers better possibilities to exercise a cordial ethics or to promote universal justice, rebutting or

weakening social tendencies that feed imaginaries of self-sufficiency, either by people or countries (Cortina, 2007).

Those interpretations from the artificial separation of humans and nature are also at the basis of the modern conceptualization of citizenship (Santos, 2020) which states that, through it, citizens abandon the state of nature and enter civil society by which they acquire duties and rights. The effort to include citizens is clear but the social contract ends up generating exclusion criteria, determining that citizenship coexists with non-citizenship (Santos, 2006, 2020): 1) the natural state only includes human nature, excluding the rest of nature that only constitutes a threat or a resource (and not a subject of rights); 2) human and citizenship rights, conceived in a "Eurocentric worldview" (Santos, 2020: p. 277) only apply to living human beings, leaving out ancestors and future generations; 3) those who, in a combination of colonialism, patriarchy, capitalism and racism are considered inferior or subhuman, and who therefore have more duties than rights, are excluded from both total protection and the power to exercise rights, as are the women, the colonized, children, adolescents and other human beings with specificities of gender, age, functionality and ethnicity; 4) the separation between public and private space by public trade of interests with expression in civil society, leaving out private life and personal interests.

URBiNAT aims to tackle exclusion criteria from the citizenship status by using participatory and other social solutions and, by doing so, composing a combination of material and immaterial NBS that better reflect the complexity of addressing a healthy public space within an urban planning process.

The third argument addresses the artificial separation between nature and human beings as the basis for framing participation as an exclusively human behaviour. In fact, it is a behaviour adopted by many species to improve their daily performance: "cooperation is omnipresent in human society, and in nature in general "(Pennisi, 2005). Participating as an act of taking part in community life is a natural strategy for survival and coexistence for many species. By deconstructing the artificial separation between humans and nature, participation can also be conceptualized as a solution based in nature, as a strategy used by many living beings. For humans, it is used across all dimensions of life. Participating in the broadest sense is an interaction strategy present in everyday human life and at all intersections of the family, organizational and collective dimensions of life. Individuals, in a continuous search for better conditions of well-being (physical, psychological, material and immaterial), produce continuous intersections between private and public spheres. Participation is a fundamental (natural) interaction strategy to activate those intersections in which grounds the liveability of public space. The reconnection of the public sphere, in the sense of the social dimension of a territory, with public space, in the sense of the ecological dimension of a territory, requires participation as the key interaction strategy that reconnects the relationship between humans and nature.

In sum, participation is not only a natural solution to include diverse citizens as urban actors for urban design purposes, which is already a distant perspective from a conservative conceptualization of citizens as clients from whom urban planners need to extract ideas and needs. It is also an approach to give visibility to participation as a fundamental natural solution to reintegrate nature in the public sphere and space. As underlined by Hannah Arendt (2007), a common world or a public sphere is only possible containing human beings but also what is beyond their mortality, transcending the brief permanence of individuals in the sense that the "common world is what we enter when we are born and left behind when we die."

Participatory NBS aim to design, in each neighbourhood and city context, the best possible solutions and combination of solutions. As a means, the best combination, for each city and neighbourhood, comes from the process of co-creating new solutions, but also, from a diversity of perspectives and knowledges on the different systems and beings that co-exist in a specific territory, co-identifying already existing solutions, recovering past solutions and adapting existing solutions. This is an adaptation from Santos' perspective on "alternative thinking of alternatives", based on a plurality of knowledge and inter-knowledge, also called ecology of knowledge (Santos, 2020). As an end, ultimately, participatory solutions forge an opportunity to activate plural voices on human and natural needs and aspirations. Cooperation and collaboration are used to empower individuals in the (decision-making) process of designing and implementing the best possible combination of NBS. Participatory NBS are the guarantee of plural voices that push forward a fairer negotiation, among different agendas and interests, but ultimately are also the guarantee of bringing plural views on what are the agenda and interests of nature to the co-creation process.

"In terms of participation in NBS the evidence suggests that challenges of moving beyond the inclusion of a relatively narrow section of society and/or a group of alternative but familiar voices remains strong. While most projects point to ways in which processes of inclusion can be made more effective and more open, there are fewer examples where deep reflections on how such projects and the ideas of nature they contain may serve to exclude. In short, there has been a good deal of willingness to change how processes for NBS are organised and deployed, but fewer that have really sought to radically open up the question of what kinds of nature should be generated and for whom the solutions should be designed. This in part reflects the challenge of thinking through what the purpose of urban greening is and who stands to benefit." (Burkeley, 2020: p.24)

The review of several EU-funded projects dedicated to NBS, led by Harriet Bulkeley (2020), show that "NBS can increase knowledge about and action for nature". While this is already a significant and relevant achievement, URBiNAT is trying to move ahead from a persistent global imaginary that positions nature as a separate entity from humans. Recognizing that humans are part of nature, within which they establish interdependency relations, offers an opportunity to accelerate a serious commitment to the relationships humans establish with nature as subject of rights, as much as with segments of population that are persistently excluded from citizenship rights. In fact, the roots of "denaturing" some and "dehumanizing" others are the same: the modern conceptualization of citizenship based on an artificial separation of humans and nature. The consequences of this conceptualization for urban regeneration are the limited and selective access from nature and humans to the right to the city and its urban planning processes. The goal is not to revolutionize the concept of NBS but to highlight hidden assumptions and values around it, particularly the ones related with the inherent processes of designing and implementing NBS, to which the above quote refers to. It is a symbolic but strong statement that redirects the discussion from territorial and technological solutions as "the solutions" for urban regeneration to the social, intergenerational and ecological perspectives and social values and imaginaries that sustain the process of designing and implementing solutions.

### 2.2.4 Social and solidarity economy

Social and Solidarity Economy NBS are assumed by URBiNAT to be opportunities for changing the social, political and economic relations among people who live in the neighbourhoods covered by the project. The project recognizes this as part of a broader socio-economy dimension based on practices whose ultimate goal is not profit (or its absence), but solidarity and cooperation. In these practices the common and general interest prevails over the utilitarian individualist interest in market societies (Singer, 2001; Laville and Gaiger, 2009; Coraggio, 2018) and solidarity is

considered as a principle of democratization of society since collective actions are seen as an attempt to effectively reduce economic inequalities.

These practices and actions can be called community-based initiatives. They are organized in multiple forms, such as: production and marketing cooperatives; workers' cooperatives; exchange networks and groups; solidarity markets and fairs; social and community currencies; fair trade and finance systems; proximity services; local community banks; agri-food short circuits; collective consumption groups and collective production chains; social enterprises; women's associations; among others. All of them pursue an explicit solidarity aim, where the social goal and reciprocity are tied to the model of how goods or services are produced and they are based on the following principles: cooperation, democratic management and autonomy. These principles are applied by taking into account a set of guidelines for: selective self-reliance in order to decrease market dependence; full mobilization of local resources, learning from traditions, local/community wisdom; formally producing common values; improving organizational capacity and promoting healthy lifestyles; boosting inclusive entrepreneurship; transforming waste and resources; focusing on the role of the anonymous lay expert or "barefoot engineers".

In historical terms, the charter of principles established by the Rochdale Cooperative (England, XIX century), had an important role in consolidating the social economy field and keeps inspiring present day cooperative activity and legislation worldwide. While the social economy acquired a wide recognition across Europe due its historical attention to social values, the decline of the welfare state has created a need for rethinking the framework for achieving socially and environmentally responsible economic development. Due to the remaining unresolved issues of both market and government failures, the issue of how to propel other forms of economic activity, including those run by civil society, has come to the forefront of the political realm.

In turn, the solidarity economy was created when the initiatives of citizens, producers and consumers, and several economic activities were organized according to the principles of solidarity and egalitarian criteria (Laville and Gaiger, 2009). Despite the convergence between the social economy and solidarity economy, some aspects highlight significant differences between one concept and another. While the social economy at the European level has evolved trough different historical periods since the 19th century, the solidarity economy emerged just in the 1990s as an alternative to the challenges of economic exclusion of certain urban areas. While the social economy became closer to the State and the legal status of the organizations, the solidarity economy maintained its focus on economic distribution and the inclusion of formal and informal community practices.

More recently, the solidarity economy (SE) has been recognised at the European level, through the adoption of two concepts - the social and solidarity economy (SSE). Beyond that, the field was recognized and introduced in a series of political events and acts. These include: the First European Forum on Social and Solidarity Economy was carried out in 2016 within the European Parliament; the insertion of solidarity economy as a governmental approach by the Catalan and French governments; the Luxembourg Declaration for the Social Economy in Europe adopted by different countries in 2015 (Spain, Slovenia, France, Italy, Luxembourg and the Slovak Republic); the systematization of databases with more than 1200 examples of solidarity economy from France. Nevertheless, although the concept has gained in popularity in Europe, the term remains underused in some countries including Portugal (Hespanha and Santos, 2016) or unpopular and unrecognized, as in the case of Bulgaria.

The SSE can be seen as an NBS that achieves inclusion through participation, added economic value and local resilience, unification of place-based and socio-economic dimensions, implementation of co-creation process and the community of practice. Based on a holistic conceptual viewpoint on NBS concept, the SSE expands the key aspects, contributing to achieve the goals of inclusive urban regeneration through four dimensions at least:

- **Economy.** Considering its substantial focus on the economic inequalities of the territories, the solidarity economy questions their "naturalization" and put some lens on equity access to the resources. Through the cooperative work all subjects can address their needs of subsistence, upon finding in solidarity economy appropriate solutions to their conditions of living. Also, models of crowdfunding with the use of social currencies are strategies for NBS as self-sustained funding and for rethinking the business in a social and solidarity way, especially in contexts where there are no monetary resources;
- **Ecology.** There is an interdependent relationship between solidarity economy and nature, either for a fairer and more conscious production and consumption perspective, or in the proximity of the rural and the urban context that advocates a sustainable environment and new solutions for the organic food production;
- **Social** relations. Democratic management fosters a political capacity of the community, new ways of sociability and urbanities, creating an innovative communitarian social space made by citizens. Also, mutual assistance, relationships and neighbourhood economies transform isolated communities into parts of an active and livable city;
- **Urban space**. The SSE expands the functionality of public spaces, diversifying the way citizens use them. SSE reveals a strong territoriality and connection to physical space - it may range from individual self-provisioning and informal small-scale economic circuits localized and operating within a limited territorial scope to networking on a larger area (region or national level). In some cases, territoriality is linked to culture, thus enabling community culture to develop territorial identity circuits.

URBiNAT partially aims at establishing new initiatives integrating participatory processes as part of the deployment of NBS and the creation of Healthy Corridors within selected cities. The project focuses on sharing experience and learning how to address the outstanding issues and achieve increased wellbeing, particularly in deprived areas and for groups in vulnerable conditions. As discussed by Bulkeley (2020), it is unrealistic to expect NBS in themselves to make any major difference to prevailing conditions, but effective participation coupled with complementary initiatives and reforms can have a range of beneficial outcomes in the reproduction of everyday social life. The greater the understanding of solidarity not as charity, but as equitable redistribution, the greater will be the opportunities to achieve such outcomes. Another fundamental challenge for the implementation of solidarity economy initiatives is sustainability. To address this challenge, it is fundamental to underline the relationship between SSE and technical and commercial innovations. A number of mechanisms need to be deployed and amenable conditions put in place for this purpose. Some of the challenges and opportunities in this respect have to do with the eco-system for risk funding, but also with capacity building and access to markets.

In recent years, the rapid spread of Information and Communications Technologies (ICT) radically expanded access to border-less knowledge networks and enabled the dissemination of new ideas and products at low cost (OECD, 2017). Digitalization further helped spur social innovation from the stage of inception to dissemination and uptake by new users (West and Lakhani, 2008; Smith and McKeen, 2011). Through enhanced exposure of waste and misallocation of resources, digitalization has helped address and overcome outdated practices (Mailoni, 2016). While ICT-

generated growth has been accompanied by reduced income differences between countries, the picture is different at national levels. Since the financial crisis in 2008-09, in particular, income differences have been rising within most countries worldwide, often leading to social polarization within cities. From early on, a number of observations made it apparent that the introduction of ICT in itself won't diminish societal gaps in knowledge and access to information (OECD, 2001; Azari and Pick, 2005). As elaborated in Andersson et al. (2020*b*), a number of confounding factors are at play.

The insight that has grown is turning the tide on income inequality and requires addressing in tandem a range of fundamental issues related to skills, administrative barriers, governance, and public as well as private underinvestment. Overcoming resistant vested interests and managing the required coordination are also formidable challenges at national level.

URBiNAT tries to test new combinations of solutions and then formulate policy advice for mainstreaming. The learning process through SSE and within informal "communities of practice" supports co-creative activities as catalysts for social transformation and community development. The community of URBiNAT practice is the opportunity to its test and one of the projects' pillars, based on the philosophy of sharing and learning by further expanding the NBS concept. The "situated learning" (Lave, J. and Wenger, E., 1991) involves a process of engagement in a "community of practice" in various project activities but also spheres of daily life and with various communities of people; the diverse kinds of knowledge are transmitted in direct personal contact and interactions, and best registered through hands-on engagement with things, people, and places. Three elements distinguish a community of practice from other groups and communities – the domain, the community, and the practice. (Wenger – Trainer E., 2015, Smith, 1999)

# 3 – URBiNAT NBS “living” Catalogue

## 3.1 - State of the art of existing NBS repositories

The URBiNAT NBS catalogue builds on existing collections of NBS. Research has been carried out to understand the work undertaken by other research projects. Many of them (e.g. Clever Cities or ProGIreg) have been financed by the EC under the same call as URBiNAT, while others received funds from previous calls (e.g. URBAN GreenUP or UNALAB). This research has involved a survey of existing NBS repositories. They have a common goal and aims to provide a tool for decision making processes. Most NBS repositories classify NBS according to different criteria and, although the same NBS can sometimes be found in more than one project, the approach used for their classification is never the same since it depends on the main objective of each specific project. One of the most cited classification method is defined by Eggermont et al (2015) that uses two criteria:

1. “How much engineering of biodiversity and ecosystems is involved in NBS?”
2. “How many ecosystem services and stakeholder groups are targeted by a given NBS?”

According to these criteria NBS are organised in three types as shown here.

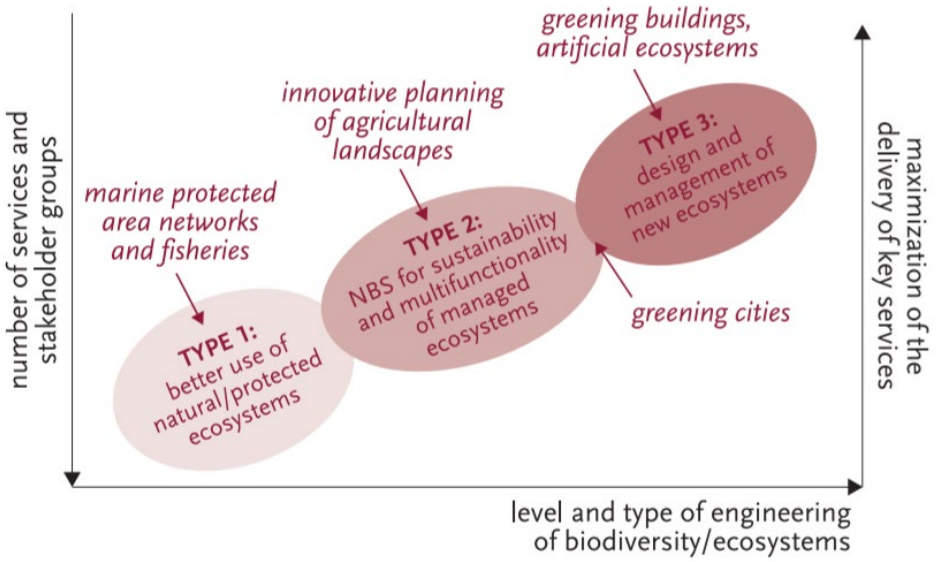



Figure 5. *Representation of Eggermont classification*

Many NBS repositories find inspiration in the Eggermont classification to define their own system of organising NBS, even in cases where the system differs from the one proposed by Eggermont. Despite the fact it is not easy to group the criteria used for the classification of analysed NBS repositories since, as mentioned, they all differ, there are some similar aspects. Some are focused on the ecosystem affected by the NBS (e.g. green infrastructure, water system, urban areas, etc.) or by the type of effect generated (e.g. erosion regulation, climate regulation, water treatment, etc.). Others only consider the location or the element where the NBS is applied (e.g. building, public green space, natural areas, etc.); and others, as is the case with the URBiNAT catalogue, are based on the nature of the NBS itself (e.g. social, technological, etc.). For each category of repository, the information of the NBS is usually represented by means of a template. The content of the latter usually includes: a general description of NBS, a technical description that could include social and economic aspects (e.g. amortization period, investment required, etc.),

challenges the NBS aims to address, and the impact of the NBS usually measured in a qualitative way.

The analysis of the repositories performed in this task has taken into consideration the following projects: Urban GreenUP, Nature4Cities, ThinkNature, proGIreg, UNaLab, GrowGreen, CleverCities. A collection of the NBS included in the repositories of these projects, organised by typology, can be found in Annex B. The figure below is a visual representation of NBS classified by EU funded projects.

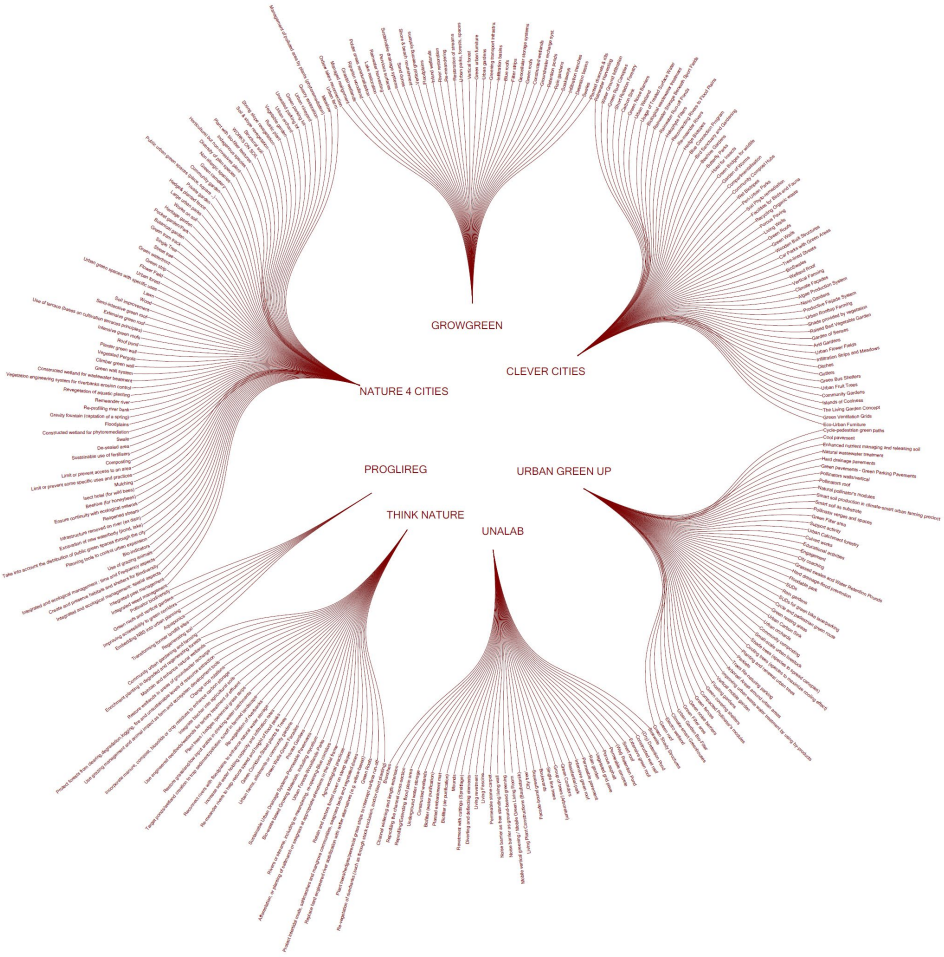



Figure 6. *Resume of NBS repositories found in other EU funded projects*

## 3.2 - Catalogue structure (tools)

URBiNAT's NBS Catalogue does not claim to be an exhaustive repository of existing NBS. It aims to embrace the variety of NBS while keeping a limited number of NBS in the catalogue in order to keep it easy to use during participatory activities. The catalogue is inspired by and works on the model of a reference book used by architects or landscape architects in the process of conception. It consists of a database of solutions to be used in participatory processes, in particular as an inspirational method and tool, for example, to:

- introduce to participants the concepts around NBS;

- broaden the perception on the existence of NBS in the city;
- expand the concept of NBS;
- raise awareness on the different aspects addressed by URBiNAT for an inclusive urban regeneration;
- address not only the problems of a territory (people, places and resources), but also the solutions that its assets can inspire as nature-based, locally meaningful and sustainable.

URBiNAT's tailoring of participatory methods and tools applied in participatory processes takes into account the mapping of current local participatory cultures, that is who, how, when and why participation happens. It also introduces and tests new elements and ways of doing, opening up a space for innovation. In particular, in the case URBiNAT's NBS Catalogue, the first main challenge is to shape it in such a way that it can properly communicate its concept and message among different groups of stakeholders. In this sense, being the catalogue a participatory method and tool to city cultures for the co-design and co-implementation of NBS processes, its format should aim at communicating with different target groups, from the technicians to the citizens, from younger to adults.

According to these considerations the catalogue will be available in three different levels of detail. Each of them addresses a different target group, kind of participatory activity that will implement it and step of research from where start to continue investigating on one of the NBS. From the less to the most detailed, the three ways of representing the URBiNAT NBS "living" Catalogue are:

1. NBS cards/poster
2. NBS factsheet
3. NBS protocol

The NBS card format is configured on one page that includes: a general description of the NBS, the level of impact on the challenges addressed by the NBS, the partner's name responsible for the NBS and some photos that represent it. To facilitate identification and use, the typology of each NBS is associated with a characteristic colour.

The format of the NBS card represents the first step of research carried out for the NBS. In this initial phase of definition of the NBS, each responsible partner has detailed the research mainly with regards to the impact that the NBS has on Nature, Wellbeing, Health, Mobility, Participation and the Economy. Due to its intuitive format and to the information included, understandable without a specific knowledge in the NBS field of application, the NBS card has been (and can be) useful in the co-creation process during co-selection activities. Furthermore, it could be also valuable, as has been the case in URBiNAT, to initiate more advanced research on a specific NBS or a preliminary urban study. It is addressed to a wide range of stakeholders including citizens, institutions, academics, researchers, companies, etc. A sample of the NBS cards (one for each category) is shown here.


Figure 7. *Technology NBS card, Territorial NBS card, Participatory NBS card, Social and Solidarity Economy NBS card (from left to right)*

The NBS fact sheet uses a two-page format. The information included represents a step up for research if compared to the one included in the NBS card above. While it has a similar look, in addition to the information contained in the NBS card (i.e. general description, impact on addressed challenges, partner name and photos), it includes:

- *Quality assessment* on three levels regarding:
  - Difficulty of implementation (Soft, Medium, Hard)
  - Replication potential/flexibility (Low, Medium, High)
  - Amortization period (Short, Medium, Long)
  - Investment required (Low, Medium, High)
- *Innovation aspects*: highlights the features that make the NBS innovative
- *Replication and scalability*: indicates how the NBS can be replicated or adapted to different contexts
- *Participation process*: provides recommendations on how to use the co-creation approach with the NBS in the four main stages of the participation, namely: Co-diagnostic, Co-selection&Co-design, Co-implementation, Co-monitoring
- *Best practices and references*: collects external or internal best practices of NBS implementation and references to similar NBS
- *Complementary URBiNAT NBS*: includes a collection of other NBS that can have synergies and can be integrated with the described NBS
- *QR code*: link to the digital version available in the URBiNAT webpage
- *ID code*: a unique code associated with each NBS

Since this format is more technical than the NBS card, its interpretation may require a deeper knowledge on the NBS field of application. The NBS factsheet will be useful in the co-creation process during co-design activities, when more details about the solution are required to plan its integration within the Healthy Corridor. A sample of the NBS factsheet is shown here.


Figure 8. *Sample of Technology NBS factsheet*

The NBS protocol has been defined as a technical sheet that can include all the information collected during the project about the NBS. Due to its level of detail, it will be available mainly for those NBS that are going to be implemented during the project, since some of the information included is very specific and can be obtained only after the co-implementation and co-monitoring stages. Therefore, it represents the deepest level of research achieved on an NBS during the URBiNAT project. The information previously included in the NBS factsheet, here in the protocol is more detailed and also includes:

- *Relevance:* it explains why the NBS is relevant in comparison to others similar solutions
- *Potential for optimization:* suggests how research on the solution can be enhanced in the future
- *Impact on selected indicators:* gives a detailed description of the impact on addressed challenges
- *Technical description:*
    - Material characterization
    - Product performance documents
    - Certificates
    - Legal barriers
- *Technical drawings*: provides technicians with the information needed to evaluate the technical needs for the implementation of the solution. This information is included mainly for technological and territorial NBS.
- *Protocol:* provides guidelines on the implementation of the solution
- *Business Model*:
    - Amortization
    - Marketability

- *Feasibility Study of the Solution Implementation in URBiNAT Project:* provides detailed information on the implementation carried out during the project
- *Challenges of innovation:* highlights the hardest challenges encountered during implementation

A sample of the NBS protocol can be found in Annex A: Template of the NBS protocol

All formats will be available on the URBiNAT website where a dynamic visualization of the NBS information will be included. The digital version of the catalogue will facilitate specific research according to the needs of the user. It will be possible to use a filtering tool to cluster NBS, not only according to their typology, but according to other parameters such as challenges addressed, difficulty of implementation, potential for replicability, amortization period and investment required for its implementation. Furthermore, the digital version of the catalogue will enrich the information about the NBS with further images and videos, additional best practices and relevant experiences from the project implementation.

## 3.3 - Why a 'living' catalogue

The "living" attribute given to the URBiNAT NBS Catalogue refers to the fact that the catalogue has grown, is growing and will continue to grow together during the implementation of the project. The first version of the URBiNAT catalogue was compiled during the project proposal phase (available at the following link: http://ces.uc.pt/temp/NBS_long_table.pdf). Project partners included several NBS according to their knowledge, expertise and research made. These have evolved since the launch of the project thanks to: (i) the **diversity** of partners involved in the project; (ii) the **inclusion of citizens** through participatory processes; and (iii) **interaction** between these two forces. Considering that these interactions will continue throughout the project lifecycle, notably through the co-creation process, it is to be expected that the catalogue will evolve and be transformed until this process is complete.

URBiNAT is an **inclusive**, **interdisciplinary, transdisciplinary** and **intercultural** project that integrates the perspectives, expertise and experiences of partners from different backgrounds and with different roles, e.g. academics, municipal employees, companies and associations. URBiNAT's NBS catalogue reflects this diversity, in terms of the potentialities it offers for a **participatory, inclusive, integrated and iterative approach** to co-creation that infuses the project, based also on sharing, learning and feedback for improvements.

As initially intended, the NBS catalogue is subject to **ongoing review** throughout developments in the field, i.e. taking into account the results of the co-creation process, from engagement to co-design, co-implementation and co-monitoring. This also includes how the NBS concept, the different typologies of NBS (territorial, technological, participatory, social and solidarity economy) and specific NBS, as well as the initial catalogue as a whole are **conveyed and evolve through communication and interaction** with different groups of stakeholders.

WP4 is focused on research and development in connection with URBiNAT's NBS. The aim is to combine the expertise of partners to grow, enrich and sharpen URBiNAT's NBS Catalogue. The **review work undertaken as part of WP4** focuses on developing a more detailed technical description of the different typologies of NBS initially integrated by respective experts of these NBS in the catalogue, as well as focusing on its combination according to the specific contexts of URBiNAT cities, and in **articulation with the other work packages**:

- **WP1**, taking into account aspects that are addressed transversally throughout the project as a matter of coordination and that should be applied in the design and implementation of NBS, such as:
    - scientific developments based on the exchange of experience and best practices (e.g. theoretical and methodological foundations, including active citizenship, inclusive public space, social and solidarity economy, as pillars that are evolving together with the implementation of the project);
    - data management (e.g. legal privacy requirements and management of personal and sensitive data);
    - cross-cutting dimensions of human rights and gender applying URBiNAT's rights-based approach (e.g. principles of inclusivity, transparency and access to information, 'do no harm') and openness to international cooperation (e.g. replicability in other contexts);
- **WP2** with the establishment of Living Labs and starting of local diagnostics in frontrunner cities based on which NBS are being co-selected, co-designed and co-implemented;
- **WP3** with the tailoring of participatory methods and tools to city cultures for the co-design and co-implementation of NBS processes, which also include the communication and interaction around the NBS concept and the solutions included in URBiNAT's initial catalogue, as well as the participatory design of NBS with citizens and stakeholders of the intervention areas;
- **WP5** considering the data gathering within the Living Labs of the project on the development of NBS aimed at inclusive urban regeneration, and the assessment framework on the effects and impact of NBS;
- **WP6**, building on the project's communication and dissemination strategies, tools and materials, as well as on the different materials and tools developed in the URBiNAT Living Labs, in particular, as mentioned before, how the NBS concept, the different typologies and the URBiNAT NBS "living" Catalogue are conveyed and evolve through communication and interaction with different groups of stakeholders and target audiences;
- **WP7**, contributing to the identification of business cases for best practice NBS, with the definition of key enabling features for replication and scaling, and to a larger extent of social innovation cases;
- **WP8**, in connection with task 1.4 of WP1, regarding ethics requirements, both related to participation of residents, citizens and stakeholders (e.g. vulnerable groups and children), as well as the work of researchers. Moreover, an ethics analysis may be applied to the NBS design considering social, ethics and legal issues, as well as any incidental findings, that will require additional attention. URBiNAT is supported by an ethics commission composed of external experts from the countries of the cities involved in the project.

Therefore, URBiNAT's NBS catalogue is "living" in the sense that it is based on learning and feedback activities for improvements throughout the different stages of the co-creation process and the mutual relationships among the project's work packages.

Being **"living"** is an essential characteristic of the NBS catalogue since it **is at the heart of the development of the Healthy Corridor**. As such it needs to be flexible and adaptable to the different features of the local physical and socio-cultural contexts and to citizens' needs and wishes, including their proposed solutions.

## 3.4 - URBiNAT NBS “living” Catalogue in the framework of 2030 Sustainable Development Agenda and World Health Organization.

URBiNAT’s framework for innovation and sustainability in inclusive urban regeneration is mainly based on the two frameworks developed by the United Nations (UN), the 2030 Agenda for Sustainable Development and by the World Health Organization (WHO).

The 2030 Agenda for Sustainable Development, adopted by the United Nations in 2015, constitutes a global framework and call for action, recognizing that “ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests” (United Nations, 2020). The URBiNAT catalogue being composed of NBS of different categories, it allows the composition, through an innovative combination and clustering of solutions, of Healthy Corridors in public spaces that are undergoing regeneration. It also relies on an integrated approach to sustainable development.

On the one hand, the development of a Healthy Corridor and an URBiNAT NBS “living” Catalogue are aimed at demonstrating innovative NBS in cities, and, as a result, contributing to the achievement of **Sustainable Development Goal (SDG) 11**: Sustainable Cities and Communities - Make cities and human settlements inclusive, safe, resilient and sustainable. On the other hand, all solutions, to a greater or lesser extent, are aimed at **contributing to the achievement of different SDGs** (multi-functionality is one of the key character of NBSs), covering impact components across the typologies of NBS of URBiNAT’s Catalogue, such as: energy, water, food, green nature, biodiversity, mobility, participation, social accountability, democratic innovations, social and solidarity economy. Although the composition of the catalogue has evolved during the project, it still considers how its solutions relate to the SDGs. The 7 following SDGs were connected to the typologies of NBS included in URBiNAT’s initial catalogue of NBS. The corresponding **benefits**, to be further detailed and evaluated throughout the co-creation process, in particular during the co-monitoring stage, are still expected in accordance to the specific challenges faced in the urban context and social housing neighbourhoods:

- **SDG 1** - No Poverty - End poverty in all its forms everywhere: benefits may arise by way of the increased purchasing power/income of families, increased employment, strength of the local economy, as well as business development;
- **SDG 2** - Zero Hunger - End hunger, achieve food security and improved nutrition and promote sustainable agriculture: better quality food, fruits and vegetables with affordable prices, urban agriculture proposals arising, for example, through hydroponic systems for cultivation, and spirulina algae bioreactors serving to enhance food resilience and boost the availability of high nutrient food for all;
- **SDG 6** - Clean Water and Sanitation - Ensure availability and sustainable management of water and sanitation for all: for example, through watercourse restoration to recreate flowing canal and drainage systems and the preservation and promotion of land that is saturated with water;
- **SDG 7** - Affordable and Clean Energy - Ensure access to affordable, reliable, sustainable and modern energy for all: URBiNAT will support innovative solutions to energy production systems with 3d printed ceramic walls that host plants used as bio-photovoltaic systems;

- **SDG 8** - Decent Work and Economic Growth - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all: through solidarity production chains and local exchange trading systems;
- **SDG 12** - Responsible Consumption and Production: Ensure sustainable consumption and production patterns: solidarity fairs and markets, recycling exchange, repair-cafés are some examples of how the social and solidarity economy can amplify sustainable practices;
- **SDG 13** - Climate Action - Take urgent action to combat climate change and its impacts: URBiNAT's NBS will amplify urban biodiversity through, for example, gardens, green corridors, renaturalization methodologies, tree planting and beehives. All of these will protect, restore and promote the sustainable use of terrestrial ecosystems, the sustainable management of forests, combating desertification, halting and reversing land degradation, and halting biodiversity loss.

The co-creation process of NBS also allows URBiNAT to address **SDG 17** - "Partnerships for the goals - Strengthen the means of implementation and revitalize the global partnership for sustainable development" since it seeks to strengthen partnerships between citizens, stakeholders, academia and municipalities. Moreover, the rights-based approach applied in the project has human rights and gender as cross-cutting dimensions, questions which relate directly to **SDG 5** – "Gender equality - Achieve gender equality and empower all women and girls". This objective is pursued by engaging women and girls in activities to empower them in the transformation of their neighbourhoods. It is also addressed when applying gender lenses in the solutions and all the stages of co-creation, that is considering the specificities of women and girls, their challenges and needs to use and enjoy public spaces.

Considering the activities being developed with schools, URBiNAT has also been addressing **SDG 4** – "Quality education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all", by supporting the inclusion of the different dimensions of sustainable urban development and NBS in the educational programs, as well as raising awareness about the children's rights to participation and their capacity and valuable contribution to the development of their communities.

The different typologies of NBS that compose URBiNAT's Catalogue also echo a multidimensional and integrated approach to **health**, considered according to the definition made by the World Health Organization (WHO) that focuses, in particular, on the importance of social determinants approach: health is a state of complete physical, mental and social well-being (WHO, 1946). The **social determinants of health** are the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life (WHO, 2020a). In sum, social, physical and economic conditions that impact upon health (WHO, 2020b). In this aspect, the SDGs provide a comprehensive blueprint for human development and systematically addressing the social determinants of health (WHO, 2020c). If not directly related to health as envisioned under SDG 3, most of the other goals are related to health or their achievement and will contribute to health indirectly (WHO, 2020d). This is also at the core of the concept of a Healthy Corridor, combining a cluster of diverse typologies of NBS in an integrated manner, which cover several conditions that impact upon health.

In this sense, it integrates **health in urban and territorial planning for sustainable urban development**, since: "The way we plan and build our cities defines our quality of life. It affects not only the quality of our living spaces and transport, but also the air we breathe, the water we drink, and our access to nutritious food, education, health care services and employment" (UN-Habitat & WHO, 2020).

In line with the strong focus of SDGs on improving equity to meet the needs of women, children and disadvantaged populations in particular so that **'no one is left behind'** (WHO, 2020d), URBiNAT follows both the principle of innovation and inclusivity. In fact, URBiNAT stands for Urban Inclusive and Innovative Nature, and targets as intervention areas neighbourhoods with specific **vulnerabilities**, namely socially deprived neighbourhoods, facing different degrees of **inequality and exclusion**. As a result, two more SDGs can be considered in the framework that URBiNAT's NBS catalogue offers: **SDG 10** – "Reduced inequality - Reduce inequality within and among countries", and **SDG 16** - "Peace, justice and strong institutions – Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels".

In the present pandemic context, the co-design of a Healthy Corridor based on the different typologies of the URBiNAT NBS Catalogue and the dimensions it covers (territorial, technological, participatory, social and solidarity economy) is even more relevant, in particular considering how the needs of vulnerable groups (e.g. racial minorities, immigrants, women, older adults, children, people with functional diversity, and the homeless) will be **accounted for in future public space designs, practices, and rules** (Honey-Rosés et al., 2020). In this regard, the measurement of changes in **use and perceptions of public spaces** will be critical, namely regarding the possibilities they offer for socialization, recreation, claims-making, community building, and identity formation (Ibidem), as integral dimensions of health, state of well-being and definition of quality of life in URBiNAT's intervention areas.

# 4 – URBiNAT NBS list

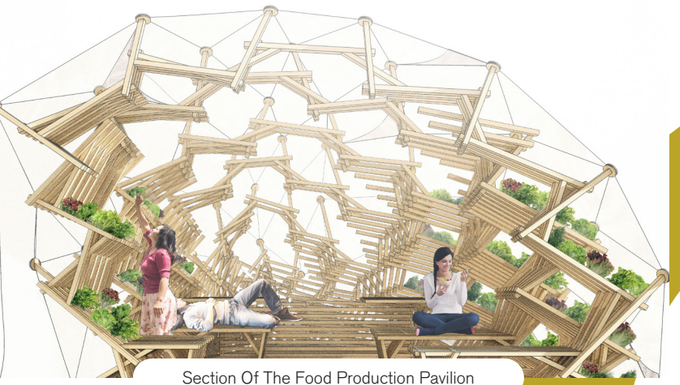
The most representative result of the work carried out in this task is, together with the definition of the New NBS, the elaboration of the reviewed repository of NBS, namely the URBiNAT NBS "living" Catalogue. According to the concept of a catalogue that will be "living", the information collected here will be enhanced and enriched during the following months thanks to research that will be carried out within the framework of the co-implementation and co-monitoring of the NBS in URBiNAT cities. These activities will allow the collection of information included in the protocol template, representing the most advanced step of research for the NBS within the URBiNAT project. At the moment of writing, according to the current stage of the project, the information available for each NBS is the one corresponding to the NBS factsheets. In the subchapters, organized according to the NBS typologies defined in the project, the factsheets of all the NBS currently included in URBiNAT NBS "living" Catalogue are shown. Here following, a table resuming the catalogue is shown.

| TYPOLOGY | CODE | NBS |
|---|---|---|
| TECHNOLOGICAL | 1 | Food production and leisure pavilion |
| | 2 | Ceramic green wall |
| | 3 | Urban mushroom farm |
| | 4 | Grow tile |
| | 5 | Mobile vegetable garden |
| | 6 | Cyding and pedestrian path - Luminescent pathways for people and bicycles (previous bike lines and stations) |
| | 7 | Multiuse Wood Structure |
| TERRITORIAL | 1 | Wildlife Park (Includes Urban Park, Urban Wetlands) |
| | 2 | Autochthonous Urban Forest (Includes Tree lined streets) |
| | 3 | Green roofs (includes Public Green Roof, Green Roof - Intensive/ extensive) |
| | 4 | Rainwater management and recirculation in residential areas |
| | 5 | Tasty garden of learning |
| | 6 | Green walls |
| | 7 | Vertical gardens/Living walls |
| | 8 | Watercourse restoration |
| | 9 | Renaturalization of Brownfields, Abandoned Infrastructures and Degraded |
| | 10 | Groasis - Waterboxx and Growboxx |
| | 11 | Beehive provision and adoption |
| | 12 | Swimming pool with thermal mineral water |
| | 13 | Adaptive reuse of urban network space |
| PARTICIPATORY | 1 | Forum Theatre |
| | 2 | Cultural Mapping (Women footprint, Forbidden city) |
| | 3 | Photovoice |
| | 4 | Walkthrough / Focus Groups in Situ |
| | 5 | Community Workshops |
| | 6 | Design Thinking |
| | 7 | Learnforlife (Lfl) |
| | 8 | Motivational Interviewing (MI) |
| | 9 | Superbarrio |
| | 10 | Community-Based Arts Projects (CAP) Or Community Cultural Development (CCD) |
| | 11 | Empowerment Evaluation |
| | 12 | Behavioural Mapping |
| | 13 | 3d Model Thinking |
| | 14 | Community based monitoring |
| SOCIAL AND SOLIDARITY ECONOMY | 1 | Solidarity markets and fairs for children in the public space |
| | 2 | Solidarity markets and fairs in the public space |
| | 3 | Community social currencies for inclusive urban regeneration |
| | 4 | Local currencies for natural based circular economy |
| | 5 | Time Bank |
| | 6 | Bread Houses Network |
| | 7 | Farmers Markets Network |

Figure 9. List of NBS factsheets included in the URBiNAT NBS "living" Catalogue

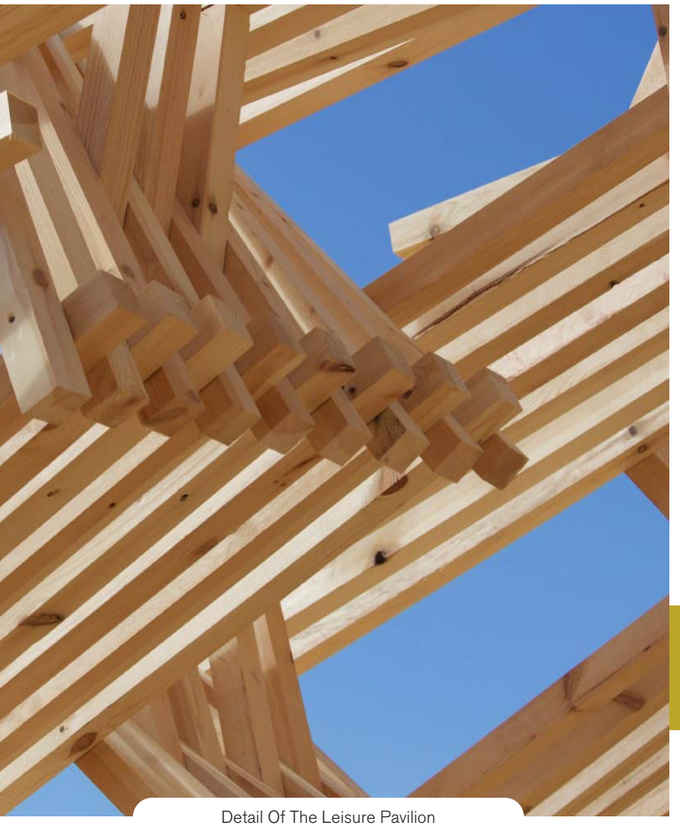
## 4.1 - Technological NBS

The technological NBS factsheets are shown in the followings pages.



Section Of The Food Production Pavilion

Interior View Of The Pavilion



Detail Of The Leisure Pavilion

www.urbinat.eu

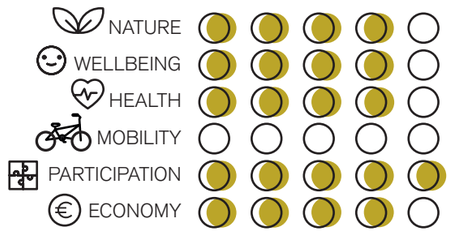
URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

NBStech1

# FOOD PRODUCTION AND LEISURE

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## FOOD PRODUCTION AND LEISURE PAVILLON

**Scan me for digital format**

## DESCRIPTION

The Food Production and Leisure Pavilion is a facility for public and private open spaces that includes both cultivation and leisure areas. The pavilion is designed according to local conditions in order to optimize shading areas and to maximize the solar exposition of the plants both in summer and winter periods. In cold climates the pavilion can be complemented by a protective skin to maintain optimum temperature needed for the growth of the plants and for users' comfort. Vegetables cultivation can be organized in soil or with hydroponic systems, allowing water savings in dry environments. Compared to traditional green houses, the plantation area is higher since it also includes the surface area of the structure.

## INNOVATION ASPECT

- The pavilion design relies on algorithms that allow the optimization of the pavilion's shape according to the local climate conditions.
- The pavilion is fabricated with digital manufacturing equipment allowing to reduce the scrap's length and to use the most part of the material.

## REPLICATION AND SCALABILITY

- The system is modular and therefore it has a high scalability potential.
- The shape and the size can be adapted to any public or private space.
- The plants integrated in the pavilion are chosen according to the local conditions.
- It can be designed both for cold and warm climate conditions.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Where to place it? > Through "walkthrough with citizens / focus groups in situ" it can be decided where the solution will be located within the neighborhood.
How to manage the needs and expectations of citizens? > Through motivational interviewing.
What is the agricultural map of the neighborhood? > Through "cultural mapping" the existent agricultural fields in the neighborhood can be identified.
How investigate the perception of technology? > Through cultural mapping.

CO-SELECTION & CO-DESIGN
Which design to give? Through model thinking (Physical and 3D models) / world café.
What materials to use? Through model thinking (Physical and 3D models) / world café.

CO-IMPLEMENTATION
How can people learn to use it (knowledge transfer? Through community workshops.
How to manage it? Through time bank / farmers markets network.

CO-MONITORING
How to monitor the system functioning? Through time bank.

## BEST PRACTICES and REFERENCES

LINKS:
A pavilion solution was designed and fabricated in 2015 and installed on the rooftop of IAAC's facilities in Barcelona. More info can be found at the following link: https://iaac.net/project/digital-urban-orchard-otf-201516/.

## COMPLEMENTAR NBS FROM URBINAT

- URBAN MUSHROOM FARM
- MOBILE VEGETABLE GARDEN
- CULTURAL MAPPING
- MOTIVATIONAL INTERVIEWING
- SOLIDARITY MARKET FOR CHILDREN
- TIME BANK
- FARMERS MARKETS NETWORK

NBStech1

3D Printed Ceramic Green Wall

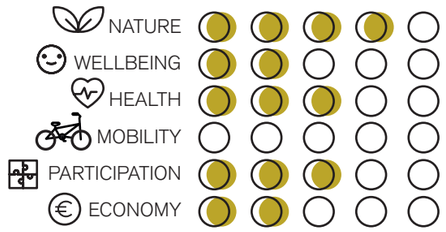
3D Printed Ceramic Green Wall

3D Printed Ceramic Green Wall

# NBStech2

# CERAMIC GREEN WALL

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

It is a 3D printed ceramic green wall composed by 3D printed ceramic pots that contains soil, plants and a bio photovoltaic system. This system harvests the energy produced by bacteria living near the plants' roots, which is used to activate the irrigation system, making it energy self sufficient. It includes sensors detecting the moisture in the soil, minimizing therefore irrigation. If vegetables are planted in it, it can also be used as a vertical vegetable garden. The green wall can be specifically designed and adapted to different spaces, local needs, and climatic conditions.
It provides several urban ecosystems services, such as: energy production, flood reduction (increasing porous in cities), air quality enhancement, and heat island effect mitigation.

## INNOVATION ASPECT

- Extremely flexible thanks to 3D printing (its shape can be adapted to respond to size, climatic and social needs);
- Small amount of energy is produced making it self sufficient;
- Several ecosystem services are delivered in one solution.

## REPLICATION AND SCALABILITY

- Being done with modules that can be applied in public space and buildings, the project has a high scalability potential;
- The project relies on a parametric design program, it has a high replication potential as it can be adapted to different environments. Plants have to be chosen according to the local conditions.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
What is the agricultural map of the neighborhood? Through "cultural mapping" the existent agricultural fields in the neighborhood can be identified.
Where to place it? Through "walkthrough with citizens / focus groups in situ" it can be decided where the solution will be located within the neighborhood.
How to manage the needs and expectations of citizens? Through "motivational interviewing".
How investigate the perception of technology? Through "cultural mapping".

CO-SELECTION & CO-DESIGN
Which design to give? Through model thinking (Physical and 3D models) / world café.
What materials to use? Through model thinking (Physical and 3D models) / world café.

CO-IMPLEMENTATION
How can people learn to use it (knowledge transfer)? Through community workshops.
How to manage it? Through time bank / farmers markets network.

CO-MONITORING
How to monitor the system functioning? Through time bank.

## BEST PRACTICES and REFERENCES

-

## COMPLEMENTAR NBS FROM URBINAT

THE GROWING CLASSROOM | GREEN WALL | RENATURA-LIZATION OF BROWNFIELDS | BEEHIVE PROVISION AND ADOPTION | SOLIDARITY MARKET FOR CHILDREN | TIME BANK | FARMERS MARKETS NETWORK

NBStech2

CERAMIC GREEN WALL

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

Detail Mushroom Growing

Option 2: Mushroom Farm Pavilion

Option 1: Self-standing Mushroom Farm

# NBStech3

## CHALLENGES ADDRESSED


### IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

### REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

### AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

### INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## URBAN MUSHROOM FARM

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

# URBAN MUSHROOM FARM



## DESCRIPTION

The urban mushroom farm is a modular system developed to grow edible mushrooms in the urban environment, producing both food and construction materials. The solution is composed by modules that are designed with two main aims: allocating the substrate needed to grow mushrooms and shaping the construction material that can be obtained from it.
The surface of the modules is designed according to the climatic conditions of the installation site (e.g. solar radiation and humidity) to provide the optimal environment for the substrate to grow the mushrooms. With the aim of being as sustainable as possible, the modules can be also fabricated with ecological or recycled materials.
In addition to producing food and construction material, the solution acts as a demonstrator, creating 'culture of caring' for locally produced food and awareness about the potentials of mushroom farming in cities.

## INNOVATION ASPECT

- The substrate, once the mushrooms are grown, can be used as a sustainable construction material (e.g. bricks or insulation panels);
- Farming mushrooms in cities is a practice that is still not widespread;
- The solution is also a tool for social inclusivity since it can be maintained by local communities.

## REPLICATION AND SCALABILITY

- Modules can be anchored to a blind facade or installed on a metal structure in the public space.
- The installation, being modular, is highly replicable and scalable;
- The solution can be replicated in areas where in a certain period of the year there is an external temperature between 15 °C and 20°C.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
What is the agricultural map of the neighborhood? Through "cultural mapping" the existent agricultural fields in the neighborhood can be identified.
Where to place it? Through "walkthrough with citizens / focus groups in situ" it can be decided where the solution will be located within the neighborhood.
How to manage the needs and expectations of citizens? Through "motivational interviewing" .
How investigate the perception of technology? Through "cultural mapping" .

CO-SELECTION & CO-DESIGN
Which design to give? Through model thinking (Physical and 3D models) / world café.
What materials to use? Through model thinking (Physical and 3D models) / world café.

CO-IMPLEMENTATION
How can people learn to use it (knowledge transfer? Through community workshops.
How to manage it? Through time bank / farmers markets network .

CO-MONITORING
How to monitor the system functioning? Through time bank.

## BEST PRACTICES and REFERENCES

LINKS:
https://creativefoodcycles.org/2019/08/28/myco-scape/

## COMPLEMENTAR NBS FROM URBINAT

- FOOD PRODUCTION AND LEISURE PAVILION
- MOBILE VEGETABLE GARDEN
- WALKTHROUGH / FOCUS GROUPS IN SITU
- MOTIVATIONAL INTERVIEWING
- 3D MODEL THINKING
- TIME BANK
- FARMERS MARKETS NETWORK

Detail 1: Grow Tile

Detail 2: Grow Tile

Vertical & Horizontal Pedestrian Corridor

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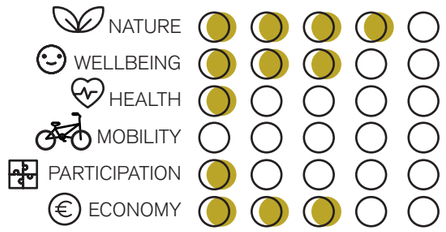
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

# NBStech4

## CHALLENGES ADDRESSED




### IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

### REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

### AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

### INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## GROW TILE

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# GROW TILE

### DESCRIPTION

The Grow Tile can be implemented on horizontal or vertical surfaces and depending of the materials used for the surface, it can be walkable. It is targeted at creating optimal environmental conditions for plants to live in an urban environment and it is designed to minimize maintenance operations. The solution brings several environmental benefits, such as (1) flooding prevention by increasing permeable surfaces; (2) heat island alleviation; (3) air quality improvement; (4) water saving increasing. Depending on the plants implemented it can also be used for food production and pollination. The external surface is designed using parametric techniques that allow to adapt the shape to local climate conditions. For instance, in wet climates, the total area of the holes would be higher as more plants can be irrigated thanks to a higher water availability.

### INNOVATION ASPECT

- The solution is fabricated using digital manufacturing techniques allowing the creation of not standardized elements that can be co-designed by citizens;
- The use of parametric techniques allows to automatically optimise the shape of the surface to environmental parameters (e.g. rainfall).;
- Moisture sensors to detect soil conditions can be implemented.

### REPLICATION AND SCALABILITY

- Design and manufacturing methods give the solution a high replication potential since they allow to adapted it to different environments and users' needs;
- A large variety of plants can be chosen, making the solution adapt to several site conditions.
- Being modular, the solution can cover from small to large surfaces.

### PARTICIPATION PROCESS

CO-DIAGNOSTIC
What is the agricultural map of the neighborhood? Through "cultural mapping" the existent agricultural fields in the neighborhood can be identified.
Where to place it? Through "walkthrough with citizens / focus groups in situ" it can be decided where the solution will be located within the neighborhood.
How to manage the needs and expectations of citizens? Through "motivational interviewing" .
How investigate the perception of technology? Through "cultural mapping".

CO-SELECTION & CO-DESIGN
Which design to give? Through model thinking (Physical and 3D models) / world café.
What materials to use? Through model thinking (Physical and 3D models) / world café.

CO-IMPLEMENTATION
How can people learn to use it (knowledge transfer)? Through community workshops.
How to manage it? Through time bank / farmers markets network.

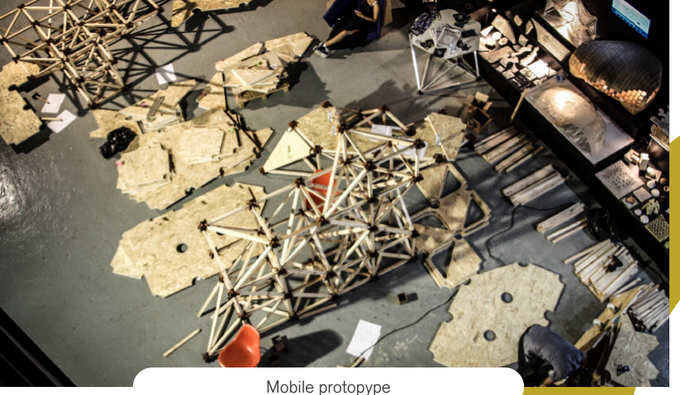
CO-MONITORING
How to monitor the system functioning? Through time bank.

### BEST PRACTICES and REFERENCES

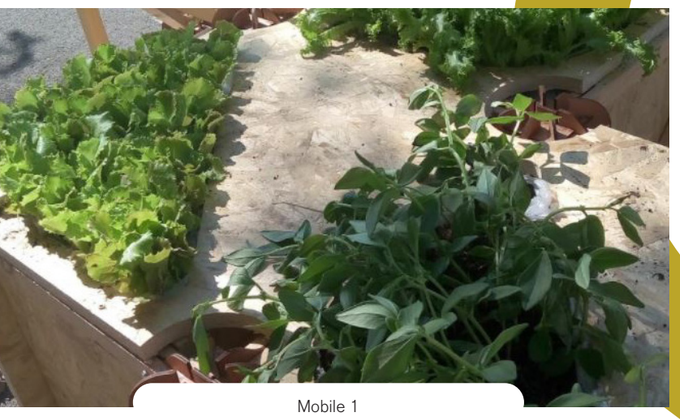
LINKS:
The Grow Tile has been developed by IAAC and tested at IAAC's facilities in both laboratory and real environment.

### COMPLEMENTAR NBS FROM URBINAT

URBAN MUSHROOM FARM | MOBILE VEGE-TABLE GARDEN | THE GROWING CLASSROOM | 3D MODEL THINKING | SOLIDARITY MARKET FOR CHILDREN | TIME BANK | FARMERS MARKETS NETWORK



Mobile protopype



Mobile 1

Mobil 2

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NBStech5

# MOBILE VEGETABLE GARDEN

## CHALLENGES ADDRESSED


## IMPLEMENTATION

| | | |
|---|---|---|
| SOFT | MEDIUM | HARD |

## REPLICATION POTENTIAL/FLEXIBILITY

| | | |
|---|---|---|
| LOW | MEDIUM | HIGH |

## AMORTIZATION PERIOD

| | | | |
|---|---|---|---|
| SHORT | MEDIUM | LONG | NA |

## INVESTMENT

| | | | |
|---|---|---|---|
| LOW | MEDIUM | HIGH | NA |

## DESCRIPTION

Mobile vegetable garden is a modular and moveable solution for growing food and plants. It can be assembled and moved by users in order to customize open public and private spaces according to their desires. The solution can be complemented with an augmented reality app that citizens can use to get information about the plants species and that can support awareness rising and educational activities.

## INNOVATION ASPECT

- The solution can be customised and assembled in several configurations according to users' preferences and space's needs, offering the opportunity for social interaction in the public space;
- The "moveable" feature allows to change the place of installation and therefore it creates a dynamic space (e.g. by moving benches from sunny spots to shadows).

## REPLICATION AND SCALABILITY

- Depending on the plants used, it can also be used for food production, improving local food markets and increasing availability and access to healthy local food;
- The modularity of the solution allows to cover surfaces of different kind and size.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
What is the agricultural map of the neighborhood? Through "cultural mapping" the existent agricultural fields in the neighborhood can be identified.
Where to place it? Through "walkthrough with citizens / focus groups in situ" it can be decided where the solution will be located within the neighborhood .
How to manage the needs and expectations of citizens? Through "motivational interviewing".
How investigate the perception of technology? Through "cultural mapping".

CO-SELECTION & CO-DESIGN
Which design to give? Through model thinking (Physical and 3D models) / world café.
What materials to use? Through model thinking (Physical and 3D models) / world café.

CO-IMPLEMENTATION
How can people learn to use it (knowledge transfer)? Through community workshops.
How to manage it? Through time bank / farmers markets network .

CO-MONITORING
How to monitor the system functioning? Through time bank.

## BEST PRACTICES and REFERENCES

LINKS:
IAAC installed the solution in 2015 during one week in Poble Nou district in Barcelona within the framework of an opening event for the Superilla project. More info can be found at: http://activepublicspace.org/2016/09/26/bcn-superilla-poblejoc-installation-set-up/#more-175

## COMPLEMENTAR NBS FROM URBINAT

FOOD PRODUCTION AND LEISURE PAVILION

URBAN MUSHROOM FARM

THE GROWING CLASSROOM

ADAPTIVE REUSE OF URBAN NETWORK SPACE

WALKTHROU-GH / FOCUS GROUPS IN SITU

COMMUNITY WORKSHOPS

MOTIVATIONAL INTERVIEWING

MOBILE VEGETABLE GARDEN

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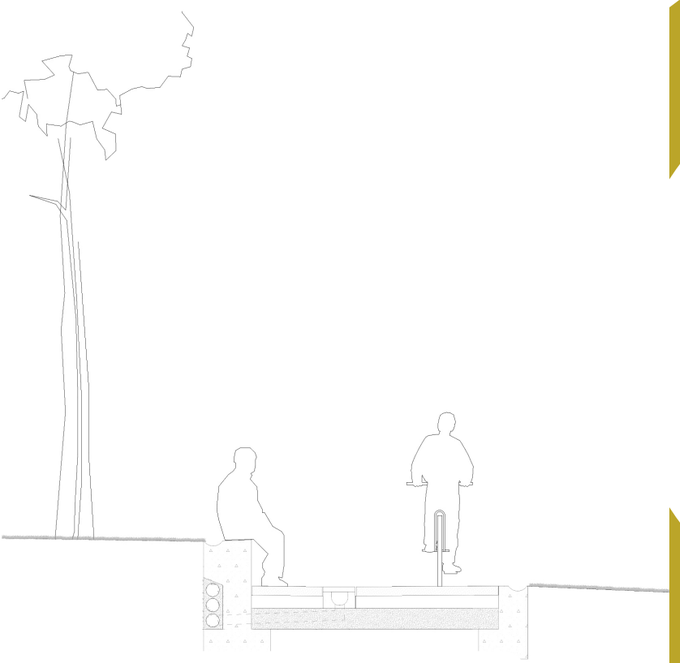

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# NBStech6

# CYCLING AND PEDESTRIAN PATH

## CHALLENGES ADDRESSED


## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## CYCLING AND PEDESTRIAN PATH

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## DESCRIPTION

Luminescent paths NBS is a mesh of designed ways for cycling and pedestrian walking.
For its character, given by the luminophore coated stones, it can be implemented as an enlightened promenade, made of walls, pavements and other luminescent elements.
Built as a resin/cement fixed aggregated stone pavement or a concrete support wall, these luminescent elements include also luminophore coated quartz pebbles, which absorbs the sunlight during the day, and emanate light during the evening.

## INNOVATION ASPECT

- The pebbles are covered with a coat material, which doesn't take its intrinsic characteristics, and can transform a common walkable and cycling road, in a safer passage, making safer evening activities, like walking, running or cycling;
- Cycling and walkable paths foster a healthier mobility, promoting walking and sport activities.

## REPLICATION AND SCALABILITY

- This NBS is a very low cost, flexible and low maintenance solution, and it can be used in various mobility situations and urban connections;
- It can be developed in different cities, with multiple forms and characteristics, and it can be the connection of parts of the healthy corridor and other NBS.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Through walkthroughs and focus groups, with citizens, local communities or other stakeholders it can be chosen the urban zones where this new infra-structure can be placed and implemented. The diagnosis it's the most important moment to define the size and the form of the pathways.

CO-SELECTION & CO-DESIGN
Through collective mapping, photovoice and focus groups, the selection can be made as an innovative solution with very simple characteristics that can answer urban challenges on mobility and urban connectivity.

CO-IMPLEMENTATION
Through model thinking, collective design and other activities as or focus group the NBS can allow a very interesting result. Its form and its constructive character are easily adapted and modified in order to answer to the challenges and routes which the stakeholders decide to address.

CO-MONITORING
The ordinariness of the used materials and the simplicity of the constructive process, along with the co-design process, allows a simple and participative implementation.

## BEST PRACTICES and REFERENCES

LINKS:
. author: TPA Instytut Badan Technicznych, Lidzbark Warminski, Poland (2016)

## COMPLEMENTAR NBS FROM URBINAT

- MULTIUSE WOOD STRUCTURE
- LIGHT MANAGEMENT
- WILDLIFE PARK
- ADAPTIVE REUSE OF URBAN NETWORK SPACE
- PHOTOVOICE
- WALKTHROUGH / FOCUS GROUPS IN SITU



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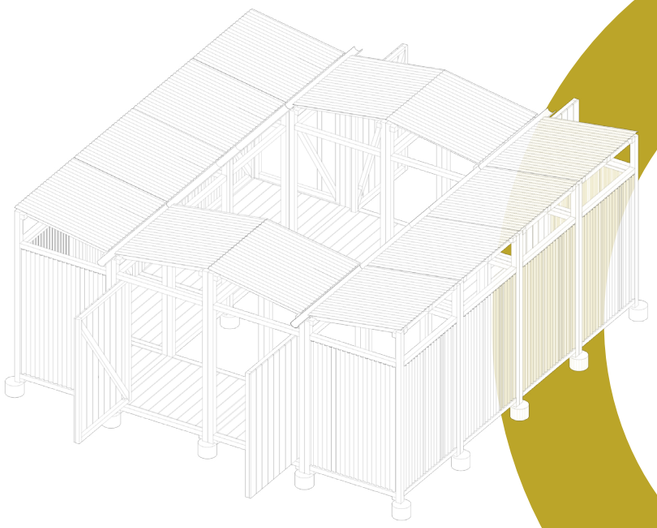
# NBStech7

# MULTIUSE WOOD STRUCTURE



axonometria formal@UC

@UC

## CHALLENGES ADDRESSED


## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

The wood structure is a multi-use modular pavilion prepared to support several activities in the public space, such as solidarity markets, illuminated storage rooms, winter gardens or just places to hangout.
From simple architectonic ideas and the production of a low-tech constructive module, this rhythmic porticoed construction is adaptable to the wills of the local community and the actual contextual features. These strategical located, flexible and illuminated structures that can help densify low defined vacant public spaces.
Throughout these simple and co-implemented constructions, it can be achieved a sophisticated and porous process of uses and activities with low footprint.

## INNOVATION ASPECT

- It's a modular pavilion with multiple uses or purposes: safety light, on low densify space; a warm protected place to sit or just a collective place to compost the agriculture rests from the communitarian vegetables gardens, these structures can exist as landmarks or just flexible and enclosed community spaces.

## REPLICATION AND SCALABILITY

- The NBS is a very low budget, flexible and recyclable solution. It can be used in various situations and for a big amount of uses and purposes;
- This capability, of adaptive possibilities, it can be developed in different cities, with multiple forms and characteristics, complemented with many other NBS, and used for a big number of uses.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Through walkthroughs and focus groups, with citizens, local communities or other stakeholders it can be diagnosis challenges that can be addressed by the NBS. The diagnosis it's the most important moment to define the form, the use and the features of the NBS.

CO-SELECTION & CO-DESIGN
Through collective mapping, photovoices and focus groups, the selection of this NBS, for its principle and simplicity, can be selected and worked for a wide range of stakeholders and answer to very different challenges.

CO-IMPLEMENTATION
Through model thinking, collective design and other collective activities as photovoice or focus group the formal multiplicity of the module can allow a process of co-design that it is evolutive and adapted to the contextual realities.

CO-MONITORING
The ordinariness of the used materials, the traditional techniques and the simplicity of the constructive process, along with the co-design process, allows a simple, participative and fast implementation of the NBS.

## BEST PRACTICES and REFERENCES

LINKS:
. Project N10, author: COMOCO, Coimbra, Portugal (2011-2012)
. Norrehus Project, author: Johansen Skovsted, Copenhagen, Denmark
. Project white flower arbor, author: APLdw, Toyama, Maezawa garden house, Japan

## COMPLEMENTAR NBS FROM URBINAT

- CYCLING AND PEDESTRIAN PATH
- GREEN WALL
- LIVING WALL
- FORUM THEATRE
- COMMUNITY WORKSHOPS
- COMMUNITY--BASED ARTS PROJECTS
- SOLIDARITY MARKET FOR CHILDREN

MULTIUSE WOOD STRUCTURE

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NBStech7

## 4.2 - Territorial NBS

The territorial NBS factsheets are shown in the followings pages.

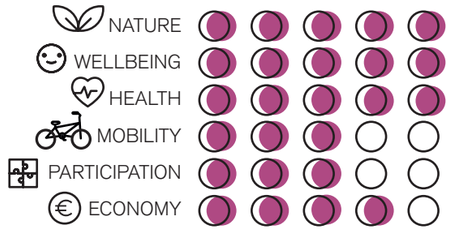
Wildlife gardens of the Faculty of Sciences, University of Porto. Author: Paulo Farinha Marques

Wildlife gardens of the Faculty of Sciences, University of Porto. Author: Paulo Farinha Marques

# NBSterr1

# WILDLIFE PARK

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

Green space designed according to sustainability principles where natural dynamics and ecological succession are a central concept and part of the design. The ecology of the site, its plants and habitats are expected to change over time, a process that can be integrated into the site's planning and design. Special care is given towards the promotion of urban biodiversity, natural regeneration, habitat development and ecological succession, through specific planting design and management. It can be a cost-efficient solution able to provide a deeper connection between recreational uses and nature.

## INNOVATION ASPECT

- The possibility of providing a low cost and low maintenance strategy with significant benefits in terms of biodiversity improvement and human health promotion;
- The garden is expected to act as a biodiversity hotspot and reservoir and the design will also have special consideration towards climate change adaptation strategies.

## REPLICATION AND SCALABILITY

- Can be used anywhere, even in the most challenging places, such as polluted brownfields. This is highly related with the low level of intervention required to achieve this NBS, that is mostly based on spontaneous vegetation succession;
- Small scale interventions can have a large-scale impact, thus can be used as an urban acupuncture strategy.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC & CO-SELECTION
Citizens can participate in walkthroughs to identify territorial needs and discuss NBS site implementation. These moments can be important to raise awareness on wildlife gardens in urban environment..

CO-DESIGN
Citizens can be part of the discussions about selecting vegetation, materials and desired functions.

CO-IMPLEMENTATION
Citizens can help in some planting and maintenance activities.

CO-MONITORING
Citizens can be part of monitoring activities to accompany the development of the wildlife garden.

## BEST PRACTICES and REFERENCES

LINKS:
Wildlife gardens of the Faculty of Sciences, University of Porto. Author: Paulo Farinha Marques

## COMPLEMENTAR NBS FROM URBINAT

- FOOD PRODUCTION AND LEISURE PAVILION
- MULTIUSE WOOD STRUCTURE
- AUTOCHTHONOUS URBAN FOREST
- RAINWATER MANAGEMENT AND RECIRCULATION
- WATERCOURSE RESTORATION
- RENATURALIZATION OF BROWNFIELDS
- BEEHIVE PROVISION AND ADOPTION

WILDLIFE PARK

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NBSterr1

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URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

Parque da Cidade, Porto. Author: Sidónio Pardal

Jardim Botânico Coimbra, Portugal

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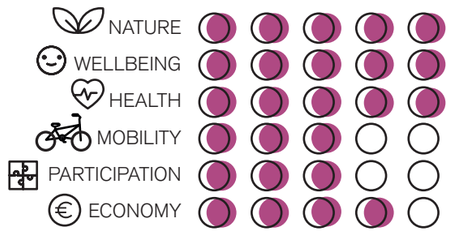
URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

NBSterr2

# AUTOCHTHONOUS URBAN FOREST

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

Urban woodland designed and managed according to ecological, aesthetic and economic principles. This NBS relies mostly on plant-based material, particularly on autochthonous vegetation. Plant species and habitat design should be chosen in accordance with local characteristics (climate, soil conditions, pollution levels, spatial needs and management capability). By using native vegetation its adaptation to the site is ensured, just like the performance in terms of water absorption and carbon fixation. Urban woodlands can help to raise social awareness towards ecological benefits of using autochthonous vegetation. At the same time, it contributes to sustainable development goals by promoting urban resilience to climate change and recreational opportunities.

## INNOVATION ASPECT

- Cost-effective strategy with major environmental, social and economic value within urban environments based on the plantation of autochthonous vegetation;
- Selection of trees that sequester carbon, reduce air pollutants, maximize water retention, while providing aesthetic delight and increase the perception of greenery in the city.

## REPLICATION AND SCALABILITY

- Can be replicated in every city;
- Can vary in scale according to each city needs and characteristics. In densely urbanized areas it can be implemented along the streets with one or two alignments of trees planted in pits or trenches, or it can be developed in larger vacant plots, integrating them into the life of the neighbourhood.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC & CO-SELECTION
Citizens can participate in walkthroughs to identify territorial needs and discuss NBS site implementation. These moments can be important to raise awareness on autochthonous urban forests and to identify remains of ancient urban forests whose past has meaning for local residents.

CO-DESIGN
Citizens can be part of the discussions about selecting vegetation, materials, and desired functions.

CO-IMPLEMENTATION
Citizens can help in some planting and maintenance activities.

CO-MONITORING
Citizens can be part of monitoring activities to accompany the development of the urban forest.

## BEST PRACTICES and REFERENCES

LINKS:
Rede de Biospots do Porto, Portugal - http://www.100milarvores.pt/2017/01/rede-de-biospots-do-porto.html
Parque da Cidade, Porto. Author: Sidónio Pardal
Jardim Botânico Coimbra, Portugal

## COMPLEMENTAR NBS FROM URBINAT

- FOOD PRODUCTION AND LEISURE PAVILION
- MULTIUSE WOOD STRUCTURE
- LIGHT MANAGEMENT
- WATERCOURSE RESTORATION
- RENATURALIZATION OF BROWNFIELDS,
- BEEHIVE PROVISION AND ADOPTION
- WALKTHROUGH / FOCUS GROUPS IN SITU

AUTOCHTHONOUS URBAN FOREST

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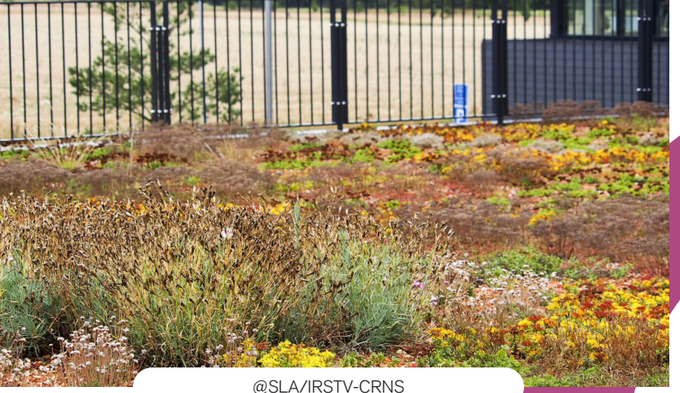

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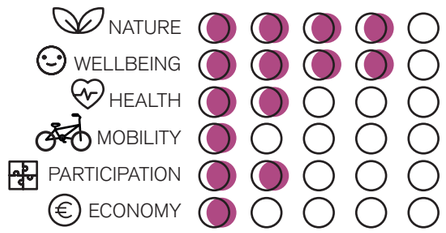
@SLA/IRSTV-CRNS

NBSterr3

# GREEN ROOFS

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

GREEN ROOFS

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## DESCRIPTION

Green roofs serve several purposes for a building, such as absorbing rainwater, providing insulation, creating a habitat for wildlife, increasing benevolence and decreasing stress of the people around the roof by providing a more aesthetically pleasing landscape, and helping to lower urban air temperatures and mitigate the urban heat island effect.
The roof of a building, a parking lot or some other build structure can be covered by vegetation that grows over an impermeabilization membrane and a soil substrate. Intensive green roofs are suitable for human use and flow of people. Extensive green roofs are not suitable for human use but require low maintenance and can have major ecological and economic benefits.

## INNOVATION ASPECT

- Integrates build structures in the development of urban green spaces;
- Provides important ecosystem services e.g., rainwater management, heat island mitigation, and increased biodiversity;
- Provides green spaces in dense urban environments;
- Mitigates climate changes by creating better microclimate in dense urban areas.

## REPLICATION AND SCALABILITY

- Substrates and base structures are standardized;
- The green roof design is dependent on the underlying load bearing structure. Extensive green roof types are more scalable than intensive because they are lighter;
- Green roofs can be established on both small and large structures.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
-

CO-SELECTION
Citizens can participate in identifying needs and potential roofs in the district.

CO-DESIGN
Variables such as materials, vegetation and functional programs can be developed in collaboration with citizens, while the base-design of green roofs are quite technical and standardized. The load bearing structure will quite likely be a limiting factor when installing a green roof on an existing structure, and this should be investigated prior to a co-design process to ensure realistic expectations concerning the possibilities.

CO-IMPLEMENTATION
Citizens can help with plantings and plants management.

CO-MONITORING
Plant identification, plant density, substrate moisture, water drainage below the substrate.

## BEST PRACTICES and REFERENCES

LINKS:
https://sla.dk/en/projects/amagerbakke
https://sla.dk/en/projects/budolfiplads/?countryoverride=lswitch
https://sla.dk/en/projects/sundnaturepark
https://sla.dk/en/projects/novo-nordisk
https://sla.dk/en/projects/dr-citys-inner-courtyard/?countryoverride=lswitch

## COMPLEMENTAR NBS FROM URBINAT

GROW TILE | MOBILE VEGETABLE GARDEN | GREEN ROOF | RAINWATER MANAGEMENT | GREEN WALL | LIVING WALL | BEEHIVE PROVISION AND ADOPTION

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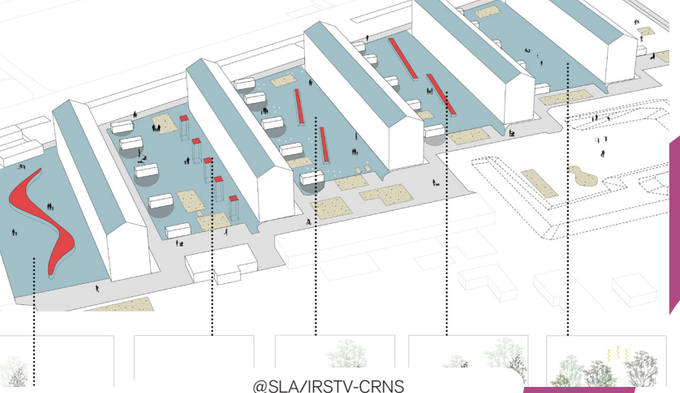
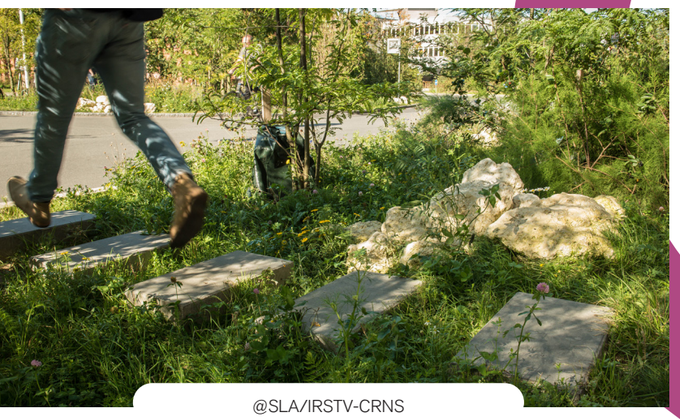
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783



@SLA/IRSTV-CRNS



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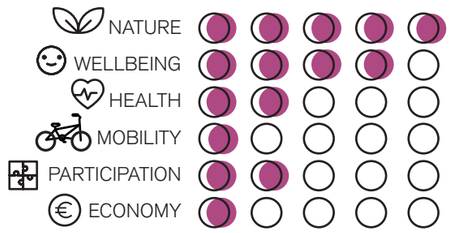
NBSterr4

# RAINWATER MANAGEMENT

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

Traditionally, the management of stormwater has relied on pipes and sewers. Due to limited storage capacity, these systems are susceptible to overflowing during storm events, presenting risks of harmful contamination to the environment, and causing damages on buildings. Nature based rainwater management is designed to collect runoff water and relieve the pressure on sewer systems. This is done by handling the water on the terrain surface and including the hydrological performance of nature. They are based on retention and infiltration principles, which mitigates flood problems, improve quality of water and recharge underground watercourses as well as promoting and improving both biodiversity and the wellbeing of people. These NBS are very flexible and includes various possibilities for site specific adaptation, in terms of scale, technical solution and combination with other programs.

## INNOVATION ASPECT

- Changes the main principles of rainwater management by utilizing natures hydrological performance rather than traditional sewers and thereby minimizing the technical installations underground;
- Same cost as, or cheaper than, technical solutions underground, whit the added benefit of providing a recreational nature space for the residents.

## REPLICATION AND SCALABILITY

- This NBS is easily scalable and can unfold on a local level or be integrated into a city-wide scheme. In the same way the specific design can be upscaled to provide a wide range of ecosystem services and enhance the quality of green spaces;
- The principles of the NBS are easily replicated but should always be tailored to the specific site.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Due to their multi-functional character, SUDS can be a good tool in the urban planning, to have a more collaborative approach of design, including several actors: rainwater managers, gardeners, green areas conception and maintenance, people interested in biodiversity and microclimate… and citizens living near these systems.

CO-SELECTION
Citizens will have valuable knowledge about where and how heavy rainfalls impact the neighborhood and whether this creates problems.
Walkthrough, photovoice, forum theatre.

CO-DESIGN
Nature based rainwater management is quite flexible and, barring the strictly technical parts, citizens can have a large impact on the design and functionality of the NBS. SUDS can easily be integrated or combined with other NBS which will allow for further co-design.

CO-IMPLEMENTATION
Citizens can help with plantings and maintenance.

CO-MONITORING
Performance during rainfalls, biodiversity.

## BEST PRACTICES and REFERENCES

LINKS:
https://sla.dk/en/projects/bryggervangen-sankt-kjelds-plads
https://sla.dk/en/projects/herlev-hospital
https://sla.dk/en/projects/hanstavsenspark

## COMPLEMENTAR NBS FROM URBINAT

- WILDLIFE PARK
- THE GROWING CLASSROOM
- WATERCOURSE RESTORATION
- RENATURA-LIZATION OF BROWNFIELDS

NBSterr4

# RAINWATER MANAGEMENT AND RECIRCULATION

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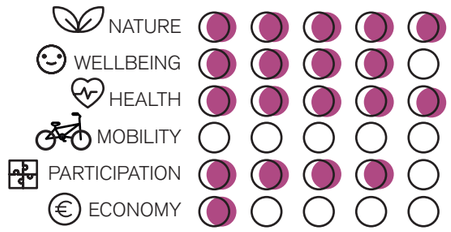
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

NBSterr5

# TASTY GARDEN OF LEARNING

## CHALLENGES ADDRESSED




Tasty garden of learning

## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

TASTY GARDEN OF LEARNING

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

## DESCRIPTION

The Tasty Garden of Learning is a "growing classroom" in the yard of a kindergarten or school where children, teachers and parents unite their efforts to grow together herbs, vegetables, and fruits; there they all get valuable lessons and inspiration directly from their experience with Nature. It is a multi-dimensional educational tool with a potential to address real-life challenges in an integrated manner and to organize educational activities in an easy, inclusive, and inspiring way. A Tasty Garden of Learning brings together all participants in the educational process in a life-enriching relationship and leads them to a creative process of learning by experiencing that supports the development of the physical, intellectual, emotional, and social intelligence of the pupils; it also unites local communities and supports their sustainable development.

## INNOVATION ASPECT

- Positive integration and shared responsibility of parents and local community in the educational process;
- Inclusive and experiential learning to develop multiple intelligences and basic competences such as creativity, team working, and risk management;
- Developing skills for healthy living in harmony with oneself, other people and Nature.

## REPLICATION AND SCALABILITY

- The concept is highly replicable, but each garden is unique as it results from the vision, ideas and creativity of the particular collective and responds to local needs;
- The gardens are adaptable to any available space; the project has a high scalability potential – it could be developed even on a small plot of land or a terrace.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
The availability of suitable space for the organic garden in the yard (natural light, shading, accessibility for watering, space for moving around the plant beds) is checked by expert analysis.

CO-SELECTION
The selection of the garden plot is based on teachers' didactic vision and needs for creating effective educational environment through motivational interviews with teachers.

CO-DESIGN
Model thinking (a physical model) is used jointly with teachers and children to choose appropriate local resources and materials to use and how to use them.

CO-IMPLEMENTATION
Based on a jointly developed vision, action plan and calendar of all activities. Tasks are discussed and distributed to all actors in world café.

CO-MONITORING
Two levels of assessment of the garden functioning applied: (a) the state of the ecosystem – through direct observations and walkthrough; (b)the educational effect – statistics on frequency and periods of visits, cultural mapping, interviews with teachers.

## BEST PRACTICES and REFERENCES

LINKS:
A Tasty Garden was initiated in 2012 with the methodological support of ZAEDNO Foundation in Elhitsa Kindergarten (310 children aged 3 to 6, including 27 with special educational needs). An ecosystem was created, where children, helped by teachers and parents, grow seasonal vegetables, herbs, and spices. http://gradinka.zaedno.net/elhica-eng

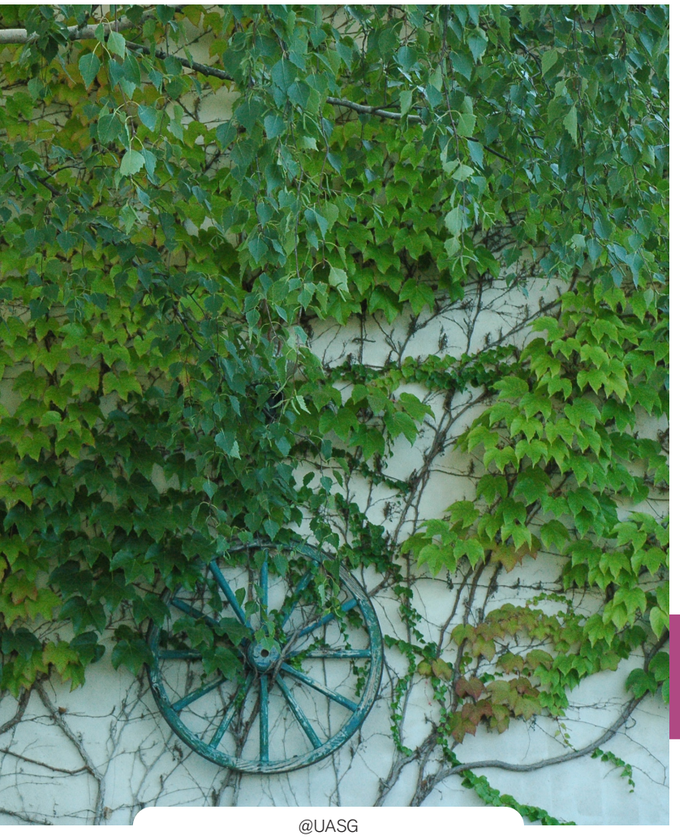
## COMPLEMENTAR NBS FROM URBINAT

CERAMIC GREEN WALL | MULTIUSE WOOD STRUCTURE | RAINWATER MANAGEMENT | BEHAVIOURAL MAPPING | WORLD CAFÉ | SOLIDARITY MARKET FOR CHILDREN | FARMERS MARKETS NETWORK

NBSterr5

@UASG

@UASG

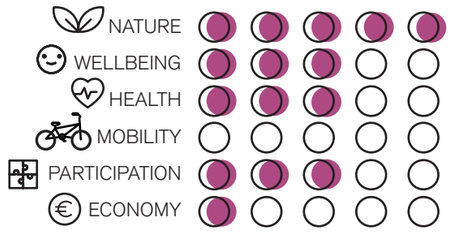


@UASG

NBSterr6

# GREEN WALLS

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

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## DESCRIPTION

Vertical green systems represent vertical surface with living plants. There are two main types of vegetated wall: traditional direct covering of a vertical surface and indirect vertical surface using additional support system to ensure air gap between the vegetation and the wall. An option to plant vegetation in planter boxes is implemented when the ground planting is not possible. Green walls have the potential to improve urban microclimate and visual site characteristics. They affect urban heat island by direct sunshade and by increasing air quality and humidity, improve acoustic environment and biodiversity. Green walls are relevant for compact city structure and areas with properties flanked by high solid fences. They can be used as noise and air pollutant screens, living elements in spatial organization of places, and for improving the aesthetics of a site.

## INNOVATION ASPECT

- Provide important ecosystem services in areas with sealed urban structure with no space for conventional urban greening;
- They provide improved air quality, heat island effect reduction, energy cost reduction, noise level reduction, visual benefits, increased biodiversity by creating habitats for birds and beneficial insects.

## REPLICATION AND SCALABILITY

- Can cover wide range of scales. Specific requirements could indicate different area of vegetation that could be ground planted or placed in planter boxes;
- Implementation is relatively easy and cheap to perform without special qualification. Constraints are imposed on the planting materials according to site climate conditions.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Focuses of identifying needs and appropriate physical settings for growing plants.

CO-SELECTION
Could be focused on the selection of place/façade, guided co-selection of planting material, and co-selection of the materials for the structure. Coordination with local administration and property owners is needed.

CO-DESIGN
The co-design is developed in focus groups and workshops by using physical models. The additional support system should be technically verified and the final design project should be approved by the technical department of the municipality.

CO-IMPLEMENTATION
The implementation requires expert action and supervision, yet it is important to motivate inhabitants to actively participate in planting, maintaining the structure, and growing the vegetation.

CO-MONITORING
Co-monitoring is related to subjective perceptions and estimations of citizens and could be performed through surveys, interviews, focus groups, walkthrough.

## BEST PRACTICES and REFERENCES

LINKS:
Green walls are traditional gardening practices across Europe and part of vernacular housing architecture in many countries. Contemporary green walls use additional support system to ensure air gap between the vegetation and the wall. Free standing or attached to a wall planter boxes are used when the surface is sealed or vegetation height is required.

## COMPLEMENTAR NBS FROM URBINAT

- FOOD PRODUCTION AND LEISURE PAVILION
- CERAMIC GREEN WALL
- GROW TILE
- RENATURALIZATION OF BROWNFIELDS
- BEEHIVE PROVISION AND ADOPTION
- SOLIDARITY MARKET FOR CHILDREN
- FARMERS MARKETS NETWORK

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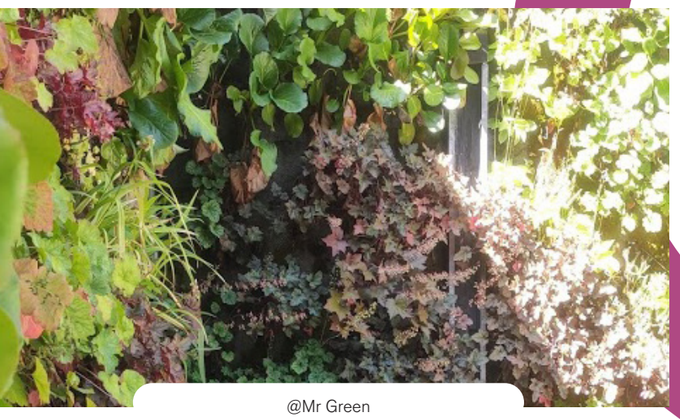
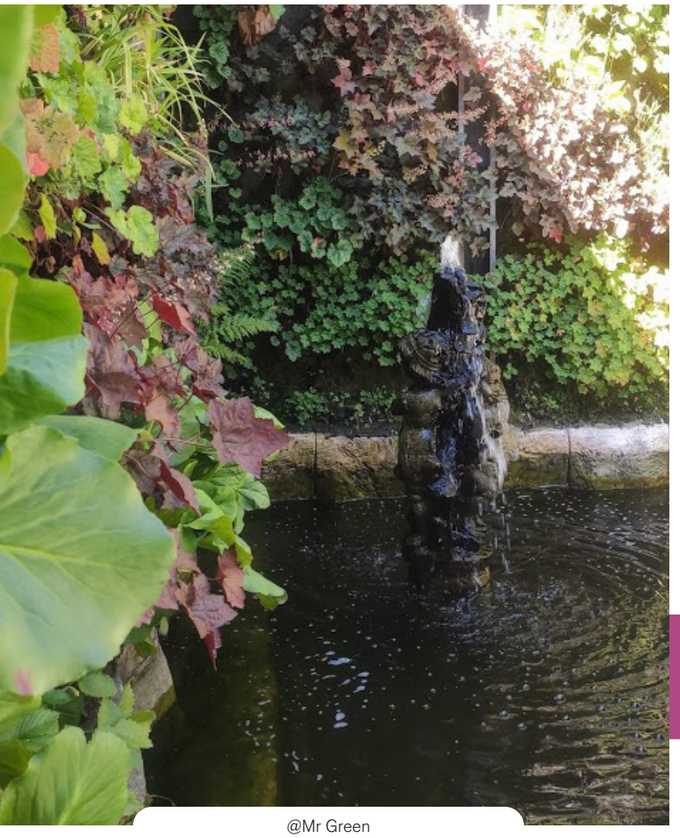
@Mr Green



@Mr Green



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# NBSterr7

# VERTICAL GARDENS / LIVING WALLS

NBSterr8

## CHALLENGES ADDRESSED


## IMPLEMENTATION

| | | |
|---|---|---|
| SOFT | MEDIUM | HARD |

## REPLICATION POTENTIAL/FLEXIBILITY

| | | |
|---|---|---|
| LOW | MEDIUM | HIGH |

## AMORTIZATION PERIOD

| | | | |
|---|---|---|---|
| SHORT | MEDIUM | LONG | NA |

## INVESTMENT

| | | | |
|---|---|---|---|
| LOW | MEDIUM | HIGH | NA |

## DESCRIPTION

Green facades and living walls are vertical greenery systems for growing plants with less or without soil on a vertical surface. Living walls are relevant for interior and exterior vertical surfaces to be vegetated with wide range of plant species, herbs, and vegetables. All public buildings and public spaces can take advantage of the positive effects of a vertical garden implementation as they improve urban microclimate and visual site characteristics. They affect urban heat island by direct sunshade and increasing air quality and humidity, improve acoustic environment and biodiversity. They could have a positive effect on mental health through biophilia - a psychological orientation of being attracted to all that is alive and vital. Living walls are relevant for compact city structure locations and areas with properties flanked by high solid fences.

## INNOVATION ASPECT

- Provide important ecosystem services in areas with sealed urban structure with no space for conventional urban greening;
- They provide improved air quality, heat island effect reduction, energy cost reduction, noise level reduction, visual benefits, increased biodiversity by creating habitats for birds and beneficial insects.

## REPLICATION AND SCALABILITY

- Broadly replicable but constraints are imposed on the planting materials due to different climate conditions at different geographical locations;
- Can cover wide range of scales due to the flexibility of the conception for vertical plant layer implementation. Needs to be incorporated into the investment projects, especially when covering a façade.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Focuses of identifying needs and appropriate physical settings for growing plants.

CO-SELECTION
Co-selection could be focused on the selection of place/fascade, guided co-selection of planting material, and co-selection of the materials for the structure.

CO-DESIGN
Vertical greenery systems provide wide range of structure elements and plant species variations which depend on the implementation purposes and specific site requirements. Citizens could take part in the design process by choosing plant species and aromatic herbs.

CO-IMPLEMENTATION
Planting could be implemented in collaboration with citizens. Taking care of the plants and keeping and maintenance of the structure could be run by the citizens after proper instructions on the systems operation.

CO-MONITORING
Co-monitoring is related to subjective perceptions and estimations of citizens and could be performed through surveys, interviews, focus groups, walkthrough.

## BEST PRACTICES and REFERENCES

LINKS:
Green walls, installed in a restaurant courtyard in order to improve the aesthetic and microclimatic qualities of the space. The process was initiated by the owner whose desire to saturate the sealed courtyard with vegetation in a space-saving way, led the design process.
https://mrgreenwalls.com/wp/%d0%be%d0%b1%d0%b5%d0%ba%d1%82%d0%b8/the-school/

## COMPLEMENTAR NBS FROM URBINAT

- FOOD PRODUCTION AND LEISURE PAVILION
- MULTIUSE WOOD STRUCTURE
- DESIGN THINKING
- LEARNFORLIFE
- SOLIDARITY MARKET FOR CHILDREN
- TIME BANK
- FARMERS MARKETS NETWORK

VERTICAL GARDENS / LIVING WALLS

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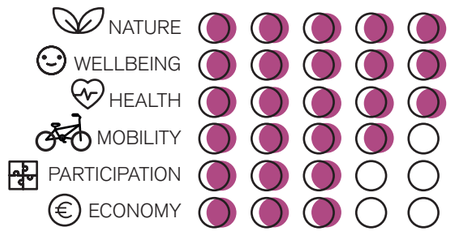
Parque Central da Asprela, Porto. Author: Paulo Farinha Marques, José Miguel Lameiras et al

Rhone river bank, Lyon (Photo: IRSTV)

# NBSterr8

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

# WATERCOURSE RESTORATION

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# WATERCOURSE RESTORATION

NBSterr8

## DESCRIPTION

Watercourse restoration concerns rivers/streams that have been degraded by the urbanization process or by heavily engineered water management solutions: contained underground watercourses, channelled rivers, concrete banks, embankments, dams, among others. Despite being necessary solutions, excessive containment of waterflow means that a man-imposed limit on volume and flow might not be sufficient, offering lower flexibility to behaviour changes over time. Mixed solutions that combine man-driven watercourse control while respecting the riverbank ecosystem offers greater success at short and long term, while promoting biodiversity, ecological connectivity and a major increase in water purification.

## INNOVATION ASPECT

- Bringing urban streams to surface and designing them according to social, aesthetic, environmental and economic principles is a solution that is being tested in front runner cities with great health and wellbeing benefits towards local communities.

## REPLICATION AND SCALABILITY

- It can be implemented in many sites but need to be adapted to flow regimes, ecological context (climate, local vegetation), and public needs;
- This NBS can be adapted to different watercourse sizes, from small streams (temporary) and rivers to the main rivers (permanent). It can be implemented all along the river or in different sections.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC & CO-SELECTION
Citizens can participate in walkthroughs to identify territorial needs and discuss NBS site implementation. These moments can be important to raise awareness about recovering waterlines and their role in urban environment.

CO-DESIGN
Citizens can be part of the discussions about selecting vegetation and materials.

CO-IMPLEMENTATION
Citizens can help in some planting and maintenance activities.

CO-MONITORING
Citizens can be part of monitoring activities to accompany the development of the waterline.

## BEST PRACTICES and REFERENCES

LINKS:
Left bank of the Rhone river, Lyon
Parque Central da Asprela, Porto. Author: Paulo Farinha Marques, José Miguel Lameiras et al. (https://biodiv.city/landscape-design-projects/parque-central-da-asprela/)

## COMPLEMENTAR NBS FROM URBINAT

- MULTIUSE WOOD STRUCTURE
- WILDLIFE PARK
- AUTOCHTHONOUS URBAN FOREST
- RAINWATER MANAGEMENT
- RENATURALIZATION OF BROWNFIELDS
- WALKTHROUGH / FOCUS GROUPS IN SITU
- SUPERBARRIO

Brownfield before intervention

After intervention (Parque da Levada, Rio Tinto.
Author: Atelier do Beco da Bela Vista)

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# NBSterr9

## CHALLENGES ADDRESSED

| | | | | | |
|---|---|---|---|---|---|
| NATURE | ● | ● | ● | ● | ● |
| WELLBEING | ● | ● | ● | ● | ● |
| HEALTH | ● | ● | ● | ● | ● |
| MOBILITY | ● | ● | ● | ○ | ○ |
| PARTICIPATION | ● | ● | ● | ○ | ○ |
| ECONOMY | ● | ● | ● | ● | ○ |

## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

# RENATURALIZATION OF BROWNFIELDS

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# RENATURALIZATION OF BROWNFIELDS

## DESCRIPTION

Renaturalization of neglected and abandoned urban areas through green space development and conscious planting design, to restore important ecologic and social functions. In some remarkable sites they can be an important cultural manifesto: an opportunity to promote historical continuity between its past and the new layer of occupation. Promoting its character is an important step for a truthful relation with the site's cultural identity, creating an opportunity to reflect on the damage inflicted by its previous occupation or, on the other hand, to celebrate the relevance of its past social and technological achievements. By recovering former abandoned spaces, this NBS creates opportunities for human use and wellbeing, while achieving ecological benefits such as treatment of polluted areas, habitat restoration and increase of local biodiversity.

## INNOVATION ASPECT

- Abandoned/degraded areas can be restored and used by local communities;
- Reclaiming permeable soil from impervious surfaces, soil remediation, and reuse of abandoned structures can be a cost-effective strategy with significant social, environmental, and ecological outputs.

## REPLICATION AND SCALABILITY

- This NBS is a potential tool for social, economic and environmental transformation and can be replicated to all neglected and socially deprived urban areas;
- The level of intervention can range from industrial areas, to abandoned city areas and small plots to wider areas. This NBS can also be developed in vacant lots pending urban development.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC & CO-SELECTION
Citizens can participate in walkthroughs to identify territorial needs and discuss NBS site implementation. These moments can be important to raise awareness about the existence of permeable areas in urban environments.

CO-DESIGN
Citizens can be part of the discussions about selecting vegetation, materials and desired functions.

CO-IMPLEMENTATION
Citizens can help in some planting and maintenance activities.

CO-MONITORING
Citizens can be part of monitoring activities to follow the development of the brownfield.

## BEST PRACTICES and REFERENCES

LINKS:
Foundries' Garden, France. Author: ADH Doazan+Hirschberger (http://landezine.com/index.php/2009/09/foundries-garden/)
Parque da Levada, Rio Tinto. Author: Atelier do Beco da Bela Vista (http://www.atelierbbv.com/in2010/project.php?tipo=3&id=113)

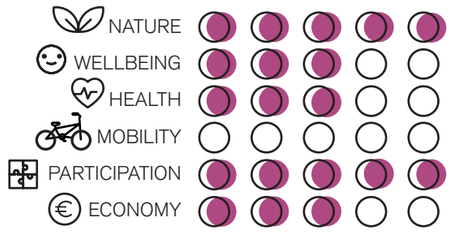
## COMPLEMENTAR NBS FROM URBINAT

- LIGHT MANAGEMENT
- AUTOCHTHONOUS URBAN FOREST
- RAINWATER MANAGEMENT
- WALKTHROUGH / FOCUS GROUPS IN SITU
- SUPERBARRIO
- SOLIDARITY MARKET FOR CHILDREN
- FARMERS MARKETS NETWORK



# NBSterr10 GROASIS

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

With Groasis, trees are planted in a way that mimics nature, requiring minimal water usage and custodial management. Given proper preparations and knowledge how and what to plant, survival rates are yet extremely high (above 90 percent). Plantations are undertaken using a boxx, either Waterboxx or Growboxx according to the land requirements. A drip-mechanism channels water to the root slowly. Atmospheric humidity is attracted during night, resulting in natural refilling, without any use of drip irrigation and minimum other irrigation.

## INNOVATION ASPECT

- Groasis protects the roots while providing minimal water and thus spurring them to seek humidity deep in the ground. Both survival rates and water savings are high;
- The Groasis multiple capillary drill enables access to inaccessible dry areas. Costs are reduced due to no use of pumps, tubes or energy.

## REPLICATION AND SCALABILITY

- Scalability highly attractive, since learning process makes it easier and less costly the larger the number of units planted;
- A global carbon credit scheme requires plantation of a large areas;
- Groais has a great potential of replication and can be adopted in different areas.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Active community engagement is important in diagnosing current problems such as over-use of water and and to gain appreciation for long-term benefits of naturally rooted trees not dependent on irrigation.

CO-SELECTION
Local communities should be engaged in the selection of lands, species, and methods for soil-improvement.

CO-DESIGN
Training and knowledge-transfers to the local community are integrated with the project design.

CO-IMPLEMENTATION
Local community involvement in preparations such as procurement and land preparation as well as actual plantation, monitoring and maintenance.

CO-MONITORING
-

## BEST PRACTICES and REFERENCES

LINKS:
Best practices around the world include: Chile, Santiago; Ecuador, Galapagos Islands; Ghana, Mafi-Anfoe; Oman, Salalah Oman.
Company/Author: Groasis, Pieter Hoff
Location: the Netherlands,
Extension: Ecuador
Year: 2011-13

## COMPLEMENTAR NBS FROM URBINAT

- FOOD PRODUCTION AND LEISURE PAVILION
- MOBILE VEGETABLE GARDEN
- GREEN ROOF
- RAINWATER MANAGEMENT
- BEEHIVE PROVISION AND ADOPTION
- LEARNFORLIFE



GROASIS

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BEEHIVE, by Damien Tupinier

BEEHIVE, by Damien Tupinier

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URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

NBSterr11

## CHALLENGES ADDRESSED

| | | | | | |
|---|---|---|---|---|---|
| NATURE | ● | ● | ● | ● | ● |
| WELLBEING | ● | ● | ● | ○ | ○ |
| HEALTH | ● | ● | ● | ○ | ○ |
| MOBILITY | ○ | ○ | ○ | ○ | ○ |
| PARTICIPATION | ● | ● | ● | ● | ○ |
| ECONOMY | ● | ● | ● | ● | ○ |

## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

# BEEHIVE PROVISION AND ADOPTION

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# NBSterr11 BEEHIVE PROVISION AND ADOPTION

## DESCRIPTION

"Beehiving" offers a manmade replica of the natural environment, aimed to produce honey (the term is used interchangeably with "bee keeping"). The focus here is "beehiving" in urban areas, a relatively recent phenomenon. Such beehiving must be complemented by other functions, i.e., "side-activities" capable of supporting "harmony" with the surrounding urban dwellers and context. Getting that relationship right is a core task which incorporates revitalizing urban ecosystems, awareness creation, mindset change, distribution chains, and social innovation. Success in that regard supports the wellbeing of citizens while also increasing access to the healthy products produced by bees.

## INNOVATION ASPECT

- Innovation is inherent to the inputs, processes and outputs as well as to the relationship between bees and urban dwellers;
- Innovativeness is also important for achieving commercial and social gains;
- Related innovations are found in the development of special gift certificates and or new ways of delivering honey to adopters.

## REPLICATION AND SCALABILITY

- Beehiving is scalable across cities and urban districts, suitable for diverse conditions;
- A moderate level of population density is suitable. High density increases the risk of problems for humans while low density makes the model uneconomical;
- The optimal scale depends on local specificities, such as the land area and hand.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Negative past experiences led to regulations against urban beehiving, e.g., in US and UK cities. A combination of entrepreneurs and communities should actively take part in co-diagnostic leading to a decision of introducing urban beehiving.

CO-SELECTION
A group of citizens may agree to the desirability and acceptance of beehives. Municipalities may play a supportive role. Success is most likely, however, if beehiving is adopted through bottom-up initiative.

CO-DESIGN
Companies involved in introducing beehives are normally rooted in the local community and have large numbers of people volunteering.

CO-IMPLEMENTATION
A customer-oriented and citizen-centric organisation may assume different models, including public service, volunteering, or private sector development. Co-implementation is of high importance for the development of value-enhancing services and voluntary support, e.g., education and training matter greatly for the viability and scope of beehiving.

CO-MONITORING
-

## BEST PRACTICES and REFERENCES

LINKS:
Beehiving has been developed in several locations, including Valencia in Spain, Puglia in Italy, Liverpool in the UK and in many US cities. A best practice case revitalizing deprived areas is ByBi in Copenhagen, Denmark. ByBi is a social enterprise and non-profit association which is successful both commercially and socially.

## COMPLEMENTAR NBS FROM URBINAT

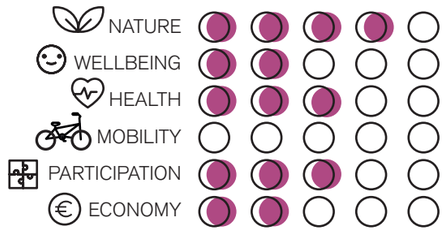
- FOOD PRODUCTION AND LEISURE PAVILION
- WILDLIFE PARK
- GREEN ROOF
- THE GROWING CLASSROOM
- FORUM THEATRE
- FARMERS MARKETS NETWORK

NBSterr11

# NBSterr12 SWIMMING POOL WITH THERMAL



## CHALLENGES ADDRESSED




## DESCRIPTION

The pool relies on local geothermal resource to provide healthy environment for children's physical education, training, and recreational activities. A millennia-long regional cultural tradition of living in contact with mineral water is revived. The ancient city of Serdica once emerged by a mineral spring, which is still in the historic core of Sofia. Public baths with pools have been used in the region for centuries. Swimming has been a compulsory element of school physical education and training in Bulgaria since mid-1970s, yet only few large school complexes had functioning swimming pools by late 1980s. The life-cycle concept developed for the school swimming pool puts an explicit focus on the interaction between authorities, experts, teachers and pupils, and community actors in building the functional and spatial design concept of the pool complex and its integrated management

## INNOVATION ASPECT

- The project aims at the psychological and emotional comfort of children and promotes a healthy living culture;
- The integrated programming, design, and operation management enables sensitivity to community's needs and preferences; various stakeholders take personal and institutional responsibility in all the stages of the process.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
-

CO-SELECTION
The co-selection of the activities and NBS in the complex is done through local public debate (discussion panels and focus groups) involving health, social and technical experts, citizens, local administration, NGOs, private business, etc.

CO-DESIGN
The co-design of the functional and spatial concept and the design brief are developed by focus groups and physical modelling. The architectural design is an expert activity and the final design project is approved by the technical department of the municipality.

CO-IMPLEMENTATION
The implementation requires expert action, yet it is important to motivate citizens' and children's creative action for organizing the surrounding area.

CO-MONITORING
The technical, and economic effectiveness of the pool are estimated by experts; its social and socio-cultural effectiveness - through cultural mapping, surveys and interviews.

## REPLICATION AND SCALABILITY

- The methodological concept of integrated programming, design, and operation management based on participatory approaches is broadly replicable;
- The scalability potential should be considered within the frame of specific functional requirements to school training facilities; expert contribution is obligatory.

## BEST PRACTICES and REFERENCES

LINKS:
A functioning swimming pool complex in school No 56, Lyulin District, Sofia, which provides services for all the local community – from babies and schoolchildren to adults. Its successful functioning is indicative for estimated needs and the relevance . https://aquasofia.com/%d0%b1%d0%b0%d1%81%d0%b5%d0%b9%d0%bd-56-%d1%81%d0%be%d1%83/

## COMPLEMENTAR NBS FROM URBINAT

LIGHT MANAGEMENT | GREEN ROOF | RENATURA-LIZATION OF BROWNFIELDS | WORLD CAFÉ | COMMUNITY WORKSHOPS | MOTIVATIONAL INTERVIEWING | MUNICIPAL REGULATIONS FOR INCLUSIVE PARTICIPATION

## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

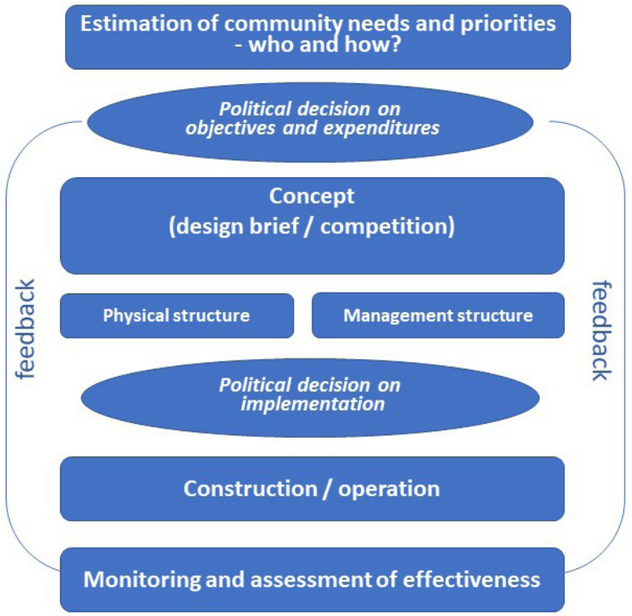
## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

**A community swimming complex in Nadezhda District: Methodological guidelines**




Thermal mineral water swimming pool

**SWIMMING POOL WITH THERMAL MINERAL WATER**

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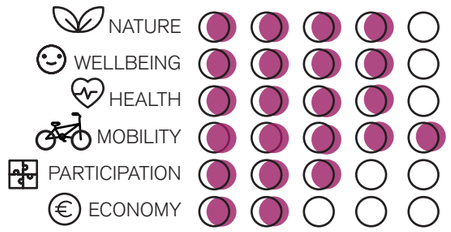
'Promenade Plantée',
photo 2019 © raf ilsbroekx

'Viaduc des Arts',
photo 2019 © raf ilsbroekx

NBSterr13

# ADAPTIVE REUSE OF URBAN NETWORK

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

Urban network space can be defined as the urban public domain, generally facilitated as transport infrastructure and/or pedestrian space and its ambiguous residual spaces (e.g. streets, pavements, bridges, tunnels, underground car parks). The NBS 'adaptive reuse of urban network space' implies alternative - nature inspired - uses and/or spatial adaptations of urban network space (e.g. unsealing surfaces, creating linear parks, redesigning for active mobility, [re]programming under bridge vaults or underground parking lots) or a time management of various temporary uses in these spaces (e.g. Ciclovia Bogota, temporary marketplaces, street festivals). The main goals of this NBS contain revitalisation of neighbourhoods, eliminating existing physical/social/cultural barriers, reducing emissions, increasing active mobility and solidarity economy.

## INNOVATION ASPECT

- Rethinking ambiguous traffic spaces and their residual spaces in a systemic way by means of ecological and social networks;
- Changing the mobility paradigm and anticipating to technological innovation in mobility (e.g. a modal shift to active/sustainable/shared mobility);
- Reducing the massive amount of sealed surfaces, tackling water issues.

## REPLICATION AND SCALABILITY

- Concepts are only partly replicable, tailoring 'in situ' is an inevitable part of this NBS;
- This NBS is extremely scalable, varying from 'quick wins', to small spatial interventions, up to massive transformations as a part of an overall integrated (re)design strategy.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Variable, depending on the scale.

CO-SELECTION
Variable, depending on the scale.

CO-DESIGN
Variable, depending on the scale.

CO-IMPLEMENTATION
Only for small scale interventions.

CO-MONITORING
-

Many best practices of 'adaptive reuse of urban network space' start as bottom-up participatory processes (e.g. New York High Line), by phases of temporary use and appropriation, often introduced by inhabitants or local associations.

## BEST PRACTICES and REFERENCES

LINKS:
- Paris, Promenade Plantée and Viaduc des Arts: a linear park on top of an abandoned viaduct and reconversion of its arcades into a strip of crafts/art shops.
- Leuven, Park Belle Vue: a traffic space converted into a linear park landscape.
- Zaanstad, Koog aan de Zaan, A8ernA: a reconversion of an ambiguous residual space under a highway bridge

## COMPLEMENTAR NBS FROM URBINAT

MOBILE VEGETABLE GARDEN | CYCLING AND PEDESTRIAN PATH | MULTIUSE WOOD STRUCTURE | WALKTHROUGH / FOCUS GROUPS IN SITU | COMMUNITY-BASED ARTS PROJECTS | SOLIDARITY MARKET FOR CHILDREN | FARMERS MARKETS NETWORK

ADAPTIVE REUSE OF URBAN NETWORK SPACE

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NBSterr13

## 4.3 - Participatory NBS

The participatory NBS factsheets are shown in the followings pages.

Theatricalization of reality, staged problem

Community directly and actively involved


Spectator encouraged to enter the scene

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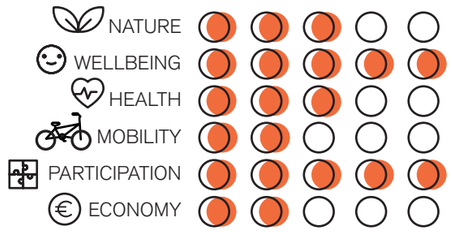
# NBSpart1

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

# FORUM THEATRE

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# FORUM THEATRE



## DESCRIPTION

Methodology based on theatre techniques, games and exercises, involving the community in analyzing and discussing problems, provoking awareness and citizen participation. A Joker (facilitator) guides a group of participants to debate on individual oppressions/ problems having a collective impact, from which they choose topic(s) to be performed. The dynamic is ideally built during 10-12 workshops (4-6 months), both to prepare a presentation and to train participants to conduct workshops. A format of 1 workshop (2-4 days) is possible to just prepare the performance. After participants present the performance to a local audience, the Joker urges for a debate, which is followed by a second performance where the "spect-actors" of the audience can introduce changes, playing new actions and exploring new strategies for individual and collective action, as active participants of a role play.

## INNOVATION ASPECT

- Process of bringing together individual and social dimensions, nurturing cohesion, commonality, and sense of identity;
- Performing arts allow addressing complex and symbolic dimensions of urban development, optimizing public discussion on collective issues and catalyzing action on alternative local development trajectories with available resources.

## REPLICATION AND SCALABILITY

- To be formally applied, it usually requires a Joker and actors;
- Replication potential optimized with a facilitator aware of the topic and citizens with some theatre (informal) experience;
- Previous participations allow replication by understanding the sequential steps;
- In any territorial context, hosting from few to many participants in the audience.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC & CO-IMPLEMENTATION
Fundamental to complement participatory solutions that are more focused on elaborating outcomes and using more rational components of interaction. E.g. focus groups, more used for co-selection and co-design.
Particularly relevant in the co-diagnostic for identifying local challenges, needs and ambitions by community members, as well as in the co-implementation for finding collective arrangements of co-maintenance and co-production.

CO-SELECTION
-

CO-DESIGN & CO-IMPLEMENTATION
The biggest challenge, at the end of the process, is to transfer the outcomes to the co-design and co-implementation of solutions.
It requires from 10/12 workshops (during 4 to 6 months) to 1 workshop (during 2-4 days) within local premises (ideally a cultural local facility) and facilitated by a Joker (or, for the short version, a trained facilitator). The participants need to be previously mobilized, and the communication actions should also mobilize the community for the final presentation.

CO-MONITORING
-

## BEST PRACTICES and REFERENCES

LINKS:
As part of the Theater of the Oppressed, Forum Theatre was developed by Augusto Boal in Brazil in the 1960s and is now practiced in over 70 countries. For example, in Portugal, GTO LX worked directly with disadvantaged populations for the creation of Forum Theatre community groups (www.gtolx.org).

## COMPLEMENTAR NBS FROM URBINAT

PHOTOVOICE
COMMUNITY WORKSHOPS
LEARNFORLIFE
SUPERBARRIO
PARTICIPATORY BUDGETING
EMPOWER-MENT EVALUATION
3D MODEL THINKING

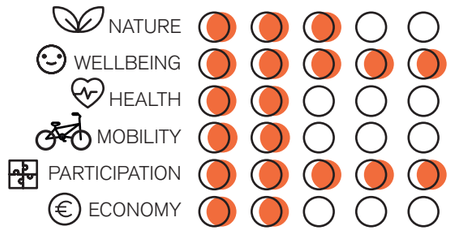

Rediscovering the city


Describing the cultural and localresources

# NBSpart2

# CULTURAL MAPPING

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

Methodological tool in participatory planning and community development, it makes visible the ways that local cultural assets, stories, practices, relationships, memories, and rituals constitute places as meaningful locations.
Process of collecting, recording, analyzing and synthesizing information to describe the cultural resources, networks, links and patterns of usage of a given community or group, also strategically used to bring stakeholders into conversation.
Flexible according to the objectives, purpose and what one wants to map. E.g. facilities, organizations, stories of places, historical sites, for the past (memories and landmarks) or for the future (aspirational mapping), for the community or for outsiders.
It can be combined with approaches such as footprint of women (gender), forbidden cities (safety), asset-based community development (community assets), arts.

## INNOVATION ASPECT

- Specific focus on cultural aspects and elements of a place, both tangible and intangible, that bring meanings to places;
- Focus on bottom-up processes for making visible the knowledge of citizens/residents;
- Allied with deep mapping, community mapping, participatory asset mapping, counter-mapping, qualitative GIS, and emotional mapping.

## REPLICATION AND SCALABILITY

- Can be used in any territorial context and host from few to many participants;
- Organization of groups and design of materials to record results must be adapted according to number, specificities and availability of participants;
- Flexible according to objectives, applied in different ways and combined with different approaches.

## PARTICIPATION PROCESS

Emphasis on processes that enable projects to be platforms for discussion, engagement and empowerment.

CO-DIAGNOSTIC & CO-MONITORING
-baselines and data for thinking about places, people and resources
-information and data not usually captured in standard statistic and profiles or other standard qualitative methods
-ongoing monitoring and assessment of cultural vitality and community well-being (e.g. new cultural celebrations, production sites, intergenerational skills transfer)

CO-SELECTION & CO-DESIGN
-incorporating meaningful symbolic elements (e.g. diversity of languages, historic objects)
-sited in places meaningful to the community
-enabling cultural activities
-recuperating meaningful places
-incorporating art (e.g. lighting features)
-developing public art
-engraving history and creating new landmarks

CO-IMPLEMENTATION & Co-MANAGEMENT
-informed by initial mapping
-involvement of inhabitants in collective life by promoting belonging, ownership and collective achievement
-catalyst effect for NBS management

## BEST PRACTICES and REFERENCES

LINKS:
Cultural mapping protocol and general guidelines for implementing participatory activities: annex 1 of URBiNAT's deliverable D3.1
Participatory activities for mapping: methodologies applied in the 2nd stage of local diagnostics, URBiNAT's deliverable D2.1
Cultural Mapping Toolkit by the Creative City Network of Canada (English & French)

## COMPLEMENTAR NBS FROM URBINAT

FORUM THEATRE | WORLD CAFÉ | COMMUNITY WORKSHOPS | SUPERBARRIO | COMMUNITY--BASED ARTS PROJECTS | EMPOWER-MENT EVALUATION | 3D MODEL THINKING

CULTURAL MAPPING

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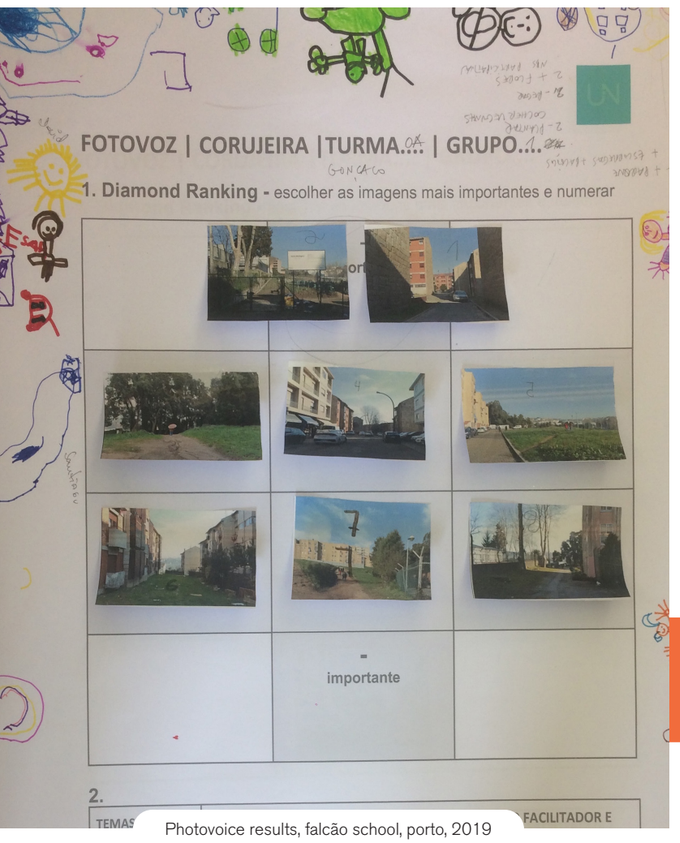
photovoice results, corujeira school,porto, 2019

Photovoice results, falcão school, porto, 2019
by Maças de Carvalho




Photovoice results, falcão school, porto, 2019

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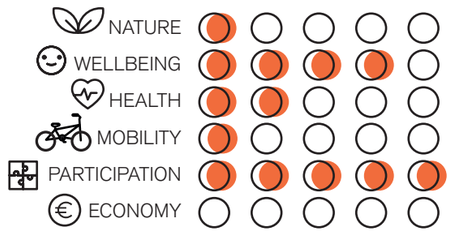
# NBSpart3

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

# PHOTOVOICE

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# PHOTOVOICE

## DESCRIPTION

Photovoice NBS uses photos to make people aware of a reality or topic, as nature-based solutions or inclusive urban regeneration. It's is a human-centered solution to engage citizens in the transformation of their territory.
It's also a tool to collect data related with people's memories and perceptions. Photos allows a co-construction of the reality through the interaction of 3 elements: the researcher, the photos and the interviewee.
It is a technique (called photo voice) that works well to engage children and young people in research, but also adults with advanced age that want to share their life stories. The photo voice aims to give voice, through photography, to those who are usually silenced or not involved in urban planning process.
It is also known as "participatory photography" and it has a correlation with "photo elicitation".

## INNOVATION ASPECT

- Photovoice is a NBS that contributes to the process of empowering people and communities by making visible their stories, memories, perceptions and also ideas or dreams to transform the territory;
- It's easy to implement and is low-cost. It can use a digital enabler or physical materials. It's focused in the participant, not in the researcher.

## REPLICATION AND SCALABILITY

- Photovoice is a NBS that contributes to the process of empowering people and communities by making visible their stories, memories, perceptions and also ideas or dreams to transform the territory;
- It's easy to implement and is low-cost. It can use a digital enabler or physical materials. It's focused in the participant, not in the researcher.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
It supports the engagement of the citizens and stakeholders in new projects., Participants express needs and perceptions related to NB. Participants say what they like, they don't like and what they would like to change represented in the picture.

CO-SELECTION
Use motivational interviewing to understand the possibility of use images to express perceptions, memories, needs
It can be used to talk about existing NBS or to identify the NBS to implement.

CO-DESIGN
The researcher or the participant can bring photos of existing NBS to inspire concrete proposals
Participants can discuss how they want to use photovoice by identifying together the purpose of the activity.

CO-IMPLEMENTATION
-

CO-MONITORING
Photovoice can be important tool to monitor the impact of the corridor. Photos can represent the transformations and participants can describe their perceptions and the way they use the corridor.
To evaluate photovoice activity, the researcher can do an interview or a short questionnaire.

## BEST PRACTICES and REFERENCES

LINKS:
URBiNAT Photovoice workshop in Porto and Sofia (2019) - Link
Film Visage Villages (2017) - Link
Photovoice.org -https://connect.photovoice.org/

## COMPLEMENTAR NBS FROM URBINAT

CULTURAL MAPPING | WALKTHROUGH / FOCUS GROUPS IN SITU | MOTIVATIONAL INTERVIEWING | SUPERBARRIO | COMMUNITY--BASED ARTS PROJECTS | EMPOWERMENT EVALUATION | 3D MODEL THINKING

NBSpart3

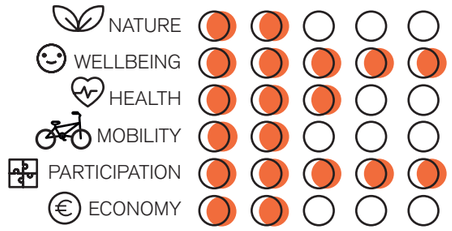
Walktrough Porto

Walktrough Porto

Walktrough Porto

# NBSpart4

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| | | |
|---|---|---|
| SOFT | MEDIUM | HARD |

## REPLICATION POTENTIAL/FLEXIBILITY

| | | |
|---|---|---|
| LOW | MEDIUM | HIGH |

## AMORTIZATION PERIOD

| | | | |
|---|---|---|---|
| SHORT | MEDIUM | LONG | NA |

## INVESTMENT

| | | | |
|---|---|---|---|
| LOW | MEDIUM | HIGH | NA |

# WALKTHROUGH / FOCUS GROUPS IN SITU

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# WALKTHROUGH

## DESCRIPTION

Walkthrough is a method of analysis that combines observation in situ with an interview simultaneously. It creates an accepting environment that puts a small number of participants at ease allowing then to thoughtfully answer questions in their own words and add meaning to their answers. It also identifies the negative and positive aspects of the analyzed environments.
It allows identifying the perception of the residents in the place where they live. In this technique, they are invited to appropriate the neighbourhood and evaluate the territory, its inadequacies, surplus or missing furniture, barriers and potentialities, among other important elements.
Walkthrough is a participatory method and solution (NBS) that creates awareness while participants walk and discuss what they feel, see and know.

## INNOVATION ASPECT

- It's a participatory nature-based solution, with a human-centered approach, to engage citizens in environmental and social challenges of their territory. It can virtual or physical. It puts the focus on the community collective vision that offers a positive and useful view for the future, at the same time motivate people to go on together.

## REPLICATION AND SCALABILITY

- Walkthrough can be organized with max. 15 participants per 1 facilitator. In URBiNAT it was used with young people, families, citizens and stakeholders, and professionals. It was used in several cities with different contexts, demonstrating its replicability and scability. With the COVID-19 restrictions, Nantes organized a virtual walkthrough - video.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
It supports the engagement of the citizens and stakeholders in new projects., Participants express needs and perceptions related to NBS. Participants say what they like, they don't like and what they would like to change while they walk in the territory.

CO-SELECTION
The participants identify solutions for specific needs that are observed in situ.

CO-DESIGN
Participants can discuss solutions and design it in situ in direct contact with the challenges that need to be addressed.
It also can generate creative thinking and motivate people to look for a solution.

CO-IMPLEMENTATION
-

CO-MONITORING
Walkthrough activity can be organized to plant trees in the intervention area or to develop education activities about nature or heritage.

## BEST PRACTICES and REFERENCES

LINKS:
URBiNAT Walkthrough in Porto and Sofia (2019) - Link
URBiNAT Walkthrough in Nantes (2020) - Link

## COMPLEMENTAR NBS FROM URBINAT

ADAPTIVE REUSE OF URBAN NETWORK SPACE | PHOTOVOICE | DESIGN THINKING | MOTIVATIONAL INTERVIEWING | EMPOWER-MENT EVALUA-TION | BEHAVIOURAL MAPPING | 3D MODEL THINKING

NBSpart4

Community workshop Nantes

Community workshop Porto

Community workshop Sofia

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URBiNAT

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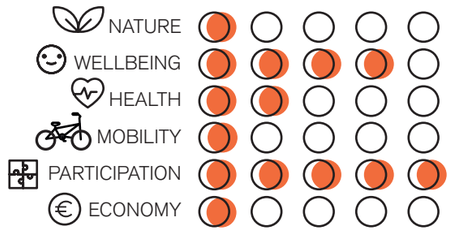
# NBSpart5

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## COMMUNITY WORKSHOPS

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# COMMUNITY WORKSHOPS

## DESCRIPTION

Open meetings facilitated and organized in small groups in which participants are invited to debate a specific thematic. This method allows to explore and develop bottom-up and grassroots community development skills for people within their own communities. Participants can identify their most pressing social determinants, with positive and negative aspects of their environment, bringing social justice and environmental sustainability.
The method also assists people to gain a clearer understanding of the principles of community development and community capacity building, increasing awareness and understanding of the main themes, terms and definitions.

## INNOVATION ASPECT

- It is a method that involves citizens in solution-based actions around neighbourhoods issues. That is not only essential, but smart, because they are experts in that area and for sure have innovative ideas for solving long term problems. The method assists to arise this invisible wisdom and create a collective view for the community future.

## REPLICATION AND SCALABILITY

- Community workshops can be used in any territorial context and should host max. 15 participant with one facilitator. If you have more, then you should create more groups. In URBiNAT, it was used in several cities with different contexts and goals, demonstrating its replicability and scability.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
It supports the engagement of the citizens and stakeholders in new projects, as URBiNAT.
Depending on the goal, participants share knowledge, express needs and perceptions. It was associated with different tools, as 3D model thinking.

CO-SELECTION
Workshop were organized to discuss and select NBS, taking in consideration the needs identified in previous workshops. NBS cards were used to inspire the participants in selecting NBS from the catalogue or from their knowledge.

CO-DESIGN
Community workshop were organized to co-design ideas and proposals that were selected in the previous meetings. Participants used 3D models, and design thinking to develop the new NBS. Technical experts were invited to support. Meetings were physical or online, using digital tools as MIRO.

CO-IMPLEMENTATION
It will support the implementation of cultural and solidarity economy NBS.

CO-MONITORING
Workshops will be organized to discuss the impact of the NBS implementation, the best practices and barriers.

## BEST PRACTICES and REFERENCES

LINKS:
URBiNAT Community workshop in Porto, Nantes, Sofia, Brussels, Siena
Porto – Community workshop to present the healthy corridor preliminary plan - link
Sofia – Community workshop to present the Local diagnostic - link
Nantes – Community workshop to play superbarrio - link

## COMPLEMENTAR NBS FROM URBINAT

FORUM THEATRE | COMMUNITY WORKSHOPS | MOTIVATIONAL INTERVIEWING | SUPERBARRIO | MUNICIPAL REGULATIONS FOR INCLUSIVE PARTICIPATION | EMPOWER-MENT EVALUATION | 3D MODEL THINKING

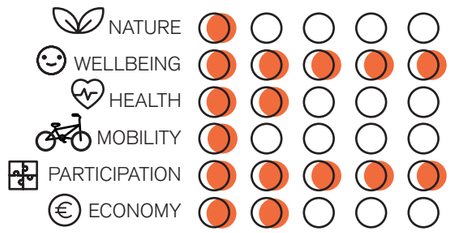
GUDA_ COCREATE EUROPEAN PROJECT

GUDA_ COCREATE EUROPEAN PROJECT


GUDA_ COCREATE EUROPEAN PROJECT

# NBSpart6

## CHALLENGES ADDRESSED




### IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

### REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

### AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

### INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESIGN THINKING

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URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

# DESIGN THINKING



### DESCRIPTION

Design Thinking is founded on the ability to combine empathy for the context of a problem, creativity in generating ideas, insights and solutions, and rationality to analyze and match solutions to the context. Design Thinking processes are at the same time analytical and empathic, rational and emotional, methodical and intuitive, often tackle ill-defined problems where the use of creative thinking abilities is fundamental to first a correct problem finding.
Design Thinking is human centered and is based on understanding the needs and motivations of people. And it is optimistic; it believes that there is always a solution to be found. From problem finding to problem solving.
By using Gamification, Serious Games, Senses and Dreams, the Design thinking tools allows people to give first-hand deeper information that it is crucial to complement and simultaneously cross-validate other sources of co-diagnostic gathered through other methods and tools.

### INNOVATION ASPECT

- It is a method that engages and involves citizens in co-creation of value approach. Specially focused on supporting the co-diagnostic and co-design stages by listening and dialoguing with the citizens and observing the neighborhoods. The Design Thinking designed tools allow the citizens and stakeholders to express their emotions, feelings, perceptions and behaviors concerning the territories and their community.

### REPLICATION AND SCALABILITY

- The Design Thinking method, tools can be used in community workshops in any territorial context, process stage, actions and activities that need to gather deep information for problem finding or new fresh ideas for problem solving and should host max. 25 participant with one facilitator. If you have more, then you should create more groups. In URBiNAT, it was used in several cities with different contexts and goals, demonstrating its replicability and scability.

### PARTICIPATION PROCESS

CO-DIAGNOSTIC
It supports the engagement, motivations and the goal of gathering deep, personal and collective information from the local citizens and stakeholders of participatory based projects, as URBiNAT. Depending on the goal, participants share emotions, feelings, express needs, identify opportunities, experiences, narratives, perceptions, behaviors and dreams for their neighborhoods. It was associated with different tools such as cultural mapping, walkthrough, photovoice and community workshops.

CO-SELECTION
It supports the co-selection of NBS inspired in the URBiNAT NBS catalogue by stimulating thinking in all directions and adapt to local context.

CO-DESIGN
Used the online meetings and workshops for the co-creation of new citizens NBS's. The diverge / converge and the analyses / synthesis framework are fundamental support the ideation step. Also relevant, adapted tools of consensus generation "Delphi" and approximation of arguments and viewpoints the "Triz".

CO-IMPLEMENTATION & CO-MONITORING
It will support the implementation of cultural and solidarity economy NBS. It can be particularly relevant to emerging issues during monitoring for the improvement of implemented solutions and the overall evaluation of the transformation of public life.

### BEST PRACTICES and REFERENCES

LINKS:
URBiNAT Design Thinking tools in Porto, Nantes and Sofia;
Design Thinking tools used in the Porto co-diagnostic stage – Mapping in Schools and Kick-off meeting;
Design Thinking tools used in the Porto Online co-design – Ideation, design and validation Workshops.

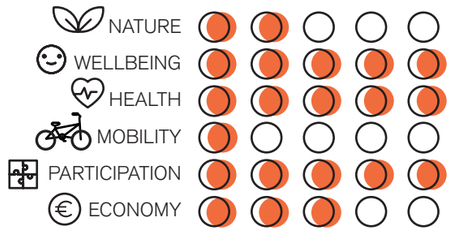
### COMPLEMENTAR NBS FROM URBINAT

CULTURAL MAPPING | PHOTOVOICE | WORLD CAFÉ | MOTIVATIONAL INTERVIEWING | SUPERBARRIO | COMMUNITY--BASED ARTS PROJECTS | 3D MODEL THINKING

# NBSpart7 LEARNFORLIFE



## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

LearnforLife (LfL) represents a behavioural change methodology with a number of building blocks including incentive schemes, tailored rewards and real-time communication targeting specific behaviours and key audiences.
LfL focuses on empowering individuals to induce self-reinforced processes in regard to healthy behaviour, green behaviour and safe behaviour. Using specially designed e-packages the scheme builds awareness and motivation to engage in behavioural change both on a personal basis as well as on community level.

## INNOVATION ASPECT

- Innovation in the application of behavioral science through the integrated approach;
- The systematic methodology to gradually enforced motivation through interactivity;
- The approach to focusing attention on minor and yet significant lifestyle modifications with high impact on well-being and in support of a sustainable environment.

## REPLICATION AND SCALABILITY

- The LfL Methodology is best applied in an environment that facilitates rapid communication of motivational messages, handling of responses and feedback;
- Mobile apps can be scaled into new environments;
- Light adaptation of infrastructure, user practices and tools can arrange in consideration of culture and target audiences.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
By implementing LfL, real-time data can be derived for several purposes. These include diagnostics, mapping stakeholders, understanding incentives and underpinning motivations.

CO-SELECTION
LfL can usefully be applied through a process where citizens become effectively involved in co-selection and combination of various complementary NBSs.

CO-DESIGN
The application adds high value within a co-creation process where the engagement of citizens evolved through a process of gradual intensification. Constructive interface between citizens and different stakeholders is further made use of systematically, in support of a successful design of and application of the LfL Methodology.

CO-IMPLEMENTATION
The implementation is preferably preceded by a pilot whereby a small number of users are made to test the product and its relevance in the local context. After fine-tuning, the results of the pilot can be applied more broadly.

CO-MONITORING
-

## BEST PRACTICES and REFERENCES

LINKS:
Best practice of LfL takes the shape of a collaborative model, as illustrated in the figure below.

## COMPLEMENTAR NBS FROM URBINAT

THE GROWING CLASSROOM | CULTURAL MAPPING | PHOTOVOICE | MOTIVATIONAL INTERVIEWING | SOLIDARITY MARKET FOR CHILDREN | FARMERS MARKETS NETWORK | LOCAL CURRENCIES FOR NATURAL BASED CIRCULAR ECONOMY

LEARNFORLIFE

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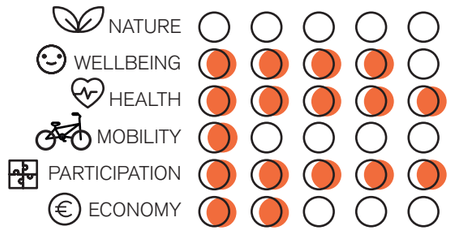
# NBSpart8

# MOTIVATIONAL INTERVIEWING

NBSpart8

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

Extending from the experience of psychology focusing on addressing behavioural risk factors, such as drinking, smoking or other forms of substance abuse, Motivational Interviewing (MI) has evolved to form a methodology and technique for wider efforts to promote behavior-change in extended communities. MI starts out with collaborative, person-centred communication method and form of guiding to understand needs and to elicit and strengthen motivation for changed behaviours. MI is particularly devised to strengthen personal motivation for and commitment to a specific goal by eliciting and exploring the person's own reasons for change within an atmosphere of acceptance and compassion. It integrates features of human, face-to-face interaction and mechanisms for establishment of trust, to build incentives for positive changes.

## INNOVATION ASPECT

- The translation of MI techniques into novel forms of community engagement in support of various NBS opens for a range of commercial and social innovations;
- Innovations are required in tackling the needs of specific categories of residents and relating to their particular motivations;

## REPLICATION AND SCALABILITY

- High in the sense that one can build on positive experience in one area for replication in another;
- Adapts the methodology used in one context can be applies to a different set of issues.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
MI is a method that can be used to identify needs and challenges of residents in the local communities and study areas of URBiNAT.

CO-SELECTION
A diverse set of residents in the local communities addressed by URBiNAT should ideally partake in MI, strengthening their ability to identify and articulate their needs and, on this basis, take part in the selection of NBS capable of contributing to solutions to the challenges they are confronted with.

CO-DESIGN
MI can be used as a component in citizen engagement processes, where it helps guide interactive communication practices and raise the ability of individuals to design NBS solutions and how they are put to use.

CO-IMPLEMENTATION
MIcan be co-implemented by the project team with local experts within the framework of local community development, alongside the implementation of various other participatory nature-based solutions, such as Walk through, Behavioural mapping, Super barrio, LearnForLife, World café and Photovoice.

CO-MONITORING
-

## BEST PRACTICES and REFERENCES

LINKS:
The UK Medical Research Council's guidance for developing and evaluating complex interventions (Campbell, M., Fitzpatrick, R., Haines, A., Kinmonth, A. L., Sandercock, P., Spiegelhalter, D., & Tyrer, P. (2000). Framework for design and evaluation of complex interventions to improve health. BMJ, 321, 694–696.

## COMPLEMENTAR NBS FROM URBINAT

THE GROWING CLASSROOM | FORUM THEATRE | WORLD CAFÉ | COMMUNITY WORKSHOPS | SUPERBARRIO | EMPOWER-MENT EVALUATION | BEHAVIOURAL MAPPING

MOTIVATIONAL INTERVIEWING

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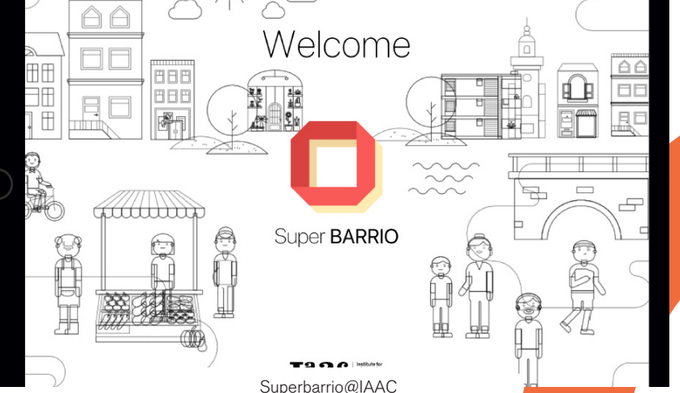
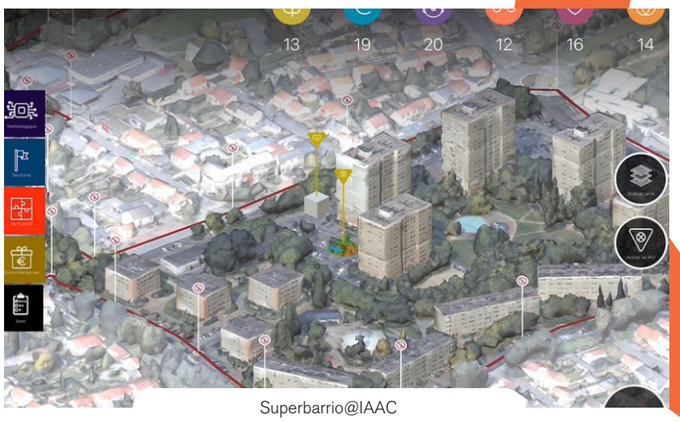
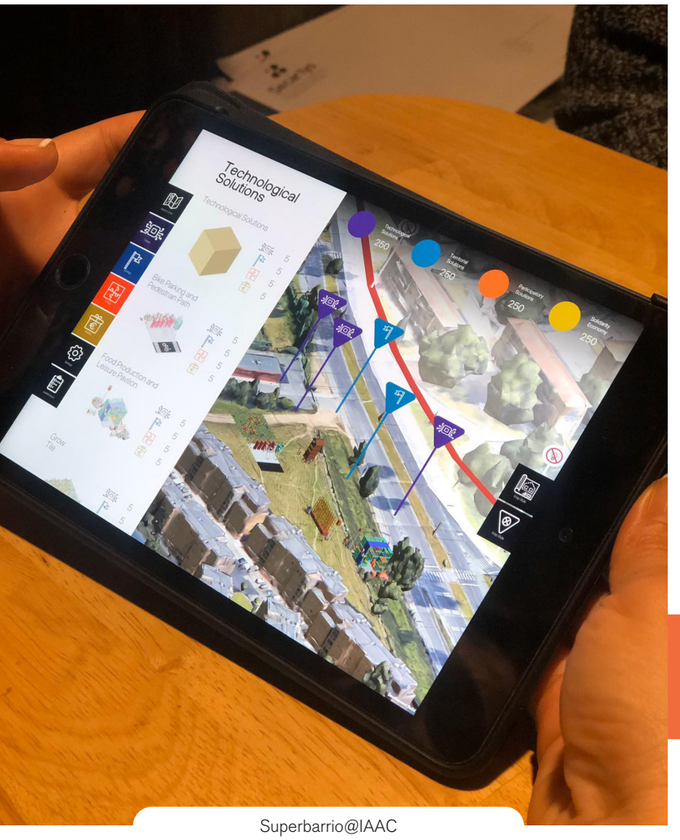


Superbarrio@IAAC



Superbarrio@IAAC

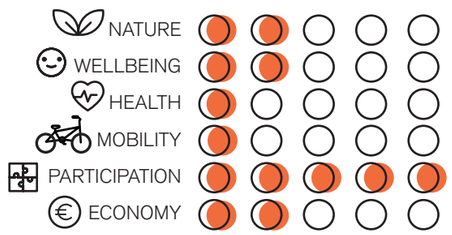


Superbarrio@IAAC

# NBSpart9

# SUPERBARRIO

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

SuperBarrio is a video game designed to gather citizens' opinion about public space design and programme. It allows citizens to visualize, navigate and interact with their neighbourhood that is represented as a detailed three dimensional model.
With a simple and intuitive interface that any user can understand, the solution gives users the possibility of playing with URBiNAT NBS or urban elements (e.g. smart urban furniture, benches, trees, markets, micro-windmills, etc.) in the public space. The user can drag the NBS in the 3D model and can visualize data about their impact on the urban environment such as data regarding accessibility, productivity, economy, ecology and social interaction for the neighbourhood.
Data about the solutions proposed by citizens are collected in a repository and statistics about their preferences can be created..

## INNOVATION ASPECT

- As an online tool, it widens the potential audience of participatory processes, overcoming the limits of conventional methodologies;
- It enables the collection of a consistent dataset about citizens' preferences, allowing designers and municipalities to thoroughly investigate the decision-making process of the user and to potentially find user patterns.

## REPLICATION AND SCALABILITY

- The NBS and urban elements included in the video game can be modified or replaced;
- New typologies of solution's impacts can be included;
- Any other neighbourhood can be designed and included in the 3d models of the game;
- Superbarrio can be used both in presence (e.g. in Living Labs) and remotely.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Superbarrio can be used to identify needs and preferences of residents in the local communities and study areas of URBiNAT.

CO-SELECTION & CO-DESIGN
The solution can be used as a digital enabler during the co-selection process. It can support decision-making processes by providing data on game sessions.

CO-IMPLEMENTATION
It can be co-implemented through workshop or webinar with facilitators that assist the players and provide them with further information about the urban site and the solutions included in the game.

CO-MONITORING
The solution's functioning can be monitored by analyzing the data collected during the game sessions.

## BEST PRACTICES and REFERENCES

LINKS:
Superbarrio has been developed by IAAC and already tested in Barcelona, Genova and Favara. More info can be found at: www.superbarrio.iaac.net.

## COMPLEMENTAR NBS FROM URBINAT

- MULTIUSE WOOD STRUCTURE
- LIGHT MANAGEMENT
- ADAPTIVE REUSE OF URBAN NETWORK SPACE
- WALKTHROU-GH / FOCUS GROUPS IN SITU
- DESIGN THINKING
- MOTIVATIONAL INTERVIEWING
- PARTICIPATORY BUDGETING AND EMPAVILLE SERIOUS GAME

SUPERBARRIO

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NBSpart9

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URBiNAT

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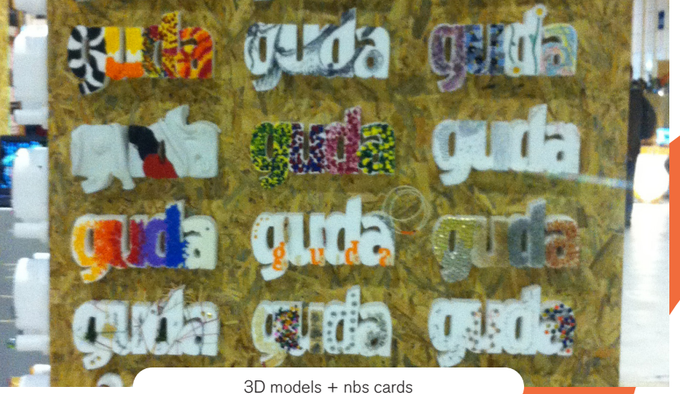


3D models + nbs cards

3D Model thinking

3D Model - Combra

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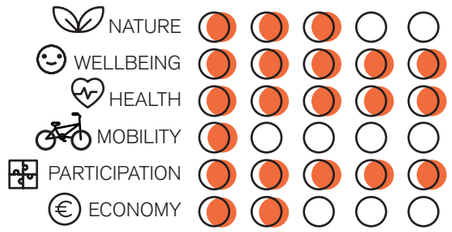
# NBSpart10

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

# COMMUNITY BASED ARTS PROJECTS

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# COMMUNITY BASED ARTS PROJECTS

## DESCRIPTION

A community-based arts project is where an artist works with a community to facilitate a creative process that enables participants to express their needs, aspirations, inspirations, identity or sense of place. Such activities are also referred to as community arts, artists in the community or community cultural development (CCD). Community-based arts projects are increasingly being used because they are able to reach people more deeply, to create bounds between all stakeholders and have a meaningful impact on their lives. This method allows the co-creation and participatory processes participants to "build" objects together and helps people to better understand their common values, system to beliefs and their collective sense of belonging to the places / communities.

## INNOVATION ASPECT

- It engages and involves citizens in co-design processes simultaneously to co-creating real life objects or interventions in their neighborhoods;
- It reinforces the "implementation" orientation since the citizens "see" tangible collective achievements during the process itself. It can test solutions developed in the co-creation process.

## REPLICATION AND SCALABILITY

- Community Based Artes Projects can be used in any territorial context and should host max. 15 participant with one facilitator. If you have more, then you should create more groups;
- In URBiNAT, it being used in several cities with different contexts and goals, demonstrating its replicability and scability.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
It supports the engagement, motivations and "doing" orientation of the citizens and stakeholders in participatory based projects, as URBiNAT.
Depending on the goal, participants share emotions, feelings, express needs and perceptions toward the neighborhoods and build a collective art object. It was associated with different tools such as Serious Games and Community workshops.

CO-SELECTION
-

CO-DESIGN
Community Based Artes Projects were organized to support the co-design stages. Simultaneously engage and empower citizens and stakeholders to develop new NBS ideas and proposals for the Healthy corridor, participations were asked to co-design e co-build a collective Art object focusing the specificity and context of each one the Cities. It can be used to test the solutions in a public event to interact with the community.

CO-IMPLEMENTATION
It will build tangible objects simultaneously to the process actions and activities that willbecome a symbolic represention of the project.

CO-MONITORING
-

## BEST PRACTICES and REFERENCES

LINKS:
URBiNAT Community Based Artes Projects in Porto, Høje-Taastrup and Brussels
In Porto, the community by arts methodology was planned as a public event to test the NBS proposed by citizens, it was called "Experimento". Due to COVID19 restrictions it was postponed.

## COMPLEMENTAR NBS FROM URBINAT

CULTURAL MAPPING | PHOTOVOICE | WALKTHROUGH / FOCUS GROUPS IN SITU | COMMUNITY WORKSHOPS | DESIGN THINKING | LEARNFORLIFE | 3D MODEL THINKING

Picture by Fernanda Curi

Picture by Carlos Barradas

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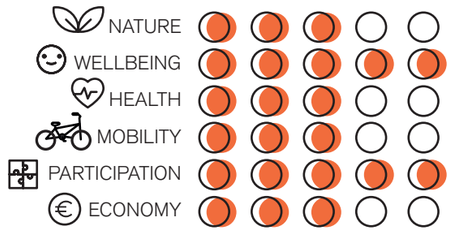
# NBSpart11

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

# EMPOWERMENT EVALUATION

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# EMPOWERMENT EVALUATION

## DESCRIPTION

Empowerment evaluation is the use of evaluation concepts, techniques, and findings to foster improvement and self-determination.
Program participants conduct their own evaluations, with the support of an outside evaluator and an additional facilitator, in workshops to complete the following steps:
a) developing a mission; b) taking stock where the program stands; c) planning for the future.
Participants determine the type of evidence required to document and monitor progress. Subsequent evaluations, such as interviews and surveys, test whether strategies are working to allow mid-course corrections. Another formal assessment of activities allows comparison with the previous ratings of key activities. All results are recorded in accessible documents to be used as references, baseline and data point for planning, implementation, monitoring and evaluation of the co-creation process.

## INNOVATION ASPECT

- By internalizing and institutionalizing self-evaluation processes and practices, a dynamic and responsive approach to evaluation can be developed;
- Addressing long-standing issues of dysfunction and inefficiency, Inclusive and transparent, open to critique and review;
- Generating meaningful data to inform decision making;
- Cultivating internal accountability.

## REPLICATION AND SCALABILITY

- Facilitators must be trained to understand sequential steps, expected role, and importance of recording results in accessible way;
- Organization of groups and design of materials to record results must be adapted according to number, specificities and availability of participants;
- Applied in over 16 countries, it can be used in any territorial context.

## PARTICIPATION PROCESS

As any other evaluation process, empowerment evaluation is relevant as a starting point to establish a baseline for planning, implementation, monitoring and assessment of NBS co-creation. Thus, it can be applied for the establishment of Living Labs and guide the progress of Living Labs' work throughout the co-creation process, from co-diagnostic to co-monitoring.

CO-DIAGNOSTIC
initial taking stock exercise represents the community's baseline for future comparison.

CO-SELECTION & CO-DESIGN
empowerment evaluation can also be applied at any point of the co-creation process, in order to foster decision making and self-determination, to propel action based on a common understanding and vision, and to focus on evidence-based results.

CO-IMPLEMENTATION
empowerment evaluation can also be applied at any point of the co-creation process, in order to foster decision making and self-determination, to propel action based on a common understanding and vision, and to focus on evidence-based results.

CO-MONITORING
a second taking stock exercise is a second data point enabling the community to measure.

## BEST PRACTICES and REFERENCES

LINKS:
David Fetterman introduced empowerment evaluation to the field of evaluation.
Fetterman, D. (2017). Empowerment Evaluation. BetterEvaluation. Retrieved from https://betterevaluation.org/en/plan/approach/empowerment_evaluation

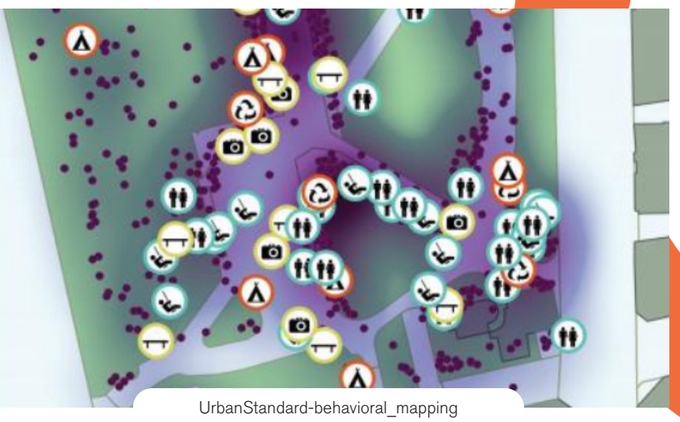
## COMPLEMENTAR NBS FROM URBINAT

- CULTURAL MAPPING
- PHOTOVOICE
- WORLD CAFÉ
- DESIGN THINKING
- PARTICIPATORY BUDGETING AND EMPAVILLE SERIOUS GAME
- COMMUNITY--BASED ARTS PROJECTS
- 3D MODEL THINKING

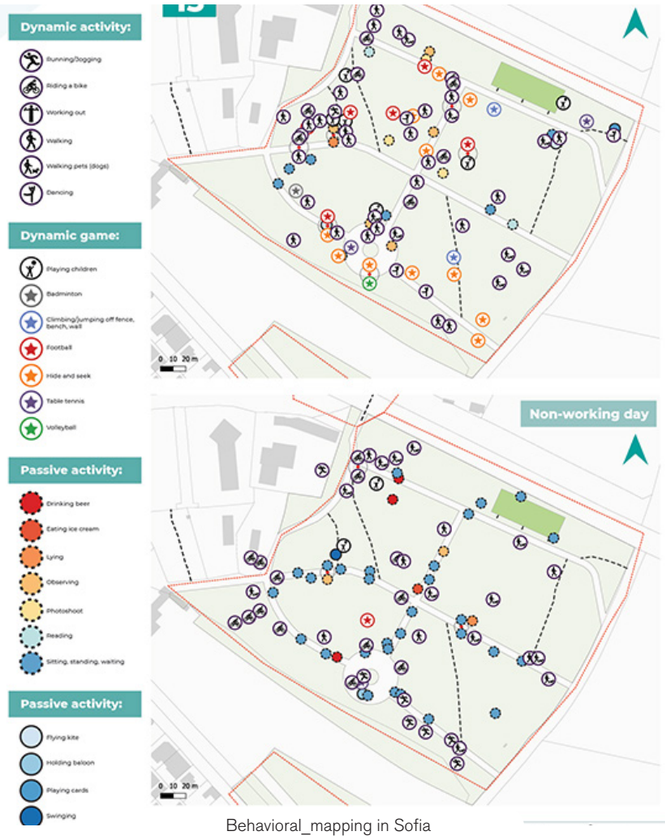
NBSpart11

# NBSpart12

# BEHAVIOURAL MAPPING

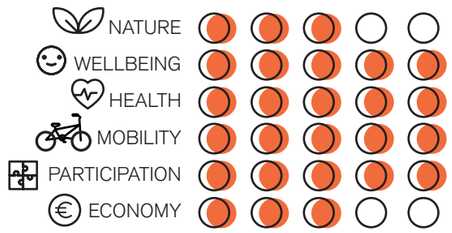


UrbanStandard-behavioral_mapping




Behavioral_mapping in Sofia

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

Behavioural mapping is structured observation combining different techniques for documentation, mapping and counting of activities performed by people passing and occupying a defined space in chosen moments of time. It helps to explore the quantity and the quality of various activities performed at the place observed, the non-motorized moving, staying, recreating or playing. The process of gathering of data through observations and data analysis and visualization can reveal the ways of presence of different targeted groups in the study area and their behaviour. This information can present overall pictures of health, wellbeing, socialization, time budget and physical activity. The results can provide in-depth knowledge of the users' dynamics at specified locations as input for urban regeneration decisions, planning and design of healthy corridors and implementation of place oriented NBSs.

## INNOVATION ASPECT

- Non-participant observation method with the help of new information and communication technologies for documenting and mapping;
- Can reveal important patterns in public space use with the help of various cartographic and other methods for visualization.

## REPLICATION AND SCALABILITY

- Easy replicable in smaller scope and useful in diverse places of interest;
- Quality of replication relates to initial preparation, instructions, motivation and potential use of reliable hardware;
- Processing and visualization of data through GIS, illustration and preprint design techniques possible with the help of free and open source software.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Very relevant for the in-depth understanding and communication of performed activities, usual or extraordinary behaviour observed in a public space.

CO-SELECTION
Particularly relevant for the informed selection of solutions more suitable to the public life which adapted to the existing environment and was cultivated in time.

CO-DESIGN
Particularly relevant for preliminary evaluation of the impact from planned and designed interventions. Also relevant for the involvement of volunteers from the community to help them to understand places beyond their routine.

CO-IMPLEMENTATION
Can be relevant if included between phases of implementation and as part of tactics for gradually evolving design and realization, step by step.

CO-MONITORING
Particularly relevant to emerging issues during monitoring for the improvement of implemented solutions and the overall evaluation of the transformation of public life, pattern of old and new activities, changes in the behaviour of users.

## BEST PRACTICES and REFERENCES

LINKS:
Gehl collaborated with the J. Max Bond Center for a study of public life and urban justice in New York City in 2015. Gehl Architects included behavioural mapping in a report for the historical centre of Sofia in 2017. It was preceded by two demonstration projects of the Union of Bulgarian Spatial Planners – Share the Neighborhood and Urban Standard.
More: urbinat.eu

## COMPLEMENTAR NBS FROM URBINAT

ADAPTIVE REUSE OF URBAN NETWORK SPACE

LEARNFORLIFE

COMMUNITY--BASED ARTS PROJECTS

3D MODEL THINKING

SOLIDARITY MARKET FOR CHILDREN

LOCAL EXCHANGE AND TRADING SYSTEM

BREAD HOUSES NETWORK

BEHAVIOURAL MAPPING

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NBSpart12

3D models + nbs cards

3D Model thinking

3D Model - Combra

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URBiNAT

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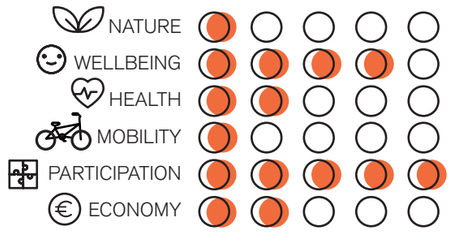
NBSpart13

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

3D MODEL THINKING

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# NBSpart13 3D MODEL THINKING



## DESCRIPTION

Model thinking is a collaborative design tool to develop urban and architectural projects with experts and citizens, in the frame of participatory processes.
Architects, landscape architects and urban planners don't lose their role as experts but engage citizens in the design process in order to explore common visions/ideas/ proposals.
The models are co-designed and co-build in workshops by participants with materials and objects that were collected by all of them. These materials can be the traditional ones, has wood or paper, or the improbable ones, has metal or plastic objects taken from everyday life.
The construction of the model can be the first step for creating consensus, by the common effort of representing the existing urban context in a small scale. Around the 3D physical models, participants can easily make strategic proposals and integrate other inputs.

## INNOVATION ASPECT

- It's a participatory nature-based solution, with a human-centered approach, to engage citizens in creation of solutions for their territory. Models not only represent realities, ideas and proposal but are also a platform for creativeness, where ideas can be discussed and consensus can be achieved.

## REPLICATION AND SCALABILITY

- The 3D models are site specific but the methodology for the construction of the model and for the activity can be replicated in several contexts.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Models are an abstraction of reality and are also its simplification. In this sense, it can be used to represent the main characteristics of the diagnostic, where specific elements can be highlighted.

CO-SELECTION
Models of urban areas can support the decision-making process, by simulating the implementation of solutions.

CO-DESIGN
Models of urban areas are platforms for designing solutions together with different experts and also with stakeholders. Models have a close relation with the existing elements - topography, buildings, public space. It's also possible to represent new buildings, new public space, as squares, roads, or even activities.

CO-IMPLEMENTATION
Real scale prototypes can be developed to test the solutions, simulating material and immaterial solutions, as amphitheater, or a solidarity market.

CO-MONITORING
-

## BEST PRACTICES and REFERENCES

LINKS:
URBiNAT 3D Model in Porto (2019)
URBiNAT 3D Model in Hoje-Taastrup (2020) - Link
URBiNAT Virtual Reality Model in Porto Urban Plan (2020)

## COMPLEMENTAR NBS FROM URBINAT

CYCLING AND PEDESTRIAN PATH

ADAPTIVE REUSE OF URBAN NETWORK SPACE

PHOTOVOICE

COMMUNITY WORKSHOPS

LEARNFORLIFE

EMPOWER-MENT EVALUATION

BEHAVIOURAL MAPPING

Picture by Fernanda Curi

Picture by Carlos Barradas

# NBSpart14

## CHALLENGES ADDRESSED

| | | | | | |
|---|---|---|---|---|---|
| NATURE | ● | ● | ● | ○ | ○ |
| WELLBEING | ● | ● | ● | ● | ○ |
| HEALTH | ● | ● | ● | ○ | ○ |
| MOBILITY | ● | ● | ○ | ○ | ○ |
| PARTICIPATION | ● | ● | ● | ● | ● |
| ECONOMY | ● | ● | ● | ○ | ○ |

## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

**COMMUNITY-BASED MONITORING**

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

# COMMUNITY-BASED MONITORING

NBSpart14

## DESCRIPTION

Tool for participatory decision-making improvement. It promotes an organized way of collecting ongoing or recurring information by residents, to be used by local governments and civil society, for planning, budgeting, and implementing local development programs, as well as for monitoring and evaluating their performance. Its activities cover community mapping, mobilization, capacity building, and information dissemination. Its benefits include:
- identification of problems and solutions in areas with fragmentation of needs and different vulnerable groups, which make it difficult to provide standardized solutions
- collective elaboration of simple and intuitive indicators
- contrast to lack of transparency and clientelism
- creation of relations of mutual trust between citizens and public officials
- awareness about policy-making helping citizens to understand the constraints of public action.

## INNOVATION ASPECT

- Development of local data not otherwise available;
- Continually improve systems of policy-making, programme implementation, monitoring of policy impacts and local needs, policy/programme adjustments and change;
- Citizen engagement and social accountability;
- Use of ICT-based tools, added value in pandemic periods. E.g. tablets connecting monitoring group.

## REPLICATION AND SCALABILITY

- Needs commitment, both financial and human resources, of local governments in this process;
- The concept of community must take into account, simultaneously, relations between individual citizens and public policies/projects, as well as the action of intermediate bodies, i.e aggregate stakeholders and their capacity to activate collective dynamics.

## PARTICIPATION PROCESS

8 step process (as defined by the community-based monitoring systems network), transversal to the co-creation process:

CO-DIAGNOSTIC
1. advocacy/organization
2. data collection and field editing organization
3. data encoding and map digitalization
4. processing and mapping

CO-SELECTION & CO-DESIGN
5. data validation and community consultation
6. database (knowledge)
7. plan formulation

CO-IMPLEMENTATION & CO-MONITORING
8. dissemination, implementation and monitoring

The Co-decision method includes:
- the creation of a large partnership of actors
- collective creation of a set of indicators and core-questions
- training activities for creating the pre-conditions for the success of the inquiry
- collection, compilation, interpretation, and dissemination of data
- creation of common arenas of deliberation
- community-based evaluation of public policies and projects, and monitoring of their implementation

## BEST PRACTICES and REFERENCES

LINKS:
Basic Principles of Community-Based Monitoring
https://issuu.com/uclgcglu/docs/community-based_monitoring
An informative and practical guide for local and regional leaders on the realities of the practice with real case studies and analysis. Developed by CES for United Cities and Local Governments and German Development Cooperation.

## COMPLEMENTAR NBS FROM URBINAT

- FORUM THEATRE
- PHOTOVOICE
- COMMUNITY WORKSHOPS
- LEARNFORLIFE
- SUPERBARRIO
- COMMUNITY--BASED ARTS PROJECTS
- 3D MODEL THINKING

## 4.4 - Social and Solidarity Economy NBS

The social and solidarity economy NBS factsheets are shown in the followings pages.

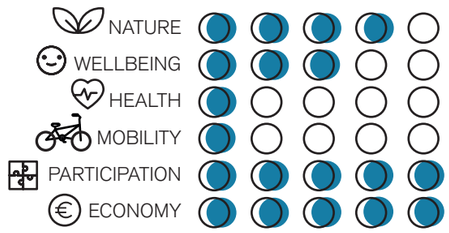
Solidarity Market and fair for children

Solidarity Market and fair for children

Solidarity Market and fair for children

# NBSsoli1

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

**SOLIDARITY MARKETS AND FAIRS FOR CHILDREN IN THE PUBLIC SPACE**

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URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

# SOLIDARITY MARKETS FOR CHILDREN

NBSsoli1

## DESCRIPTION

The exchange markets are examples of practices that promote new ways of consuming goods and services based on reciprocity, solidarity and justice. They can strengthen a more adequate perception of public space as a space for everyone. The markets allow pedagogically to work with the detachment of children in relation to toys and various goods consumed, unraveling the sense of fun from the idea of accumulating objects that are always new (Lucas dos Santos & Caitana, 2014). Associating elements such as generational sustainability and the socialization of children in the context of urban regeneration further enhances the markets in their transformative role, since: it makes the child aware of the relationship between finitude of resources, the recognition of urban spaces as a space that must integrate everyone without discrimination and the re-construction of consumption as a collective act.

## INNOVATION ASPECT

- Promoting new ways of consuming goods and services based on reciprocity, solidarity and justice;
- Changing individual and collective behaviors based on other consumption criteria already experienced since childhood;
- Raising children's awareness about limits and scarcity of natural resources, urban inclusion, and consumption as a collective act.

## REPLICATION AND SCALABILITY

- The new created values are shared with the families with a positive impact for future generations, setting up bases for generational sustainability;
- The schools can promote markets as creative pedagogical practices and can contribute to their replication, through the integration with the urban space.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Participants are identified and will be able to assess the need and conditions to implement the market., supporting the definition of the best criteria that apply to the territory.

CO-SELECTION
-

CO-DESIGN
The markets are designed with children, in order to guarantee them the right to participate actively in activities that affect them. Participatory planning is the way in which markets can be adapted from the beginning, enhancing the community's ongoing bond and adhesion.

CO-IMPLEMENTATION
The implementation of the markets involves: 1) technical professionals responsible for ensuring the logistical and infrastructure conditions in the public space, 2) the families, by being present in the activities together with the children and contributing to the pedagogical objectives, 3) children and youth from the communities.

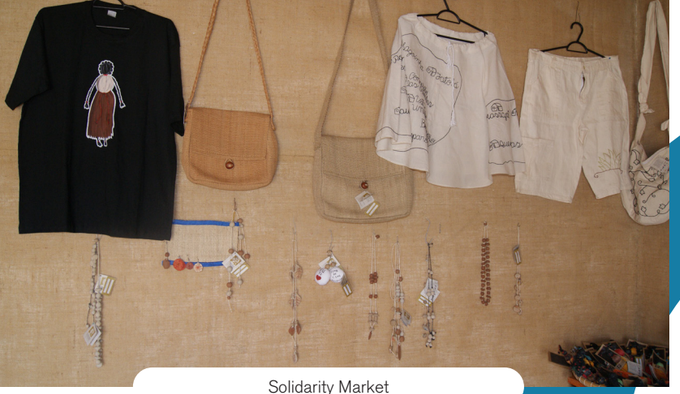
CO-MONITORING
As part of the methodology to assess the markets during their implementation as a way of monitoring the progress and correcting possible deviations that may arise.

## BEST PRACTICES and REFERENCES

LINKS:
URBiNAT solidarity market for children in Porto: CampMarket
Exchange Market for Children - Coimbra Portugal: http://nacasadaesquina.blogspot.com

## COMPLEMENTAR NBS FROM URBINAT

- MULTIUSE WOOD STRUCTURE
- FORUM THEATRE
- PHOTOVOICE
- PARTICIPATORY BUDGETING AND EMPAVILLE SERIOUS GAME
- COMMUNITY CURRENCIES
- TIME BANK
- LOCAL CURRENCIES FOR NATURAL BASED CIRCULAR ECONOMY



Solidarity Market

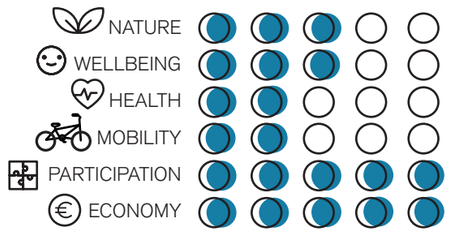
Solidarity Market

Solidarity Market

# NBSsoli2

# SOLIDARITY MARKETS AND FAIRS

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## SOLIDARITY MARKETS AND FAIRS IN THE PUBLIC SPACE

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## DESCRIPTION

In these spaces of conviviality products, knowledge and services manufactured by the own participants are exchanged using or not social currencies as intermediary mechanisms. These markets intensify the social dynamics through valuing the knowledge diversity from the community and creating a circuit of integration and economic autonomy. The markets/fairs contribute to a broader movement focused on rediscovery of the local and popular economy. It innovates by combining three distinct elements in the same space in society: the social ties of proximity, solidarity consumption and the use / occupation of public spaces. Into the markets we find the figure of the "prosumer" who refers to the person who is both consumer and producer. For the continued participation of community members, the markets can be implemented through a local residents' committee and through activities beyond market spaces.

## INNOVATION ASPECT

- Promoting consumption through the combination of shared management and collective consumption practices;
- Foster new ways of sociability and urbanities;
- Expanding and diversifying the functionality of public spaces;
- Building a space for debate and political articulation to face community social problems.

## REPLICATION AND SCALABILITY

- Markets naturally have enormous potential for scale-up, participation and emancipation;
- The number of stakeholders, the diversity and demand of offered products increase as communities become more aware of markets' existence ;
- The resources needed for its implementation can be easily found in any urban context.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Mapping popular economic initiatives in the neighborhood, managed by individual or collective producers (producers, craftsmen, self-employed professionals). Simultaneously, mapping the community's needs in terms of products/goods and services.

CO-SELECTION
-

CO-DESIGN
The mobilization of the local community for active participation in market planning can be carried out through the constitution of a local committee that could be composed by citizens, local associations, and other stakeholders from municipalities, universities and local economic initiatives.

CO-IMPLEMENTATION
The market for its implementation can need the adaptation and/or construction of adequate infrastructure in public spaces as well as dissemination and community mobilization activities.

CO-MONITORING
Specific categories can be taken into account to monitor with participants the implementation and results obtained.

## BEST PRACTICES and REFERENCES

LINKS:
URBiNAT solidarity market in Porto: CampMarket (under development). See the project in this link
Troca-a-Tod@s Fair. Local: Covilhã - Portugal. https://coolabora.pt
Digital solution for social currencies and payments: Clickoin - https://web.clickoin.com and Cyclos - https://www.cyclos.org

## COMPLEMENTAR NBS FROM URBINAT

- URBAN MUSHROOM FARM
- THE GROWING CLASSROOM
- FORUM THEATRE
- CULTURAL MAPPING
- WALKTHROUGH / FOCUS GROUPS IN SITU
- COMMUNITY WORKSHOPS
- EMPOWERMENT EVALUATION

NBSsoli2

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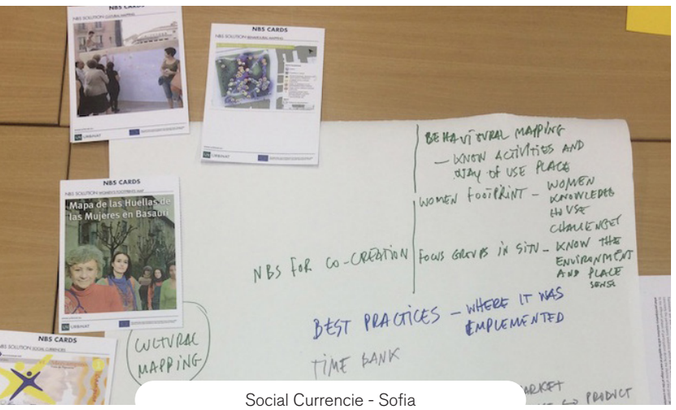
Social Currencie


Social Currencie




Social Currencie - Sofia


Social Currencie

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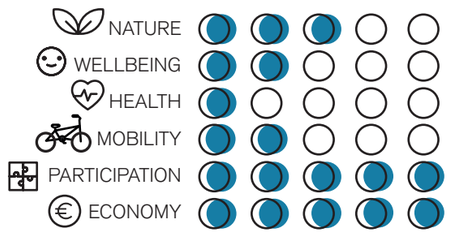
# NBSsoli3

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| | | |
|---|---|---|
| SOFT | MEDIUM | HARD |

## REPLICATION POTENTIAL/FLEXIBILITY

| | | |
|---|---|---|
| LOW | MEDIUM | HIGH |

## AMORTIZATION PERIOD

| | | | |
|---|---|---|---|
| SHORT | MEDIUM | LONG | NA |

## INVESTMENT

| | | | |
|---|---|---|---|
| LOW | MEDIUM | HIGH | NA |

## COMMUNITY SOCIAL CURRENCIES FOR INCLUSIVE

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# COMMUNITY SOCIAL CURRENCIES

NBSsoli3

## DESCRIPTION

Social currencies could be created with physical (or virtual) support and managed by a community with the objective of promoting local economy, especially in places where there are vulnerabilities. Its use is voluntary and the purpose is not to replace the official currency or to seek the accumulation or capitalization but they are primarily intended to expand exchanges between people with products of different use value, facilitating exchanges that would hardly occur from direct exchange. The necessary basis for its circulation is the democratic management and the mutual trust relationship. Despite its restricted circulation, this currency may have a political meaning, as it results from a community process of construction and decision, strengthening the symbolic autonomy of the subjects and the communities (Lucas dos Santos and Caitana, 2014 ).

## INNOVATION ASPECT

- It's linked to simple methods for their implementation, with significant effects and changes in the communities;
- The social currencies expand access to goods and services, and to the bonds of mutual trust;
- It alters the local economy with the population's adhesion and allows to keep wealth into neighborhoods.

## REPLICATION AND SCALABILITY

- Adherence to the use of social currencies within the scope of solidarity markets;
- The use of currencies can be expanded in local commerce, going beyond the markets and reaching a larger community.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Participants will be able to prepare an action plan. The information brought by the participants and discussed in the collective will help to define the best criteria that apply to the context of the territory.

CO-SELECTION
-

CO-DESIGN
The definition of name, use and scope, implies an intense discussion in the collective. Their implementation involves a strong relationship of trust among all.

CO-IMPLEMENTATION
The social currencies may or may not assume parity with the conventional currency. Its use may occur in different contexts: into the solidarity markets, fairs, or local commerce. It may operate with the possibility to change conventional currency by social currency giving users some kind of advantages (e.g. discount) to stimulate its use.

CO-MONITORING
The creation of groups for management will be able to assume the monitoring as one of their activities.

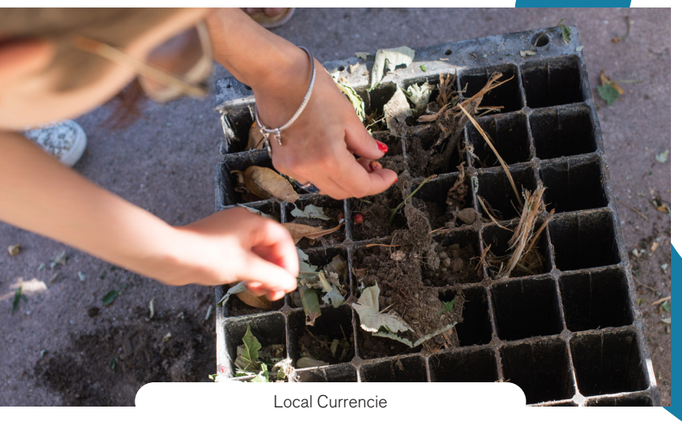
## BEST PRACTICES and REFERENCES

LINKS:
Currency Mor in Portugal: https://moedamor.pt
Currency "Waste" - Campolide. Portugal: http://portugalparticipa.pt/News/Details/2095c60c-11fd-4715-bc97-fcb3864f5597
Spain:
Vila Watts - energy and social currency: http://www.vilawatt.cat/es/moneda

## COMPLEMENTAR NBS FROM URBINAT

- CULTURAL MAPPING
- COMMUNITY WORKSHOPS
- SOLIDARITY MARKET FOR CHILDREN
- TIME BANK
- BREAD HOUSES NETWORK
- FARMERS MARKETS NETWORK
- LOCAL CURRENCIES FOR NATURAL BASED CIRCULAR ECONOMY

Local Currencie



Local Currencie

Local Currencie

Local Currencie

# NBSsoli4

# LOCAL CURRENCIES FOR NATURAL BASED CIRCULAR ECONOMY

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## CHALLENGES ADDRESSED

| | | | | | |
|---|---|---|---|---|---|
| NATURE | ● | ● | ● | ● | ● |
| WELLBEING | ● | ● | ● | ○ | ○ |
| HEALTH | ● | ● | ● | ○ | ○ |
| MOBILITY | ● | ○ | ○ | ○ | ○ |
| PARTICIPATION | ● | ● | ● | ● | ● |
| ECONOMY | ● | ● | ● | ● | ● |

## IMPLEMENTATION

| | | |
|---|---|---|
| SOFT | MEDIUM | HARD |

## REPLICATION POTENTIAL/FLEXIBILITY

| | | |
|---|---|---|
| LOW | MEDIUM | HIGH |

## AMORTIZATION PERIOD

| | | | |
|---|---|---|---|
| SHORT | MEDIUM | LONG | NA |

## INVESTMENT

| | | | |
|---|---|---|---|
| LOW | MEDIUM | HIGH | NA |

## DESCRIPTION

The main goal is to promote the waste recovering through a highly social efficient separation strategy. This would aim to separating mix waste into different fractions, organic and plastic in particular, in order to properly recycling each of them. To properly separate and recover the different fractions citizens have to look at the waste of a community as a natural resource in a metabolic perspective. In this sense, giving a reward to citizen that can be used in local commerce would foster the diffusion of this perspective. It would also constitute a deep and effective injection of wealth and an increasing of local transactions. A Natural Based Currencies can be considered as an exploratory solution adapted to recycling challenges and would represent a high synergy bio mimetic solution

## INNOVATION ASPECT

- To enhance local transactions thanks to a local currency that boost proper waste separation practices;
- To improve the transition towards natural based local ecosystems through the implication of local administration and stakeholders in a systemic way;
- The currency can be used as discount in commerce retailers or for paying municipal taxes.

## REPLICATION AND SCALABILITY

- High potential for replicability since the resources needed for implementation are found in almost all neighborhoods;
- It can be disseminated through the use of digital resources Clickoin or Cyclos applications.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
The resources that will support the currency (e.g. organic, plastics, electronic devices, etc.) will be decided in a participatory process in each local community.

CO-SELECTION
-

CO-DESIGN
-

CO-IMPLEMENTATION
Every home, commerce or economic actor produces waste and therefore anyone can earn currency and wealth just by performing a more effective waste separation.

CO-MONITORING
The weight of the selected fraction of waste that a single person separates (organic or/and plastic, or/and others) will be monitored as an amount of currency issued: "my separate contribution generates money and wealth !!".

## BEST PRACTICES and REFERENCES

LINKS:
La MOLA (Liberated Organic Matter) https://www.monedamola.com/
IRATI - Local Complementary Currency
http://mancomunidad-irati.es/irati-ekhi-moneda-intercambio-reciclaje-birziklatzean-trukerako-txanpona/

## COMPLEMENTAR NBS FROM URBINAT

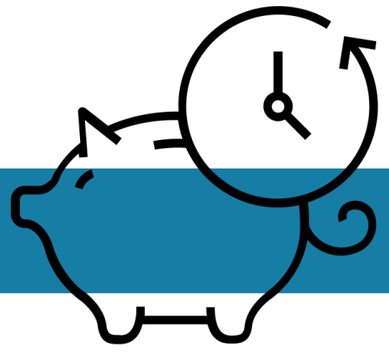
- FOOD PRODUCTION AND LEISURE PAVILION
- MULTIUSE WOOD STRUCTURE
- PHOTOVOICE
- COMMUNITY WORKSHOPS
- PARTICIPATORY BUDGETING AND EMPAVILLE SERIOUS GAME
- SOLIDARITY MARKET FOR CHILDREN
- LOCAL CURRENCIES FOR NATURAL BASED CIRCULAR ECONOMY

NBSsoli4

Time Bank - Coimbra

Time Bank - Coimbra

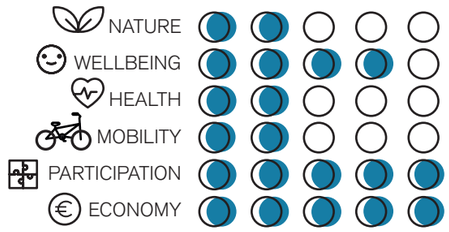
Time Bank - Coimbra



Time Bank

# NBSsoli5

## CHALLENGES ADDRESSED




### IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

### REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

### AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

### INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

# TIME BANK

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URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

## DESCRIPTION

Time Bank is a system that encourages the solidary exchange of knowledge, services and products without money as an intermediary. It meets both the offer and demand of services provided by participants. It uses time-based currency, which is valued equally, independently of the type of the knowledge, skills or tasks: for each hour participants give to help the community, they earn one hour's credit in their time bank. Key principles of Time Banking also include: "everyone's skills are useful" and "everyone needs to give and receive time". This solution strengthens the networks of social support, as well as the sense of belonging to the community. It is also a great opportunity to reduce loneliness and amplify the models to value the time and the mutual care between neighbors. Members of existing experiences report that they acquire new skills, meet new people, and feel healthier.

## INNOVATION ASPECT

- The promotion of intergenerational relations based on reciprocal and solidarity attitude.
- The community becomes the reference for help, in face of social changes and when there are no close family members.
- The use of digital enablers to support the interactive communication among citizens and to engage different target audiences.

## REPLICATION AND SCALABILITY

- The replication of Time Banking can be coordinated by organizations or individuals.
- Active networks in different European countries can be of support and share knowledge.
- Resources needed for implementation are easily found in any urban or rural context.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
A stage to identify existing experiences close to the neighborhood, as well as to map available resources.

CO-SELECTION
-

CO-DESIGN
Participants will organize a local coordination and define its functioning.
Existing regulations and codes of conduct can be used as references.

CO-IMPLEMENTATION
The exchanges of services can take place between two members or in groups.
After the activation, anyone who needs a particular service can contact the local coordination.
The coordination contacts the available members and informs them about the service needed and who is requesting it. Membership cards can be used when people do not know each other.

CO-MONITORING
Specific categories can be taken into account to monitor with participants the implementation and the results obtained.
Measure and monitor the performance, number of participants, as well as the exchanges undertaken and their frequency.

## BEST PRACTICES and REFERENCES

LINKS:
Experiences in Portugal: Graal - Banco de Tempo
https://bancodetempo.pt

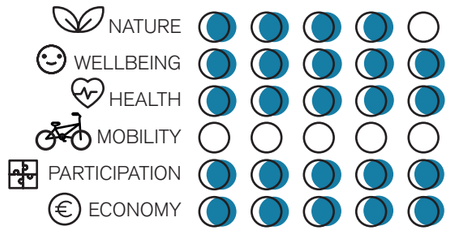
## COMPLEMENTAR NBS FROM URBINAT

- FOOD PRODUCTION AND LEISURE PAVILION
- URBAN MUSHROOM FARM
- GROW TILE
- COMMUNITY WORKSHOPS
- DESIGN THINKING
- EMPOWER-MENT EVALUATION
- COMMUNITY CURRENCIES

# NBSsoli6

# BREAD HOUSES NETWORK

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

@Bread Houses Network

BREAD HOUSES NETWORK

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www.urbinat.eu

URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

## DESCRIPTION

The Bread Houses Network is an initiative of International Council for Cultural Centers Association. It creates and unites centers for community-building, creativity, and social entrepreneurship. The mission of BHN is to inspire individuals and communities to develop their creative potential and cooperate across all ages, professions, gender, special needs, and ethnic backgrounds through collective bread making and accompanying art forms. The network strives to empower the people to connect with each other and find hope and solutions to their challenges. Currently, the network unites 8 Bread Houses in Bulgaria and trained people and organizations in 20+ countries on 6 continents.

## INNOVATION ASPECT

- Collective preparing and sharing of food facilitate community building;
- The inclusive "Theatre of Crumbs" method and "Build a Bread House" events allow involvement of people with different, backgrounds, abilities;
- Bread as symbol of peace and unity and the bread making foster cooperation and collective experience across cultures, professions, ages.

## REPLICATION AND SCALABILITY

- The concept of the Bread House is to be an accessible and friendly space where people from all walks of life can gather and participate in collective creative activities;
- The Bread House can be a social and cultural centre and a successful social enterprise at the same time. The social enterprise model can include the Event centre and Bakery forms.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC & CO-DESIGN & CO-IMPLEMENTATION

Bread Houses Network creates opportunities for co-designing and co-creating through the "Theatre of Crumbs" method and the "Build a Bread House" educational board game.

The Theatre of Crumbs method consists in collective bread making during which the participants are engaged in creative activities: drawing in flour and expressing ideas on a chosen topic; mixing dough in couples; making and decorating bread puppets and playing out a collective story. Every bread making has a specific topic, which can be related to any aspect of the community or personal life, fostering direct cooperation, co-creation and self-expression.

In the "Build a Bread House" educational game, the participants identify and discuss the challenges in their community and collectively propose solutions for overcoming them. The game enables collective creation of ideas and design of solutions, but also teaches basic social entrepreneurship skills.

CO-SELECTION

-

CO-MONITORING

-

## BEST PRACTICES and REFERENCES

LINKS:

The model and methods of the Bread Houses Network have been awarded and recognized as good practices by various international organizations. As an example, the Sofia Bread House cooperation with the Health and Social Development Foundation was dedicated to educational bread makings for children of Roma origin between 4 and 8 years old.

## COMPLEMENTAR NBS FROM URBINAT

- BEEHIVE PROVISION AND ADOPTION
- CULTURAL MAPPING
- MOTIVATIONAL INTERVIEWING
- COMMUNITY--BASED ARTS PROJECTS
- SOLIDARITY MARKET FOR CHILDREN
- TIME BANK
- FARMERS MARKETS NETWORK

NBSsoli6

@UACEG


@UACEG

@ Farmers'"Market Network"

www.urbinat.eu

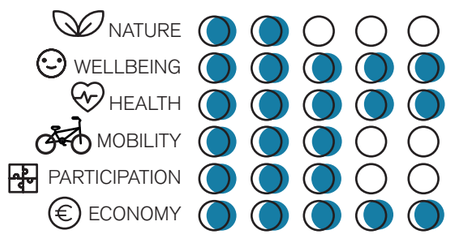
URBiNAT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776783

# NBSsoli7

# FARMERS MARKETS NETWORK

## CHALLENGES ADDRESSED




## IMPLEMENTATION

| SOFT | MEDIUM | HARD |
|---|---|---|

## REPLICATION POTENTIAL/FLEXIBILITY

| LOW | MEDIUM | HIGH |
|---|---|---|

## AMORTIZATION PERIOD

| SHORT | MEDIUM | LONG | NA |
|---|---|---|---|

## INVESTMENT

| LOW | MEDIUM | HIGH | NA |
|---|---|---|---|

## DESCRIPTION

The Farmers' market (FM) is an alternative food network that provides shorter delivery circuits of farmers' products to local communities through direct interaction with farmers in the urban environment. This practice enables restoration of the connection of inhabitants of bigger cities to land, fresh and good quality tasty food of healthy origin. It raises people's awareness on nature-friendly farming practices, provides access to good quality local production, thus leading to healthier lifestyles and new social networks and relations. The Farmers' Markets have an additional social value as a community event that may bring additional elements. The farmer-consumer cooperatives or other organizations could operationalize efforts by bringing together farmers and acting as a platform securing farmers meet a set of requirements for access and organise farmer market venues and events.

## INNOVATION ASPECT

- FM builds local social networks ;
- FM brings together farmers and consumers;
- FM shortens supply chains;
- FM allows sharing and keeping knowledge, practices, and values.

## REPLICATION AND SCALABILITY

- The farmers' market models can be easily adapted in each location and urban environment, which makes it ready for replication, by integrating local specifics;
- Resources for its organisation are to be found in any location – urban or rural;
- The farmers' market scale depends on local potentialities and the organization ability.

## PARTICIPATION PROCESS

CO-DIAGNOSTIC
Identification of the socioeconomic profile of the community by analysing the neighbourhood economic data, focus groups, and "cultural mapping.

CO-SELECTION & CO-DESIGN
-Starts with awareness raising and mobilization of interested local community members and active dissemination of information about the market. Provides opportunities for community members to discuss during accompanying events.

CO-IMPLEMENTATION
Community members can be involved in the organisation of workshops and accompanying activities. Possibility to establish a long-term body responsible for communication and dissemination of information.

CO-MANAGEMENT
Stakeholders could be involved for the management of the market's legal entity. Formal or non-formal structures and groups could be involved.

CO-MONITORING
Interviews, questionnaires, and feedback collection techniques can be applied. A steering committee and a partnership with the local technical teams are essential for the participatory monitoring process.

## BEST PRACTICES and REFERENCES

LINKS:
FM in several neighbourhoods in Sofia, as well as monthly farmer market fests in the centre of Sofia have become a new phenomenon over the last 4 years. They contribute to fostering a healthier consumer identity and provide a new cultural and social space for encounters, and shared identity. In Sofia – Hrankoop Cooperative has leaded the process.

## COMPLEMENTAR NBS FROM URBINAT

- URBAN MUSHROOM FARM
- WILDLIFE PARK
- BEEHIVE PROVISION AND ADOPTION
- ADAPTIVE REUSE OF URBAN NETWORK SPACE
- COMMUNITY-BASED ARTS PROJECTS
- BREAD HOUSES NETWORK
- LOCAL CURRENCIES FOR NATURAL BASED CIRCULAR ECONOMY

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NBSsoli7

# 5 – The implementation of URBiNAT NBS “living” Catalogue in the co-creation process

## 5.1 –The co-creation of the New NBS

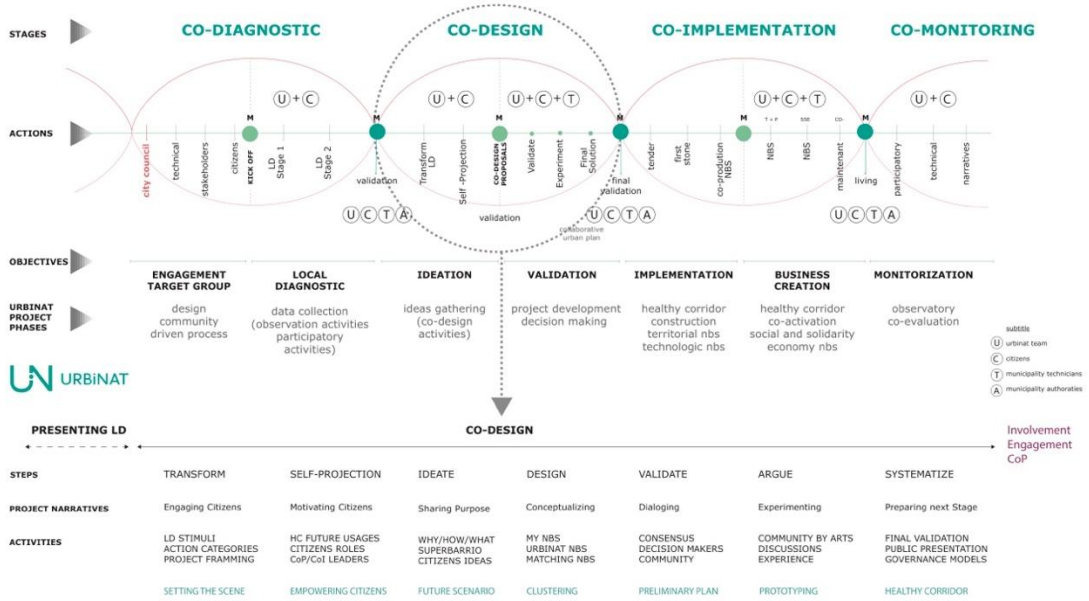


Figure 10. *URBiNAT co-creation approach scheme*

The URBiNAT NBS “living” catalogue, previously presented, has been the main tool used in the co-creation of New NBS, one of the main goals of the URBiNAT project. As stated before, citizens and stakeholders have been challenged to identify their needs and design together with URBiNAT teams innovative NBS solutions. The co-creation of New NBS takes into consideration the NBS catalogue, as an inspiration, but also as source of technical knowledge that can be used in support of the development of new solutions. New NBS have been (and will be) co-created during the 4 stages of the process: co-diagnostic, co-design, co-implementation and co-monitoring. This methodology is adapted to the local participatory culture of each city and aims to raise the level of participation, decision-making and influence of citizens and stakeholders within a co-governance context.

The co-diagnostic stage identifies the baseline for the co-design of New NBS. The experts identify existing NBS in the city and the institutions and local citizens that are already implementing them. During this stage, participatory activities are developed to create awareness of NBS and their benefits, and to identify the needs and challenges relating to the use of public space, the environment, society and the economy.

The co-design stage builds on the results achieved in the diagnostic in order to start the process of co-selecting solutions or ideas that can address identified needs.

The URBiNAT approach does not require citizens in intervention areas to select solutions from its NBS catalogue. Instead, thanks to the openness of the co-creation process, it also allows citizens to bring their own solutions and ideas in order to design together the New NBS. At this stage (ideation phase), citizens share the purpose of their proposals in order to create a sense of community.

In this sense, citizens first generate their ideas according to their day by day experience with the urban context. Then, the ideas are tested in individual or collective projects and events, namely the ones framed by the municipality or associations. During the co-design phase, New NBS can emerge as a combination of catalogued NBS, as an adaptation of existing concepts in the territory or as the generation of new or related ideas. Others, more culturally rooted and already perceived as established social practices, can be rethought as NBS after an in-depth observation of the studied territories.

The validation of new ideas is achieved through a process of dialogue between different actors to tailor proposals. This process is needed to better define the ideas and transform them into NBS, without focusing only on needs, challenges and priorities of the study area but also on different subjects, such as aims and approaches. With this approach developers of the urban project can complete their set of solutions with the New NBS and be more certain that it achieves a better adapted catalogue for each city and the specificities of each Healthy Corridor.

These common achievements can be tested through experiments and prototypes, to demonstrate the merits of proposals and their impact. It is a moment of discussion between different actors participating in the process as well as an opportunity to open proposals to a wider public in the community.

Finally, during the systematization phase of the co-design stage, actors involved in the process must agree on which NBS can be implemented or not. The decision-making process needs to be completed in three moments – analysis, discussion and decision. In order to establish a more concrete and objective NBS catalogue, and to enrich the project and the Healthy Corridor, it is essential to organize and analyse the ideas and concepts proposed by the citizens (the New NBS). The systematization can be composed by different levels and themes of analysis, but considering the ideas that are featured, it shall contextualize New NBS, preview the level of impact, and question feasibility and sustainability. Starting from this critical assessment, the technical team working on the process, together with citizens and politicians, may try to develop the proposed ideas, which can form the basis for the city catalogue, and fix relevant dimensions and constraints that are important for the project design. This exploration and review can detect and add information which is essential for the process. Finally, these analyses are shared with citizens and stakeholders of each New NBS to promote an exchange of arguments that will result in a decision about its implementation.

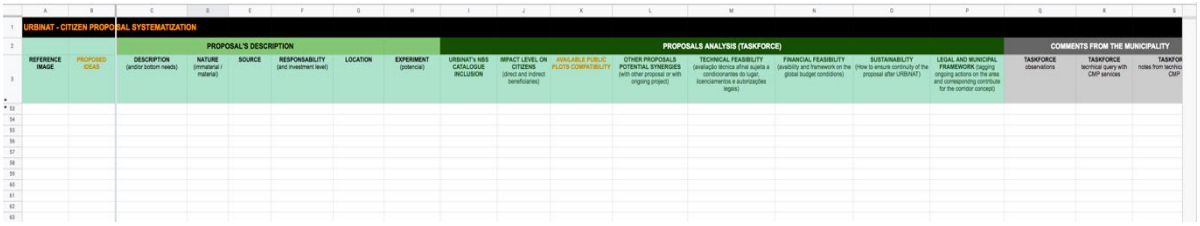


Figure 11. *English draft version for the systematization table of citizen proposed ideas: https://docs.google.com/spreadsheets/d/14oSTFZBaXnW5K5CFvZbA1DdOnGe6g1XdAnsI1UvZxFM/edit?usp=sharing*

After the decision-making process, New NBS are developed by small groups of people to be integrated in the Healthy Corridor strategy and prepare the co-implementation stage. New territorial NBS (including products and infrastructures) are developed in the frame of the constructions works, but New NBS that are more related with processes and services need the support of citizens and stakeholders to implement them with URBiNAT. These NBS can have more market potential if people are directly involved, e.g. a social market implemented together with citizens can face the social challenges of the same community, such as unemployment.

The co-creation process completes its cycle with the monitoring stage, that should also be assessed with the citizens and stakeholders. The objective is to evaluate the impact of NBS on their health and wellbeing.

### 5.1.1 – Monitoring and evaluation of the New NBS co-creation

URBiNAT's emphasis on the co-creation of NBS is strongly reflected in the evaluation framework. Considering that the processes of generating ecosystem services can take multiple shapes, considerable attention is devoted to the complex interaction among socio-cultural systems within the intervention area (district/neighbourhood level), including interactions between individuals and groups, and various kinds of NBS (Eklipse, 2017) in a co-production perspective. Thus, the focus will also be on the evaluation of the process methods (process-oriented perspective) that reveal the subjects' voices, their expectations, perceptions and experiences.

Clusters of NBS will be co-implemented in frontrunner cities with the active involvement of citizens, municipal staff, local and social associations and institutions, academic partners and other stakeholders. To analyse the effects of those implementations, including the participatory process, URBiNAT deliberately focuses on the whole co-creation process and on its results. This is done to capture the dynamic performance (both the short-term effects based on the immediate results within the project duration and the medium to long-term social impacts beyond the project), and to measure the status quo before the participation process and after some months of use of the new clustered NBS at the district level. The assessment model includes the following actions: (1) Devoting considerable attention to the complex interaction between socio-cultural system, economic and political dimensions within the intervention area (district/neighbourhood level), whose focus is on the evaluation of the process that reveal the subjects' voices, knowledges, expectations, perceptions, experiences, networks and interactions. (2) Using indicators tailored to NBS to combine qualitative information and quantitative data. (3) Collecting information from neighbourhood about physical activity, social activity, wellbeing, health and the satisfaction/dissatisfaction with the environment at district level through the use of surveys to (4) Observing open spaces using techniques of behavioural mapping, (5) measurements regarding the quality of air, soil and water. (6) Completing quantitative measures with spatial GIS analysis and statistical data.

A multidisciplinary approach is used to collect quantitative and qualitative data on a periodic basis within the study area. Datasets provide valuable information for monitoring and evaluation. **Monitoring is defined as the process of observation during the process of co-creation of NBS** in the study areas and their combination and extension into Healthy Corridors (co-diagnostic, co-design, and co-implementation). **Evaluation refers to the comparative assessment of the study area before and after the implementation of the Healthy Corridors.**

The URBiNAT Observatory platform facilitates monitoring and evaluation. It provides space for cities and project partners to gather monitored information as part of the ongoing process of co-designing and co-implementing NBS in the Healthy Corridors. It is supported by the *Digital platform of the Observatory* which creates a centralised digital environment where city officials, urban planners, as well as citizens can work interactively with the uploaded data (for further information about the Observatory please visit the URBiNAT webpage). In sum, the Observatory Platform focuses on research data conducted and content collected within T5.3 (health and wellbeing), T5.4 (economy and society), and T5.5 (local governance). These tasks provide data analyses to WP 2, 3, and 4 in order to evaluate the implementation process and to support the replication of the co-creation process for follower cities (MS5).

Aggregated data will be used to contribute to the establishment of an EU-wide reference framework for NBS (T5.6). In this regard, Task Force 2 has been put in place to assess the impact of the EU-wide reference framework on NBS as well as the Eklipse Report (2017). Moreover, the platform provides crucial information for the Scientific Community through open access research permissions, allowing any related research institution or private researcher to use URBiNAT data for comparison or other purposes. Locals from the intervention areas are expected to benefit from the data collected which they can share amongst themselves, and used to generate a generic understanding of conducted work and implemented NBS.

## 5.2 - From the catalogue to the Healthy Corridor

The URBiNAT NBS “living” Catalogue has been used and will continue to be used as a driver tool for the co-creation of the Healthy Corridor, being an inspiration for all the citizens and stakeholders that are taking part in the participation process. It is the starting point for the Healthy Corridor’s co-creation process. Therefore, actually, the Healthy Corridor, as a cluster of NBS, can be seen as the materialization of the URBiNAT NBS “living” Catalogue after its adaptation to the context of each city.

Originally, the Healthy Corridor concept is based on the “green corridors” concept. According to Isabel Ferreira (2005) the green corridor is defined as systems of linear spaces that are planned, designed and managed with multiple, compatible and synergetic uses, namely ecological, economic, recreational, cultural or aesthetic, compatible with the sustainable use of the territory. As (Hammerschmidt, 2016) proposes, more than the traditional green corridors that cross our cities, the Healthy Corridor aims to contribute to the overall health of the surrounding community.

In URBiNAT, the Healthy Corridor is a public space, both material and immaterial, that connects and links neighbourhoods by means of a physical pathway. But it also functions as a social, cultural and educational platform that integrates not only nature-based solutions but human-centered ones, providing a double effect on the environment and people’s health and wellbeing. A Healthy Corridor can occupy public and private urban plots or commons that connect different spaces and different communities, contributing to urban regeneration and the promotion of social and urban cohesion. In this sense, the URBiNAT Healthy Corridor will be activated in several Living Labs,

placed in the city's periphery and deprived areas, to implement a set of NBS, co-created with local citizens, stakeholders and local taskforces (URBiNAT partners, municipal technicians and political decisions makers) starting from the URBiNAT NBS "living" Catalogue. Based on co-production processes and people-centered perspective, URBiNAT will provide the citizens of social housing neighbourhoods the opportunity to co-diagnose, co-select, co-design, co-implement and co-monitoring NBS developed by them.

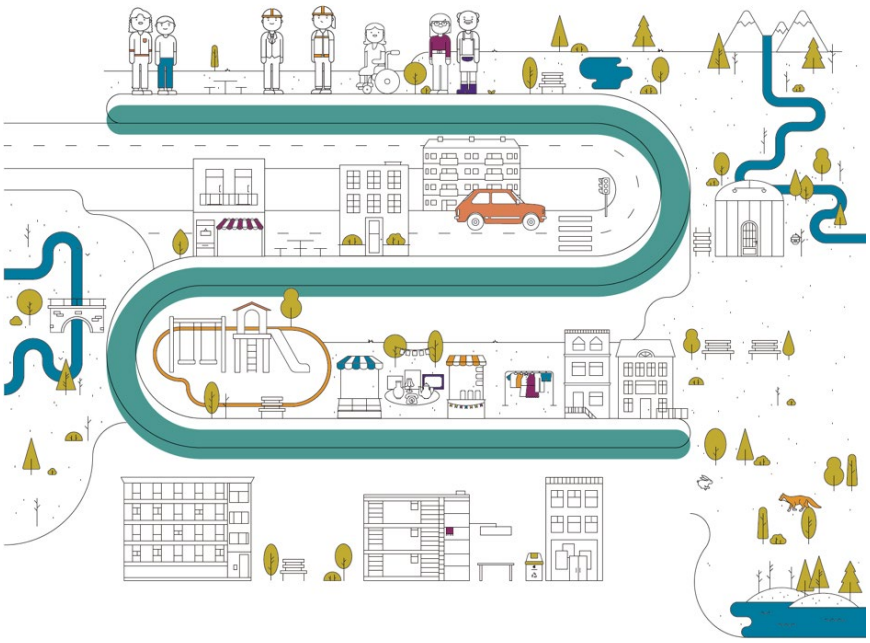

Figure 12. *Healthy Corridor concept (URBiNAT, GUDA, 2020).*

A Healthy Corridor is under development in the Living Labs of each city, based on the URBiNAT concept that combines different NBS (territorial, technological, participatory, social and solidarity economy) co-created from the catalogue. The combination and amount of each NBS, as well as the side effects between them is the consequence of the different needs and expectations identified during the co-creation process, namely the co-diagnostic and co-selection phases. However, the Healthy Corridor will be more than a collection of NBS, since the whole is more than the sum of its parts. URBiNAT develops a strategy to address specific social, environmental and economic needs of deprived areas of each city. The challenge that URBiNAT faces is about co-designing and implementing these solutions not as individual elements but as part of a broader strategy. This translates into a systemic approach that takes into account linkages and synergies between different components, including the public space created between individual NBS in the Healthy Corridor. The aim of distributing NBS along a Healthy Corridor is to enhance the visibility of solutions and maximize their impact at different levels such as ecological, social, economic and health.

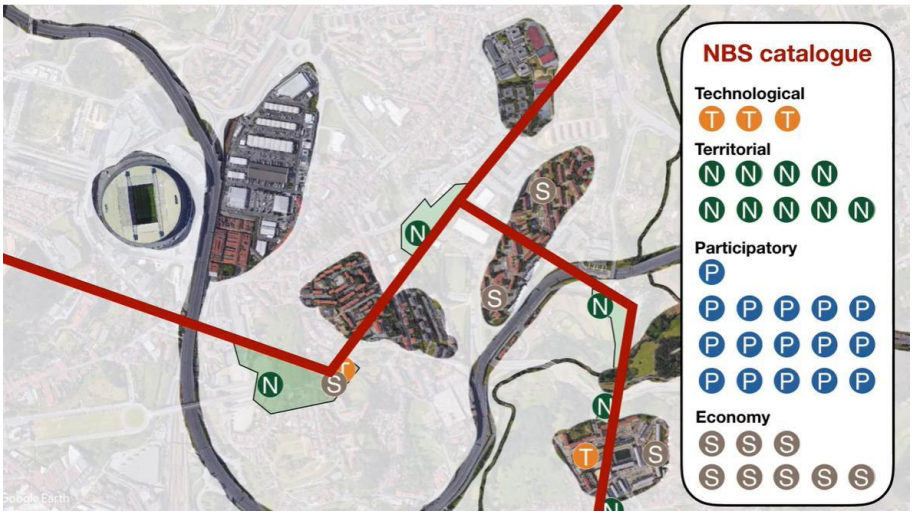


Figure 13. *Healthy Corridor as a cluster of NBS (Source: URBiNAT video https://www.youtube.com/watch?v=FWnH5T9GX9I)*

## 5.3 – The use of the catalogue for the New NBS co-creation in the frontrunner cities.

The URBiNAT NBS catalogue has been used on a number of occasions during citizen workshops in the frontrunner cities Porto, Nantes and Sofia. The purpose has been to offer inspiration to citizens in terms of what could be designed and introduced in their neighbourhood in terms of the different kinds of NBS. For this purpose, NBS cards and posters were developed providing a quick overview of the characteristics and functions of different NBS.

Citizens have used the NBS catalogue and especially the city-specific selection of NBS cards and posters as an inspiration. Often they have come up with their own NBS as a result of reviewing and discussing the existing catalogue. Citizens' workshops and other diagnostic methods have been adapted to introduce elements for discussing and applying the NBS catalogue as a way of putting into words what citizens would like to experience in their neighbourhoods.

Cities followed the co-creation process, as defined in subchapter 5.1, and have adapted it to the local culture, taking in consideration the participatory culture and the interaction between the taskforces. The three cities have already identified the main ideas and proposals, but a new co-design step needs to be realised in the months following the writing of this document to better develop the solutions together with citizens and stakeholders. In this sense, this chapter is more focused on the process itself than on the final results.

### 5.3.1 – Porto

The co-creation of NBS in Porto has completed two stages: co-diagnostic and the co-design. This process was carried out by local citizens, stakeholders (institutions and associations), and Porto Taskforce (CMP, DOMUS, CIBIO, CES, UC, GUDA). The calendar of activities for the co-creation of the New NBS in Campanhã (Porto) are summarised below.

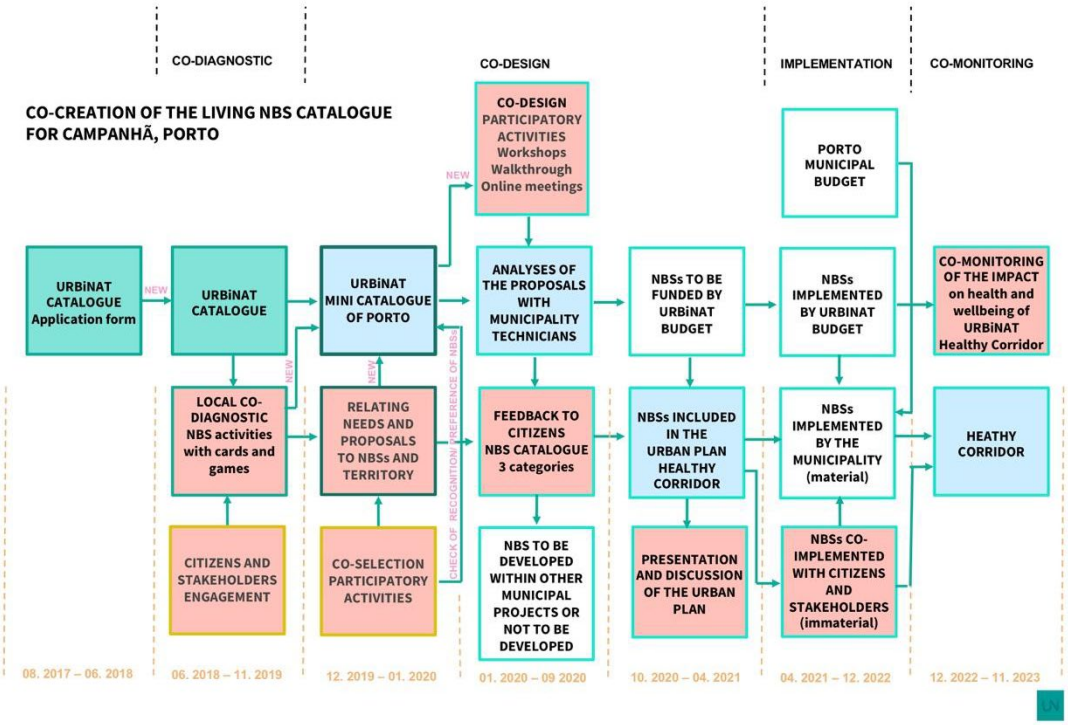


Figure 14. *Methodological steps of the co-creation process in Campanhã (Porto)*

The aim of the process was to start from the existing knowledge in the city and in the intervention area in order to identify needs, challenges and dreams of citizens, stakeholders and the municipality. Urban planning and the political strategy for the city were taken into account. The result is a catalogue of new ideas proposed by citizens and stakeholders. These have been analysed by the Porto Taskforce and have already been integrated in the preliminary study of the urban plan for the Healthy Corridor, to be presented in Deliverable 4.2 - Healthy Corridor Concept (available on the URBiNAT webpage).

As demonstrated in the local diagnostic, Porto already has an interesting experience in the implementation of NBS (Deliverable 2.1 - Local Diagnosis Report for Each Frontrunner City), namely with urban farms, such as *Horta da Oliveira*, built in 2018 in the intervention area, and many other NBS distributed throughout the city, green-roofs and green/blue areas covering considerable areas (e.g. City Park, one of the biggest green urban areas in Portugal).

During the co-diagnostic phase, the Porto Taskforce organised events during which the concept of NBS was discussed with participants. This was done with a view to understanding their perceptions of solutions, if they knew of NBS already implemented in Porto, and which NBS could be more useful in their community. During the events held in primary schools (Corujeira, Falcão and Cerco do Porto), the URBiNAT NBS "living" catalogue, in the form of posters, was used to introduce the topic with children from 6 to 10 years old. Afterwards, a public launch event was held in Corujeira Square including several engaging and educational games (e.g. *game of the goose*) where all citizens from "8 to 80" explored different questions – what do you know, what do you like, what do you want – while learning about URBiNAT.

Figure 15. *Corujeira Primary School, NBS Poster, May 2019 (left) and Corujeira Square, NBS Game, October 2019. (Photos by Carlos Barradas)*

After the Local Diagnostic, Porto taskforce organized a set of participatory activities to co-select and co-design the New NBS. This first phase consisted of 12 activities carried out with citizens, over a period of 6 weeks, between November 18, 2019, and January 24, 2020. These involved primary schools, citizens and associations of the Campanhã Parish (some were already participating, but others joined and participated for the first time). Among the 12 activities carried out, 5 were developed with adults (4 workshops in class and one walkthrough), and 7 with primary school-aged children (4 workshops in the school and 3 workshops that included a city walkthrough and a classroom activity).

The activities with primary school-aged children were focused both in their courtyards, where different needs were identified that could be addressed using NBS, and in the pathway from their primary school to the secondary school. During the walkthrough, children talked about what they liked and disliked, exploring the changes they proposed. This discourse was translated into a collective drawing that represents their purpose.

Figure 16. *Walkthrough and workshop with children and adults.*

The activities with adults were a moment to share their knowledge about the area, as well as to identify needs and solutions for the main challenges. In the final session with adults, some of the

NBS designed by experts for the URBiNAT NBS “living” catalogue were presented with the support of NBS Cards. Participants found that some of these NBS cards were not aligned with the real challenges of the intervention area and made new proposals, building on existing ones, which were more aligned with their local needs and opportunities (previously identified during the workshops and walkthroughs). Proposals were further developed during meetings that were organised in the following weeks with small groups and compiled into, what we may call the Porto Catalogue of New NBS. This consists of: the creation of vegetable gardens, pedagogical farms, community kitchens, heritage routes, artisans and local producers’ markets, a “cultural hangar” and an open-air amphitheatre for artistic and cultural activities, among others.

With the outbreak of the COVID-19 pandemic, participatory activities were suspended, requiring a replanning effort by the local team. In June 2020, after the first wave of the pandemic, online meetings were held to reactivate the participatory process, called **phase 2**. Meetings were planned taking into consideration the fact that some participants might not have digital access and others might have more/less time to attend. In this sense, several meetings with small groups of people and six online meetings were organised between June and July:

a) Meetings with local participants to prepare a video for the purpose of making proposals
b) Presentation of the local diagnostic as a baseline for new participants;
c) Three online meetings to develop new ideas;
d) One meeting to present the ideas that were proposed during the first phase (before COVID19 outbreak) and the new ones;
e) One meeting to discuss the ideas with participants, municipal technicians, political representatives and URBiNAT’s team.

After this series of meetings, it was possible to hold two face-to-face workshops on 14$^{th}$ and 16$^{th}$ of July 2020, at the Falcão primary School, in the heart of the project's intervention area, to develop ideas and to separate them into four main categories - Environment, Culture, Education and Social Economy. Municipal technicians from different areas supported the workshops in order to create synergies with other municipal projects and to give technical and legal input to the ideas. During the workshops, a walkthrough along the area with participants to start to visualize the NBS in the territory was organised. In parallel, CIBIO (with the collaboration of DOMUS and CMP) carried out a survey by applying a questionnaire to passers-by in the intervention area, aiming at identifying users’ needs and collect their experiences.

**Phase 3** started after these meetings to prepare the decision-making process. The Task Force, after the systematization, started a technical analysis of the New NBS together with the municipal technicians and the political representatives. This analysis helped to better define the NBS and to present to the citizens in September 2020 during an online meeting using a TRIZ based methodology - positive aspects, constraints, proposal of decision from the Task Force and a space for debate with the citizens. In the following image, a screenshot taken during the online meeting is shown.

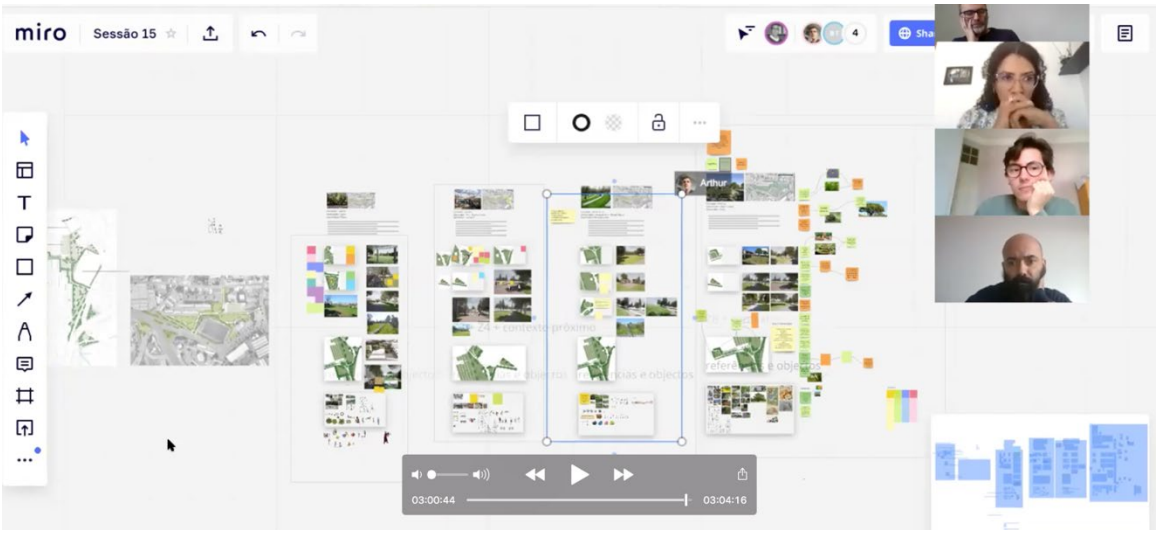


Figure 17. *Online session to co-design four NBS with participants, November 2021.*

Most of the ideas resulting from this process went on to be developed into NBS to be integrated in the Healthy Corridor, with the support of the citizens. Other ideas were considered to be internally channelled and eventually integrated into other municipal projects. Only few ideas were not developed as they were not aligned with URBiNAT goals nor with the municipality's strategies or because the project budget was not large enough to implement them. In the end, however most ideas were very close to the URBiNAT NBS Catalogue, New NBS were integrated in the preliminary study of the material urban project that was presented and discussed in another online meeting held in November 2020 (Figure 16). In the following graph the list of New NBS defined during the process are resumed.


Figure 18. *Summary of the ideas for New NBS gathered through different participatory methods implemented in the Living Lab in Porto (table version in Appendix A: list of New NBS in frontrunner cities)*

In the following image, the cards used during the workshops in Porto are shown.

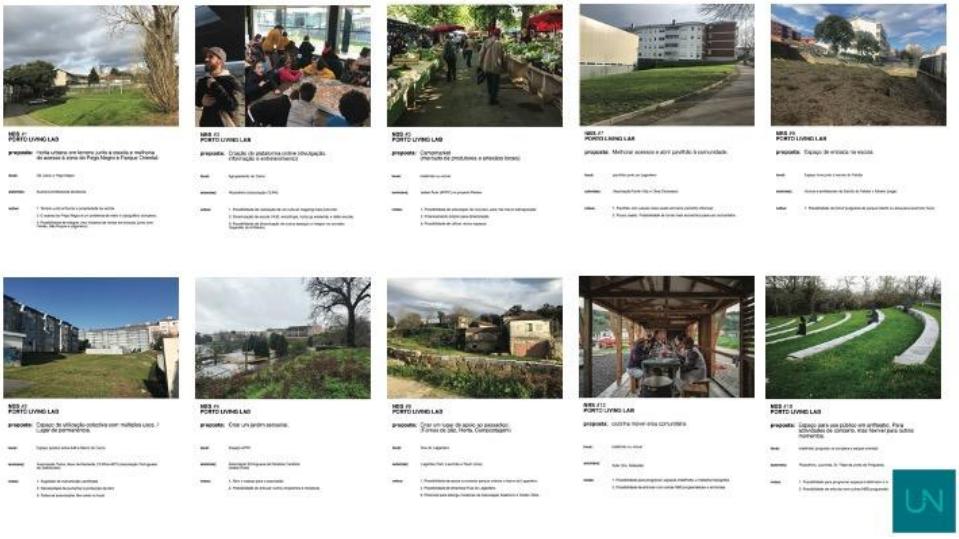

Figure 19. *Porto NBS Catalogue, with the new cards, organised after the workshops.*

## 5.3.2 - Nantes

In Nantes, the co-design process was conducted in two steps, with (i) a first step for the expression of needs and ideation and (ii) a second step for technical concerns and design. Marking these two steps was important in order to make the co-creation process accessible to inhabitants. In the following image, the activities part of the co-creation process in Nantes North is resumed.

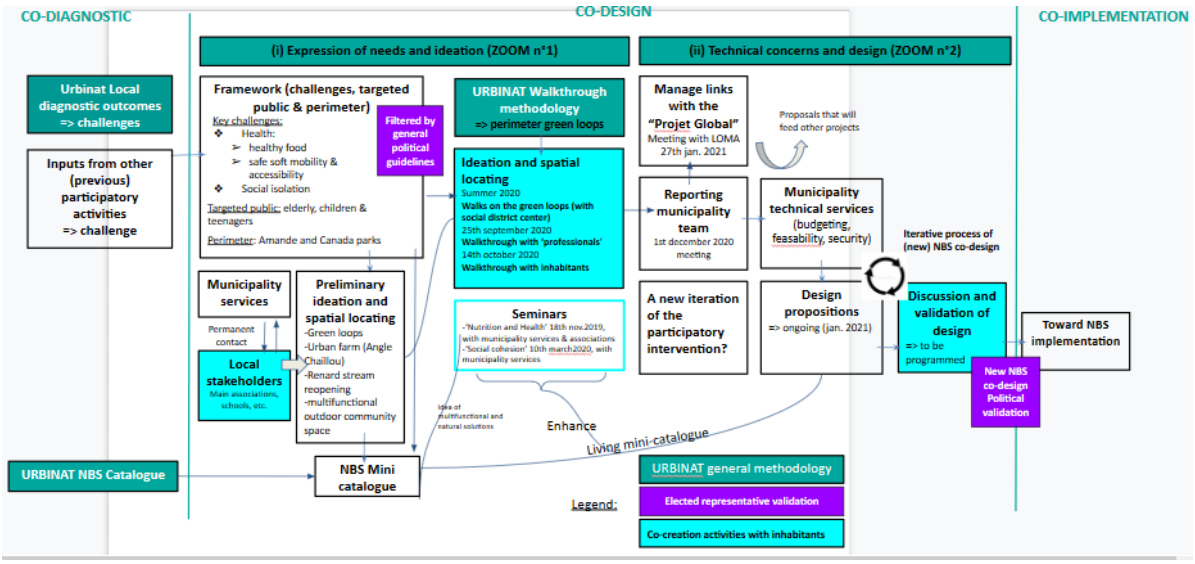


Figure 20. *Methodological steps of the co-creation process in Nantes Nord*

*Construction of the NBS mini-catalogue*

The first draft of the mini-catalogue carried out by the municipality aimed to pre-select and prepare the co-selection of NBS.

This work was based on a crossover between the main URBiNAT NBS catalogue and elements of the local context, mainly based on local diagnostic outputs (key challenges, etc.) but also on the preliminary proposals and identified opportunities brought by municipality services and local stakeholders.

Several criteria were applied in the selection of NBS. (i) Firstly, NBS were selected in accordance with the local context, both the biophysical resources on which NBS can be based, the local participatory culture and socio-economic forces and dynamics. (ii) Pre-selected NBS also targeted some of the challenges that emerged through the Local Diagnostic and previously from the Nantes Global Project. Within the general aim of the Healthy Corridor of improving the mental and physical health of inhabitants, the Local Diagnostic highlighted the social inequalities in health in this deprived district. It revealed for example that children and teenagers in particular are facing obesity at a higher rate than in the rest of the city. The district is also getting older, and the elderly suffer from isolation. The challenge was also to value the existing large green spaces that are little used by the inhabitants, both because they are not necessarily adapted to their expectations and because some of them are poorly identified. Then (iii), the selection ensured to match with the local strategic agenda and especially with the 'Projet Global' which is going on in parallel of URBiNAT in Nantes Nord. Finally, (iv), attention was also paid to keep a realistic budget and feasibility in the time-frame of URBiNAT, considering that implementation and assessment of the Healthy Corridor have to be included within the project.

The mini-catalogue is kept open for the duration of the co-design process. Like the main NBS catalogue, it is a living tool. For example, it has already been enriched with Social and Solidarity Economy NBS following remarks made by inhabitants during the walkthrough.

*Use of the mini-catalogue in Nantes*

The mini-catalogue was not presented to inhabitants during the ideation stage (namely the walkthrough activities on the green loops) in order to do not influence and limit their proposals and feedbacks. It has been used to feed the design propositions of the municipality services (mainly green spaces service). This kind of presentation of NBS in a contextualized urban design is preferred to a presentation through NBS factsheets produced by the project, because it would require a difficult effort of projection for the inhabitants. Nevertheless, NBS design propositions have been presented with different scenarios and options in order to have an interactive co-design with the inhabitants' preferences and new propositions.

*Case of technological NBS*

Technological NBS have followed a similar process with the creation of a mini-catalogue (3 NBS selected). But they have been treated separately because of their strong experimental character and because part of them are financed by the URBiNAT project. The selection of Technological NBS for mini catalogue considers these specificities. Selection was probably less strict, even if NBS were still selected to fit in the context and in a way they can benefit inhabitants. The mini catalogue, composed of 14 + 3NBS is resumed in the following table.

| TYPOLOGY | NBS |
|---|---|
| **Technological** | Food production and leisure pavilion |
| | Grow tile |
| | Mobile vegetable garden |
| **Territorial** | Wildlife Park (Includes Urban Park, Urban Wetlands) |
| | Green roofs (includes Public Green Roof, Green Roof - Intensive/ extensive) |
| | Watercourse restoration |
| | Beehive provision and adoption |
| | Urban Vegetable Garden |
| **Participatory** | Deliberate Democratic evaluation |
| | Cultural Mapping (Women footprint, Forbidden city) |
| | Community Based Arts Projects (CAP) |
| | 3d Model Thinking |
| | Community based monitoring |
| **Social and Solidarity Economy** | Community composting and social currencies |
| | Repair-cafes |
| | Solidarity markets and fairs |
| | Local currencies for natural based circular economy |

Figure 21. *Nantes NBS mini catalogue selected by technicians from URBiNAT NBS "living" catalogue for the co-creation process in Nantes.*

The mini catalogue was helpful to inspire and guide citizens in the co-design of the New NBS. As result of the process, citizens have proposed several ideas for the New NBS that were organised in five categories. The list of ideas and proposals made by citizens for the New NBS is shown in the following figure.

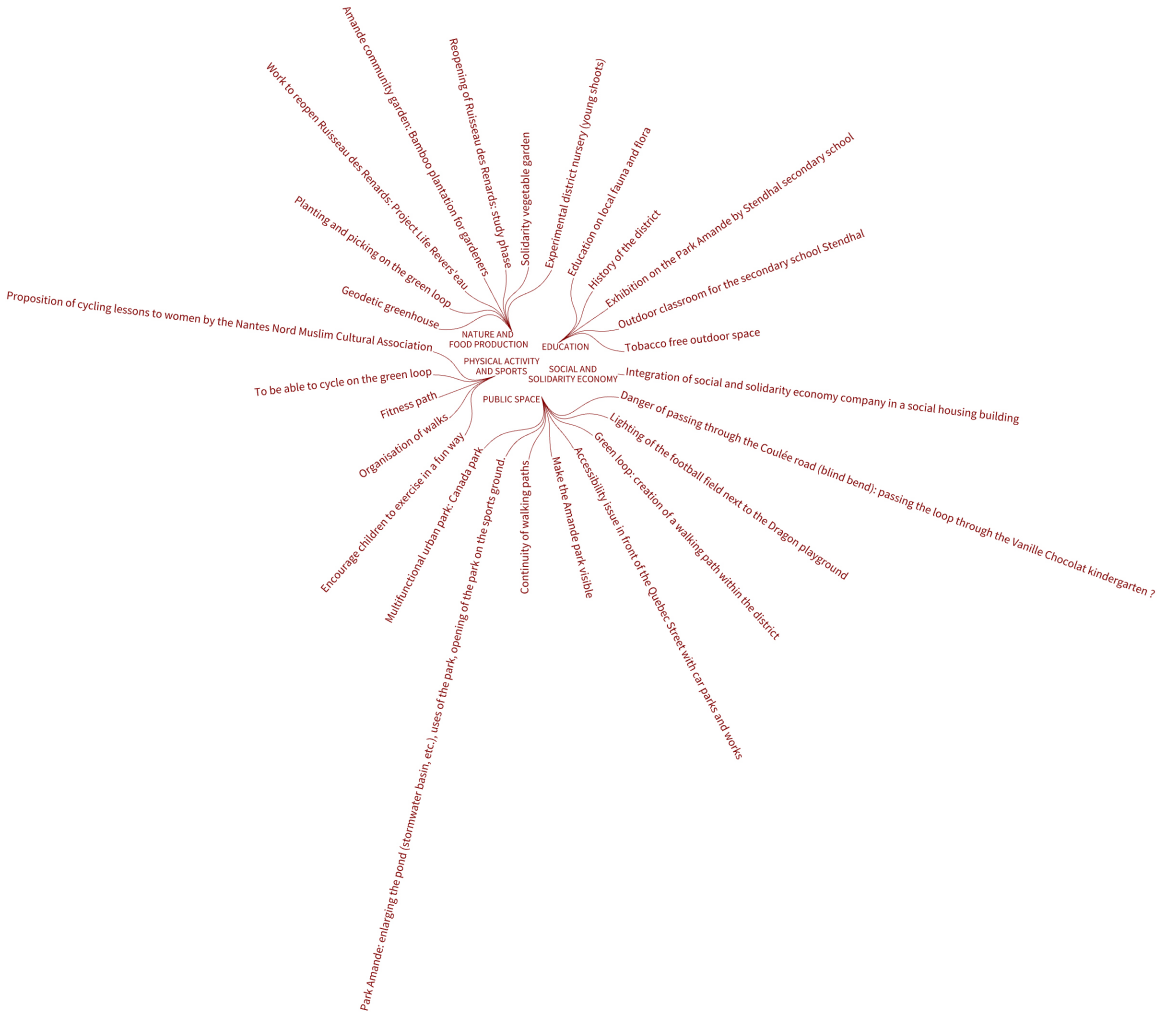


Figure 22. Summary of the ideas for New NBS gathered through different participatory methods implemented in the Living Lab in Nantes (table version in Appendix A: list of New NBS in frontrunner cities)

This list, originally elaborated by citizens, have been filtered by municipal technicians according to technical aspects, urban projects' agenda or municipal priorities. In Deliverable 4.2, the list of New NBS that will finally be co-implemented in the following months of URBiNAT project are identified.

### 5.3.3 – Sofia

Over the course of the URBiNAT project several New NBS were and are being integrated in the catalogue of each city. In three stages, from the proposal stage to October 2020, NBS were:

a) proposed by Sofia as frontrunner city during the application process;
b) identified as established cultural practices in the city and in Nadezhda district or as needed to reclaim and bring back previously existing NBS during the Local diagnostic stage;
c) envisioned during the co-creation process.

In the following image, the calendar planned for the co-creation of the NBS "living" Catalogue for Nadezha (Sofia) is resumed.

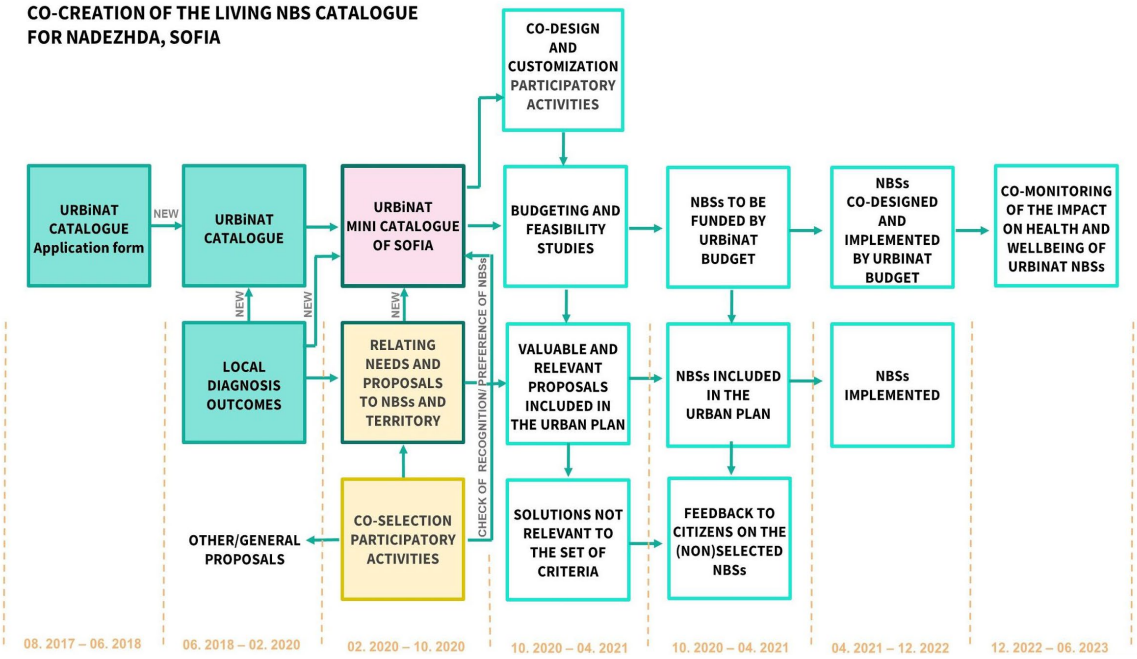


Figure 23. *Calendar for the co-creation of the NBS "living" catalogue for Nadezha (Sofia)*

During the proposal phase emphasis was put on the availability of thermal water springs. Thermal waters have healing qualities and can be used in swimming pools (later formulated as "Thermal water school swimming pool") being this an established tradition in Sofia and across the country.

The Internationally recognized practices of the "Bread house network" and "The edible organic garden of learning: alternative environmental education for the youngest" (later transformed to 'Tasty gardens of learning") have been included as best practices for Sofia as a frontrunner city. This complements previously selected NBS coming from different partners in the first draft of URBiNAT catalogue. Along with the letter of support from Zaedno foundation, the "Tasty gardens of learning" practices became part of the project application.

A stakeholders' workshop and the organization of the Consortium meeting in Sofia held in January 2019 was the occasion to include the "Farmers market network" as a social and solidarity NBS. It was conceived together with already developed and experienced agents. They were also identified as potential facilitators of the participatory process in Nadezhda. This NBS is expected to contribute to the restoration of the connection of bigger cities' inhabitants to land, fresh and good quality food and at the fostering of a new and healthier consumer identity, providing a new cultural and social space for encounters and shared identity.

The two-stage process of the local diagnostic gave a good baseline for identifying possible solutions that fit local natural and social needs. In the course of the local diagnostic, the appropriateness of certain territorial (and some technological) NBS was re-considered and aligned with the specific territorial context and needs, as well as with the local strategic agenda and the current political support. The fulfilment of these criteria brought about the idea of the unique NBS called "Thermal mineral water swimming pool". It relies on the use of local geothermal resource (i.e. mineral water) and provides a healthy environment for physical educational and training as well as recreational activities for school children. It also aims at the revival of the millennia-long regional and cultural tradition of living in close contact with mineral water.

Another NBS, called "Grow a bench" (Co-creation of neighbours meeting places), has been extensively studied as an existing sustainable practice during the local diagnosis and developed in

a preliminary draft, yet not included in Sofia Mini Catalogue. The formulated New NBS “Welcome water back in public space” was identified and augmented as needed since it was previously existing as a practice in Sofia as well as a step towards building resilient communities in the process of climate adaptation change in the South Europe. During the co-selection process, the idea of this NBS was also widely supported by the citizens.

The workshop with the municipal technicians and Sofia taskforce carried out in March 2020 brought to the compilation of the first draft of the Sofia mini catalogue. It consists of 11 participatory, 9 territorial, 5 technological and 7 social and solidarity NBS. The compilation process of Sofia Mini Catalogue, prepared for the purposes of the co-selection and co-design, was subjected to the following criteria: a) objective need, cultural traditions and political support to implement the NBS; b) realism; c) potential for clustering and synergetic results; d) availability of agents able to assist the implementation of the NBS. During the co-selection phase, a series of activities influenced the compilation of the first draft of Sofia mini catalogue and proved the need of an open and “living” catalogue that serves as an inspiration rather than imposing ready-made solutions.

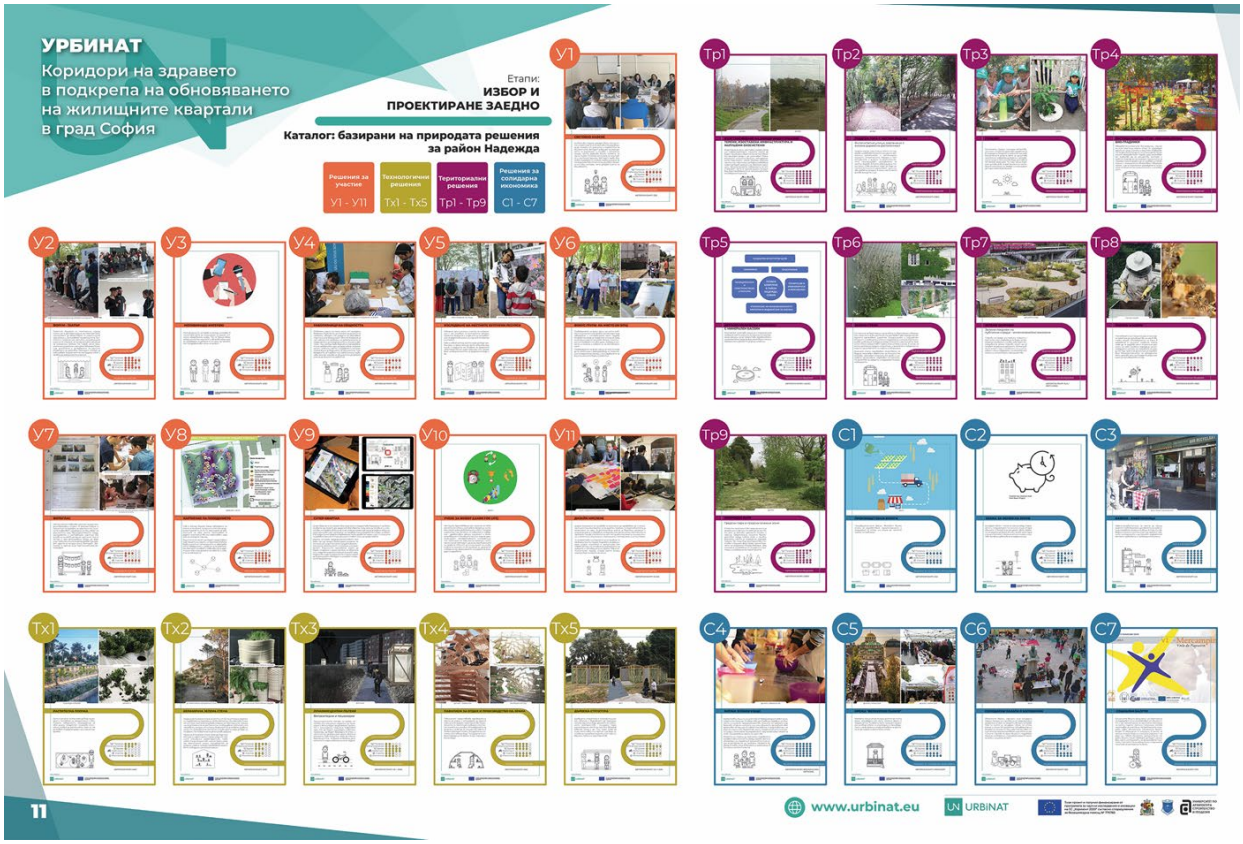


Figure 24. *Sofia NBS mini catalogue as prepared for the purposes of the open-air exhibition and later circulated in Internet (https://public.3.basecamp.com/p/dPT5RLzECMWqLDNYKihMJsf6)*

The presentation of the results of the local diagnostic and the two-week exhibition in May 2020 were an opportunity to attract new participants, hear new ideas, and test the appropriation and perception of NBS in the draft catalogue. In August and September 2020 four workshops were organized with citizens to collect ideas about the four sites within the URBiNAT area. The NBS included in the draft catalogue were used as reference and best practices as well as a source of inspiration for the generation of new ideas. The data collected during the process, and organized in a GIS database, included both the attributes of the ideas and of the participants who raised

them. In the following image, the main processes followed during the workshops are shown: discussing citizens' ideas (1), spatial referencing of ideas (2), using of the NBS catalogue as source of inspiration (3), associating ideas to the NBS catalogue (4).


Figure 25. *Operationalization of the NBS draft catalogue for the purpose of idea generation and connection to different locations*

The ideas used for the definition of New NBS, and gathered through the different participatory methods implemented in the Living Lab in Sofia, were summarized into six groups: public space, sports and recreation, social economy, education, culture, and climate adaptation measures (climate adapt). These groups represent the main, but not the only, connection that the generated ideas have with the site. The following table summarizes the ideas collected for the creation of the New NBS in the six groups previously defined.


Figure 26. *Summary of the ideas for New NBS gathered through different participatory methods implemented in the Living Lab in Sofia (table version in Appendix A: list of New NBS in frontrunner cities)*

A series of meetings and a webinar on "Tasty gardens of learning" organized for the kindergartens in Nadezhda district with their staff resulted in the identification of two possible kindergartens available for the co-creation of the respective NBS. Because of the time schedule, which is dependent on the seasonal changes, the prototyping, the co-design and the implementation of this NBS was scheduled for March-April 2021.

The intensive work of the mini-working group "Work with schools" and the organization of an exhibition on the Local diagnostic's results in September and October 2019 in the four schools in the URBiNAT area and the and the participatory activities during 2020 attracted the interest of the 15th school management. After an interview with the headmistress, an idea about educational school pavilion for food production and its site location was brought. This idea was further discussed with IAAC team to evaluate which technological solutions and options exist to integrate different NBS from the already existing catalogue draft and to further customize them through participatory activities.

During the long COVID-19 episode and the continuous work under increased uncertainty on the implementation of live workshops with citizens, an existing NBS in the Sofia catalogue draft, called "Learn for life" focused on on-line participatory GIS learning, has been customized and is under development. The New NBS with a working title "Participatory GIS" will be tested in the near future and is expected to fill the communication gaps and to facilitate the involvement of more people in

the co-selection, co-design, and hopefully in the co-monitoring processes. The following image shows the stages already implemented in the co-creation of the New NBS catalogue for Nadezha (Sofia).

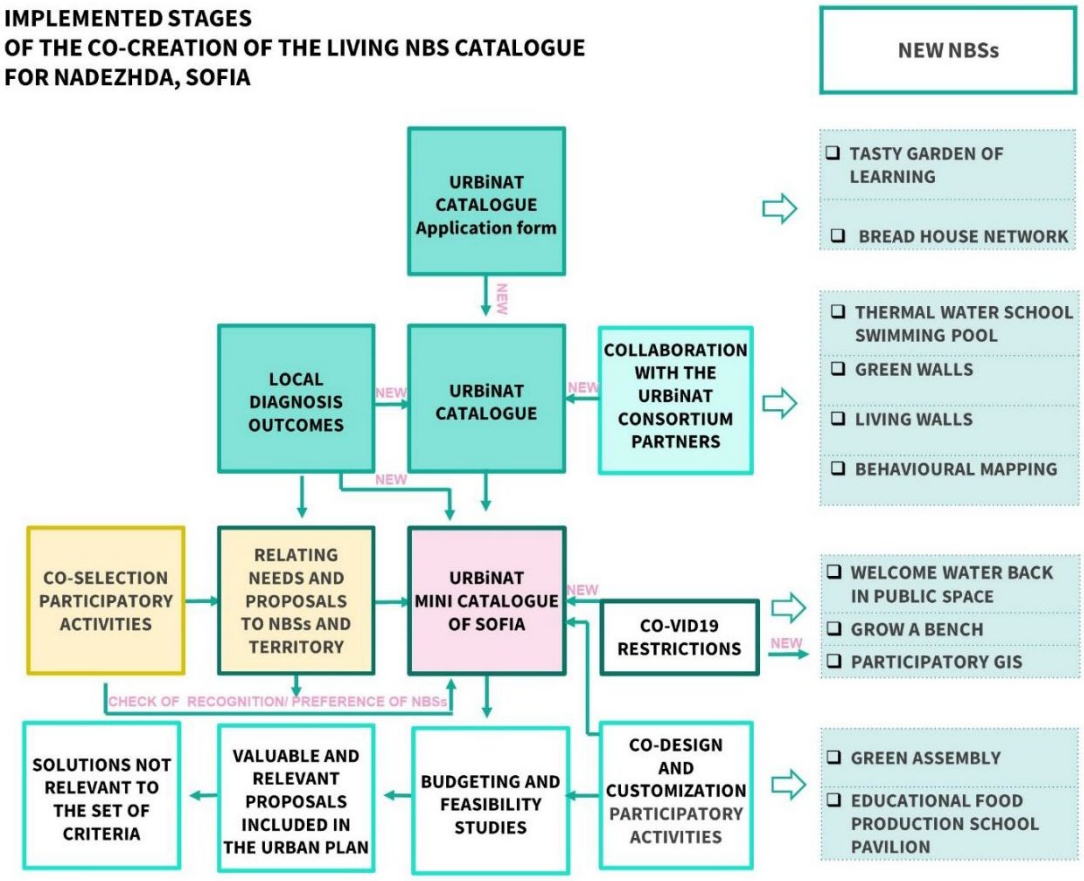


Figure 27. *NEW NBSs developed and under development by Sofia taskforce during the co-design phase as January 2021*

## 5.3.4 – Outcomes of the New NBS catalogues co-creation process

Some reflections can be done about the three co-creation processes and their results as a whole.

A common aspect detected among the co-creation processes in the frontrunner cities is its implementation's complexity. The diagrams that resume the methodological steps of the co-creation process in each city, represent this challenge well. In fact, they show how, the management and coordination of the participatory activities, the technical work to systematize data and the municipal procedures to validate the New NBS, were fundamental tasks for implementing the process successfully.

At these challenges, mostly expected since the beginning of the project, COVID-19 created additional barriers in the co-design process. It reduced the interaction with citizens, a central aspect in the project's development and, despite most of the activities were adapted to be realised virtually, several limitations were not fully overcome due to the embedded nature of this modality. For instance, COVID-19 didn't allow the fully implementation of Superbarrio in the cities. The Superbarrio App, as a tool for the digital representation of the catalogue, was expected to be used for the co-selection phase and co-design phase.

On one hand, the use of the game would have been useful to strongly engage youngest people in the co-creation process and to enhance their knowledge about the NBS in a more dynamic way. This would have reinforced the inclusivity character of the participation process.
On the other hand, Superbarrio would have supported the co-selection of NBS by extracting insights about users' preferences from the database of the app where decisions taken during the game sessions are recorded and stored. This would have been useful to analytically inform decision makers about citizens' preferences and to provide them with additional inputs for the co-creation of the Healthy Corridors.
Due to the Covid-19 pandemic its implementation in the co-selection and co-design phase of URBiNAT was limited. The main reason was that, although Superbarrio is a tool that can be used digitally, it needs face to face support during the firsts game sessions, especially those involving the youngest participants. The physical involvement of game developers, players and technicians in game sessions' workshops, would have been also useful for testing purposes in order to improve the game app before its spreading on a larger public of stakeholders. During the continuation of URBiNAT's development, further uses for Superbarrio app may consist in using it as a tool for the validation of decisions already taken in the co-selection process by each frontrunner city and for keep raising citizens' awareness about NBS.

Despite the difficulties of the pandemic period, the three cities achieved to define first their mini catalogue and then their catalogue of New NBS. It was created in each city using different participation tools, selected among the ones included in URBiNAT NBS "living" catalogue. After the completion of the co-design, the New NBS have been systematise following the same criteria in the three cities, namely the organization of the departments in each municipality. This categorisation was done to make the recognition of the link between the New NBS and the municipality's department responsible for their implementation more intuitive. The new categories are also linked with the structure of the URBiNAT NBS "living" catalogue already presented in the section 2.2 of this document. This link, together with the categories used in the catalogues of New NBS for each frontrunner city, is shown in the following table.

Table 1- NewNBS Typologies for the frontrunner cities

| URBiNAT NBS "living" catalogue | Porto | Nantes | Sofia |
|---|---|---|---|
| Technology | Education and Environment | Education | Education |
| Territorial | Public Space and Nature | Public space | Public Space |
| | | | Climate Adapt |
| Participation | Culture and Sports | Physical activity and sport | Culture |
| | | | Sports and Recreation |
| Social and Solidarity Economy | Social economy and solidarity practices | Social and Solidarity Economy | Social Economy |
| | | Nature and food production | |

Together with the categories, also the New NBS proposals, identified by the citizens, have established multiple relations with the NBS created by the project's partners, expanding their definition. In this sense, the co-creation process in each frontrunner, has shown how the citizens explored NBS that were not included in the NBS catalogue but that contribute very well to define what does healthy mean. The most relevant gaps were found in the following approaches:

- Educational: project's partners worked a lot on this aspect in the three cities but it did not result clear enough in the catalogue proposed to the citizens. For instance, the tasty gardens of learning, the cultural mapping and the learnforlife, already included in the catalogue, were not sufficient to establish a link with all the environmental educational actions and places that cities wanted to create.
- Cultural: during the process a lack of NBS addressing the need of dedicated spaces for cultural and recreational activities was highlighted, although it was already explored and considered in the catalogue by the partners through the inclusion of cultural activities.
- Sports: the citizens' requirements for places where children and adults can develop open air activities were underestimated. This could be strongly connected with a post-Covid effect. In fact, a new increasing demand of spaces for open air activities has risen as consequence of the hard lockdown at which most of the citizens were forced during the 2020.
- Solidarity: in addition to the activities proposed by the partners' catalogue, it was highlighted the lack of activities more related to the production of resources, such as an urban garden or a community farm. These activities, identified by the citizens, would complement other NBS already included in the catalogue such as the "Ceramic green wall" or the "Food production and leisure pavilion".

Moreover, with regards to territorial NBS, some gaps were also detected. For instance, the lack of NBS concerning the installation of places to seat and meet, places to play, and lightning. These NBS were included but not as an independent and specific NBS.

The identification of these gaps demonstrate that citizens understood very well the expanded concept of NBS proposed by URBiNAT and that they went even far from what was expected at the beginning of the co-creation process. Therefore, the New NBS can be seen both as solutions proposed by the citizens for the construction of the Healthy Corridor and, more in general, as solutions for closing the identified gaps, complementing as consequence, the URBiNAT NBS "living" catalogue created by the experts.

The different relations amongst the NBS of the URBiNAT NBS "living" catalogue and the New NBS proposals of each city generated by the citizens have been recorded and studied. From its analysis, it can be observed that they are not always bidirectional and unique, but sometimes several NBS from the URBiNAT NBS "living" catalogue have been used as an inspiration or as a starting point for the co-creation of the New NBS. The following three diagrams, one for each city, show these relations.

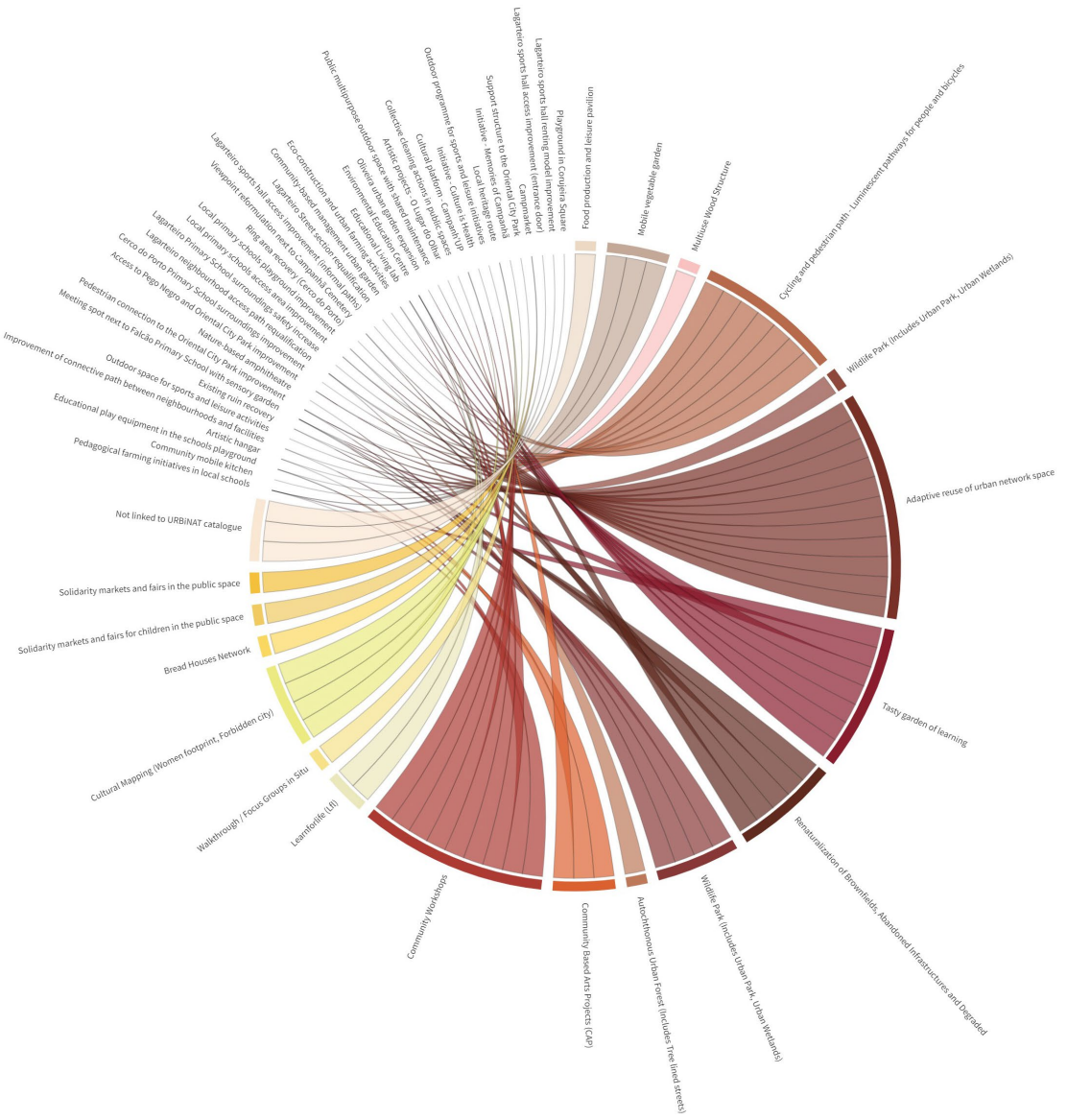


Figure 28. New NBS link to URBiNAT NBS “living catalogue in Porto co-creation process

As can be observed from the diagram, in Porto the most inspiring NBS of the URBiNAT NBS “living” catalogue have been the NBSterr13 – Adaptive reuse of urban network space, the NBSpart5 – Community workshops and NBStech6 - Cycling and Pedestrian path (Luminescent pathways for people and bicycles). These 3 NBS have inspired a total of 27 New NBS out of 38. Among the participatory NBS, together with the NBSpart5, the NBSpart2 – Cultural mapping has been the most relevant in the co-creation process.

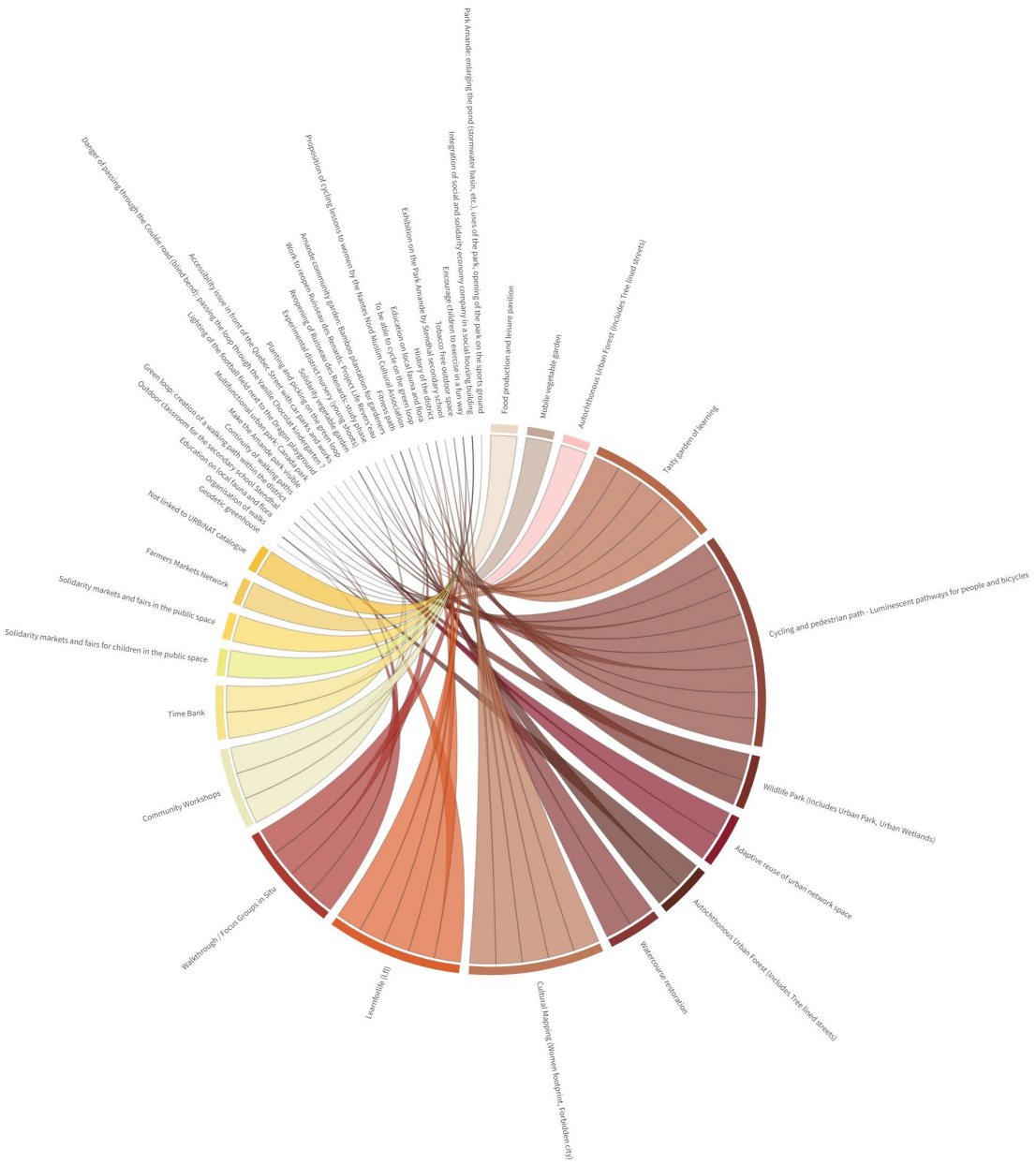


Figure 29. New NBS link to URBiNAT NBS “living catalogue in Nantes co-creation process

The diagram shows that in Nantes the most inspiring NBS of the URBiNAT NBS “living” catalogue has been the NBStech6 - Cycling and Pedestrian path (Luminescent pathways for people and bicycles) with a total of 8 New NBS out of 26 that have been generated from it. Other relevant NBS used by the citizens have been the NBSpart2 – Cultural mapping, NBSpart7 - Learnforlife and NBSterr5 – Tasty garden of learning.

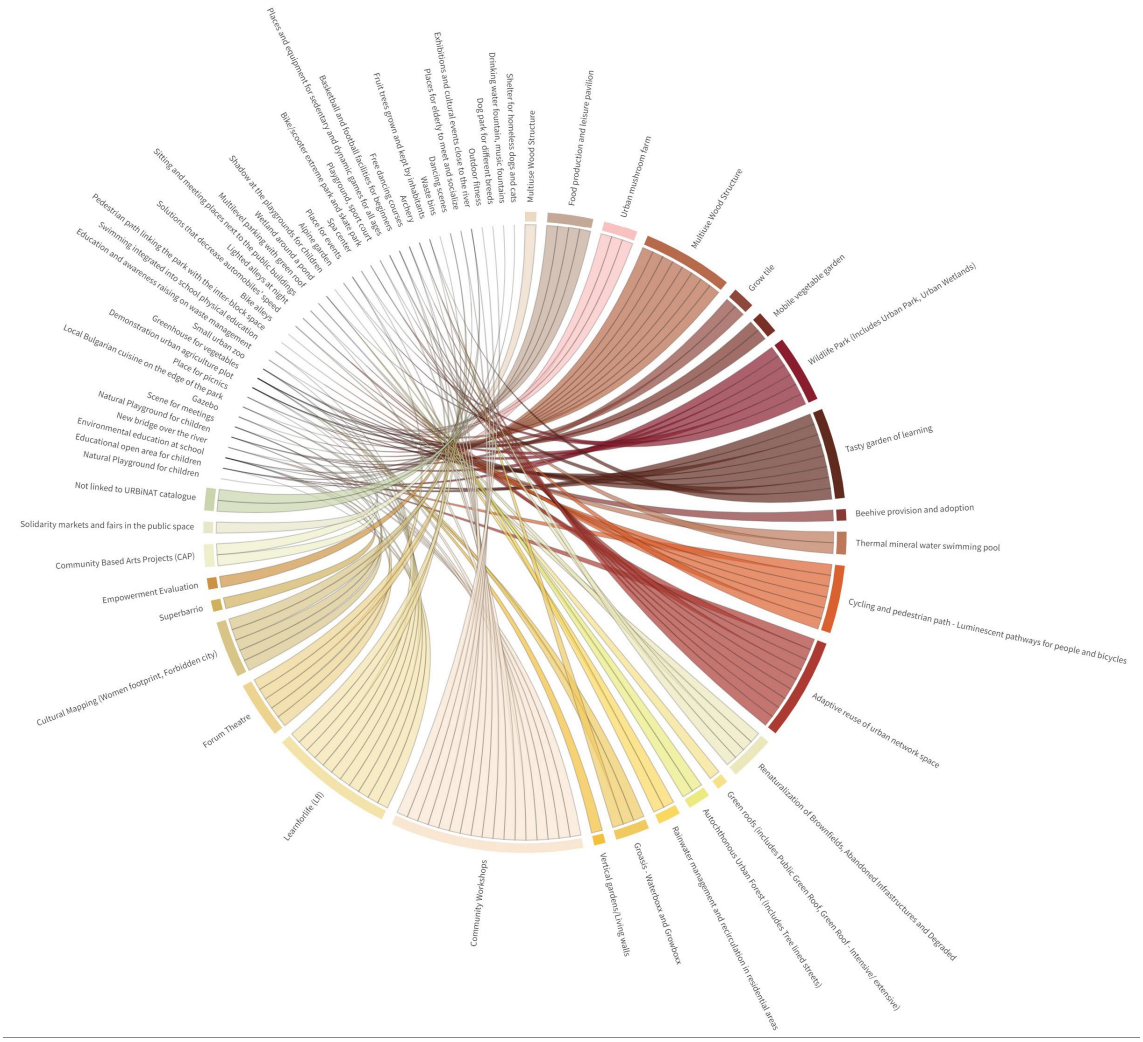


Figure 30. New NBS link to URBiNAT NBS “living catalogue in Sofia co-creation process

In Sofia the diagram highlights that the most inspiring NBS of the URBiNAT NBS “living” catalogue have been the NBSpart5 – Community workshops and NBSpart7 - Learnforlife. These 2 NBS have inspired a total of 28 New NBS out of 45. The NBSterr5 – Tasty garden of learning, NBSterr13 – Adaptive reuse of urban network space and the NBStech7 – Multiuse wood structure have also been one of the most used by citizens inspiring 24 New NBS.

# Conclusions

The main result of the research carried out during the development of this document is the definition of the New NBS. They have been inspired by the NBS included in the URBiNAT catalogue but, unlike them, New NBS are specific to the site area where the Healthy Corridor in each frontrunner city is being co-created. New NBS are obtained by a combination of other NBS already included in the URBiNAT catalogue or just by taking inspiration from them. Participatory activities carried out in frontrunner cities have guided the process of New NBS co-creation using as the main tool the URBiNAT NBS "living" catalogue which itself has been reviewed and further detailed. The new version of the URBiNAT NBS "living" catalogue - an evolution from the URBiNAT NBS catalogue defined at the proposal stage - is, together with the frontrunner cities' New NBS catalogues, the other main achievement included in this deliverable.

The revision carried out has been the opportunity to further explain the background on which the four main typologies of NBS (i.e. technological, territorial, participatory, social and solidarity economy) are based as well as to better systematise and define the NBS finally selected and included in the URBiNAT NBS "living" Catalogue. The latter has been done also thanks to the creation of the NBS factsheets and NBS protocols that allowed the collection of additional information about the NBS, not included previously in the catalogue (e.g. replication and scalability potential of the NBS, relation of the NBS with the co-creation process and with other NBS of the URBiNAT catalogue, quality assessment of the investment required for the NBS implementation, etc.).

The document, by explaining the URBiNAT catalogue, its co-creation process and its implementation in the frontrunner cities, represents also a tool that can help and support the follower and observer cities to replicate the process and co-create their own NBS catalogues.

Moreover, within the URBiNAT context, this deliverable is complementary with the achievement of results in other upcoming URBiNAT's activities. The New NBS will be integrated into the Healthy Corridor concept (Deliverable 4.2) and Urban plan (Deliverable 2.4) as clusters that mix the several groups of NBS, in order to create multi-functionality and liveability. The use of the NBS catalogue as an inspirational participatory method and tool, will enrich URBiNAT guidelines related to citizen engagement, through different user-friendly tools, such as in the form of a training program and toolkit, being devised also as a digital enabler (WP3 - task 3.5). In order to amplify its participatory solutions, URBiNAT will also undertake assessments on progress, results and insights for the combination of methods, citizen's engagement, and use of digital enablers, including the use and development of URBiNAT NBS "living" Catalogue, resulting in a participatory handbook for NBS (WP3 - task 3.6).

The mutual relationships between work packages that compose the structure of URBiNAT's work plan, also put URBiNAT NBS "living" Catalogue at the centre of collaborative developments to tailor it to different target audiences, namely for sharing and learning both through networking (WP2 - task 2.2) and community of practice (WP2 - task 2.3), as well as regarding the creation of methodologies for replication and up-scaling in different contexts (WP5 - task 5.5), and dissemination of the NBS catalogue (task 6.3). In this sense, URBiNAT NBS "living" Catalogue is at the intersection of possible developments in a knowledge-based collaborative platform, as a combination of knowledge-based tools.

In the following months, when the co-design of the New NBS will be finalised and their co-implementation will take place in frontrunner cities, the catalogue will be enriched with

experiences and best practices. Complementary activities, such as the testing of New technological NBS prototypes to characterise technical properties of the solutions (WP4 – Task 4.3) or the definition of the business cases for the most marketable and bankable NBS (WP7 – Task 7.3), will provide the URBiNAT NBS "living" Catalogue with further useful information for NBS replication. The novel information will be included in a reviewed version of this document while the content of the URBiNAT catalogue itself will be "lively" until (and beyond) the end of URBiNAT project.

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# Appendix

## Appendix A: list of New NBS proposals in front runner cities

### *Porto*

| TYPOLOGY | NBS |
|---|---|
| PUBLIC SPACE AND NATURE | Outdoor space for sports and leisure activities |
| | Improvement of connective path between neighbourhoods and facilities |
| | Meeting spot next to Falcão Primary School with sensory garden |
| | Nature-based amphitheater |
| | Existing ruin recovery |
| | Pedestrian connection to the Oriental City Park improvement |
| | Oliveira urban garden expansion |
| | Public multipurpose outdoor space with shared maintenance |
| | Cerco do Porto Primary School surroundings improvement |
| | Ring area recovery (Cerco do Porto) |
| | Lagarteiro Primary School surroundings safety increase |
| | Viewpoint reformulation next to Campanhã Cemetery |
| | Lagarteiro neighbourhood access path requalification |
| | Lagarteiro Street section requalification |
| | Access to Pego Negro and Oriental City Park improvement |
| | Playground in Corujeira Square |
| | Lagarteiro sports hall access improvement (informal paths) |
| | Lagarteiro sports hall access improvement (entrance door) |
| SOCIAL ECONOMY AND SOLIDARITY PRACTICES | Campmarket |
| | Community mobile kitchen |
| | Community-based management urban garden |
| | Support structure to the Oriental City Park |
| CULTURE AND SPORTS | Outdoor programme for sports and leisure initiatives |
| | Cultural platform - Campanh'UP |
| | *Artistic projects - O Lugar do Olhar* |
| | Initiative - Memories of Campanhã |

| | |
|---|---|
| | Local heritage route |
| | Initiative - Culture is Health |
| | Artistic hangar |
| | Lagarteiro sports hall renting model improvement |
| **EDUCATION AND ENVIRONMENT** | Educational Living lab |
| | Eco-construction and urban farming activities |
| | Collective cleaning actions in public spaces |
| | Pedagogical farming initiatives in local schools |
| | Educational play equipment in the schools playground |
| | Local primary schools playground improvement |
| | Local primary schools access area improvement |
| | Environmental Education Centre |

## *Nantes*

| TYPOLOGY | NBS |
|---|---|
| **PUBLIC SPACE** | Green loop: creation of a walking path within the district |
| | Continuity of walking paths |
| | Make the Amande park visible |
| | Multifunctional urban park: Canada park |
| | Park Amande: enlarging the pond (stormwater basin, etc.), uses of the park, opening of the park on the sports ground. |
| | Lighting of the football field next to the Dragon playground |
| | Danger of passing through the Coulée road (blind bend): passing the loop through the Vanille Chocolat kindergarten ? |
| | Accessibility issue in front of the Quebec Street with car parks and works |
| **NATURE AND FOOD PRODUCTION** | Planting and picking on the green loop |
| | Geodetic greenhouse |
| | Solidarity vegetable garden |
| | Experimental district nursery (young shoots) |
| | Reopening of Ruisseau des Renards: study phase |
| | Work to reopen Ruisseau des Renards: Project Life Revers'eau |
| | Amande community garden: Bamboo plantation for gardeners |
| **EDUCATION** | Education on local fauna and flora |
| | History of the district |
| | Exhibition on the Park Amande by Stendhal secondary school |
| | Outdoor classroom for the secondary school Stendhal |
| | Tobacco free outdoor space |
| **PHYSICAL ACTIVITY AND SPORTS** | Organization of walks |
| | Encourage children to exercise in a fun way |
| | Fitness path |
| | Proposition of cycling lessons to women by the Nantes Nord Muslim Cultural Association |
| | To be able to cycle on the green loop |
| **SOCIAL AND SOLIDARITY ECONOMY** | Integration of social and solidarity economy company in a social housing building |

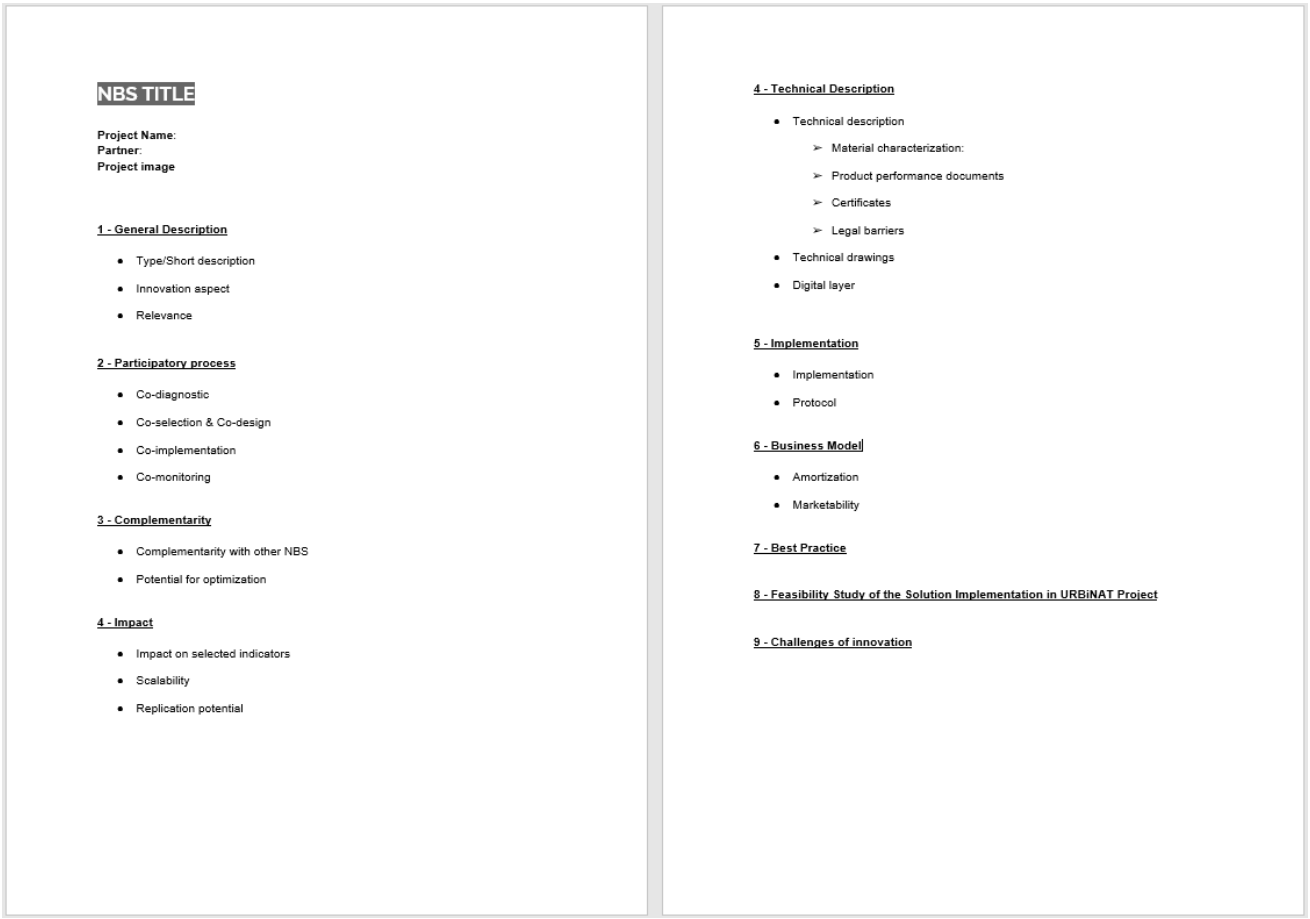
## *Sofia*

| TYPOLOGY | NBS |
|---|---|
| PUBLIC SPACE | Pedestrian path linking the park with the inter-block space |
| | New bridge over the river |
| | Bike alleys |
| | Solutions that decrease automobiles' speed |
| | Lighted alleys at night |
| | Sitting and meeting places next to the public buildings |
| | Toilets |
| | Waste bins |
| | Place for picnics |
| | Natural Playground for Children |
| | Scene for meetings |
| CLIMATE ADAPT | Drinking water fountain, music fountains |
| | Glowing fountains |
| | Multilevel parking with green roof |
| | Wetland around a pond |
| | Shadow at the playgrounds for children |
| | Alpine garden |
| CULTURE | Scene for meetings |
| | Dancing scenes |
| | Gazebo |
| | Places for elderly to meet and socialize |
| | Place for events |
| | Exhibitions and cultural events close to the river |
| | Local Bulgarian cuisine on the edge of the park |
| | Place for picnics |
| | Shelter for homeless dogs and cats |
| SPORTS AND RECRATION | Natural Playground for Children |
| | Outdoor fitness |
| | Spa center |
| | Bike/scooter extreme park and skate park |
| | Dog park for different breeds |
| | Playground, sport court |
| | Places and equipment for sedentary and dynamic games for all ages |
| | Basketball and football facilities for beginners |
| | Free dancing courses |
| | Archery |
| SOCIAL ECONOMY | Demonstration urban agriculture plot |
| | Greenhouse for vegetables |
| | Fruit trees grown and kept by inhabitants |

| | |
|---|---|
| **EDUCATION** | Natural Playground for Children<br>Educational open area for children<br>Small urban zoo<br>Education and awareness raising on waste management<br>Environmental education at school<br>Swimming integrated into school physical education |

# Annexes

## Annex A: Template of the NBS protocol



**NBS TITLE**

**Project Name**:
**Partner**:
**Project image**

**1 - General Description**

- Type/Short description
- Innovation aspect
- Relevance

**2 - Participatory process**

- Co-diagnostic
- Co-selection & Co-design
- Co-implementation
- Co-monitoring

**3 - Complementarity**

- Complementarity with other NBS
- Potential for optimization

**4 - Impact**

- Impact on selected indicators
- Scalability
- Replication potential

**4 - Technical Description**

- Technical description
  - ➢ Material characterization:
  - ➢ Product performance documents
  - ➢ Certificates
  - ➢ Legal barriers
- Technical drawings
- Digital layer

**5 - Implementation**

- Implementation
- Protocol

**6 - Business Model**

- Amortization
- Marketability

**7 - Best Practice**

**8 - Feasibility Study of the Solution Implementation in URBiNAT Project**

**9 - Challenges of innovation**

# Annex B: list of NBS from other EU funded projects.

## *Clever Cities*

| PROJECT | NBS CATEGORY | NBS |
|---|---|---|
| CLEVER CITIES | BUILDING SCALE - INTERVENTIONS | Green Roofs |
| | | Green Walls |
| | | Nano Gardens |
| | | Productive Façade System |
| | | Urban Rooftop Farming |
| | | Algae Production System |
| | | Wetland Roof |
| | | Vertical Farming |
| | | Climate Façades |
| | | Living Walls |
| | | Wooden Built Structures |
| | PUBLIC AND URBAN SPACES - INTERVENTIONS | BioSwales |
| | | Tree-lined Streets |
| | | Car Parks with Green Areas |
| | | Shade provided by vegetation |
| | | Community Gardens |
| | | Urban Fruit Trees |
| | | Green Bus Shelters |
| | | Islands of Coolness |
| | | Eco-Urban Furniture |
| | | Green Ventilation Grids |
| | | The Living Garden Concept |
| | | Arid Gardens |
| | | Garden of Senses |
| | | Raised Bed Vegetable Garden |
| | | Urban Flower Fields |
| | INTERVENTIONS IN WATER BODIES AND DRAINAGE SYSTEMS | Gutters |
| | | Ditches |
| | | Infiltration Strips and Meadows |
| | | Porous Paving |
| | | Water Ground Infiltration |
| | | Urban Wetland |
| | | Helophyte Filters |
| | | Reconnecting Rivers to Flood Plains |
| | | Re-meander Rivers |
| | | Rainwater Run-off Ponds |
| | | Usage of Treated Surface Water |
| | | Biological wastewater treatment |
| | | Rainwater Storage Beneath Sport Fields |
| | | Rainwater Harvesting |
| | INTERVENTIONS IN TRANSPORT LINEAR INFRASTRUCTURES | Green Roof Canopies |
| | | Green Noise Barriers |
| | INTERNVENTIONS IN NATURAL AREAS AND MANAGEMENT OF RURAL LAND | Carbon Sink |
| | | Short Rotation Forestry |
| | | Hedge Biotopes |
| | | Wet Biotopes |
| | | Community Compost Hubs |
| | | Compartmentalisation |
| | | Peri-Urban Parks |
| | | Recycling Organic waste |
| | | Soil Phyto-remediation |
| | INTERVENTIONS IN ECOLOGICAL AND HABITAT BIODIVERSITY | Beehive Gardens |
| | | Bird Sanctuary and Gardening |
| | | Blue Connection Program |
| | | Butterfly Parks |
| | | Garden of Worms |
| | | Green Bridges for wildlife |
| | | Hotel for Insects |
| | | Facilities for Birds and Fauna |

## Unalab

| PROJECT | NBS CATEGORY | | NBS |
|---|---|---|---|
| UNALAB | GREENING INTERVENTIONS | Street trees | Single line trees |
| | | | Boulevards |
| | | Group of trees | Group of trees (Arboretum) |
| | PUBLIC GREEN SPACE | | Residential park |
| | | | Green Corridors |
| | VERTICAL GREENING | | Facade-bound greening |
| | | Ground-based greening | Noise barrier as ground-based greening |
| | | | Noise barrier as free standing living wall |
| | | Free standing living wall | Mobile vertical greening / Mobile Green Living Room |
| | | Moss wall | ‚City tree' |
| | | | Living Plant Constructions (Baubotanik) |
| | GREEN ROOFS | | Intensive green roof |
| | | | Extensive green roof |
| | | | Smart roof |
| | | | Constructed wet roof |
| | WATER SENSITIVE URBAN DESIGN MEASURE | | Bioswale |
| | | Infiltration basin | (Dry) Detention Pond |
| | | | (Wet) Retention Pond |
| | | | Rain garden |
| | | Permeable paving system | Permeable pavement |
| | | | Vegetated grid pave |
| | | | Permeable concrete |
| | | | Porous asphalt |
| | | | Permeable stone carpet |
| | | | Underground water storage |
| | | | Constructed wetlands |
| | | | Biofilter (water purification) |
| | (RIVER) RESTORATION | River space extension | Reprofiling/Extending flood plain area |
| | | | Branches |
| | | | Channel widening and length extension |
| | | | Reprofiling the channel cross-section |
| | | | Diverting and deflecting elements |
| | | | Living revetment |
| | MEASURE OF BIOENGINEERING | | Living Fascine |
| | | | Revetment with cuttings (Spreitlage) |
| | | | Planted embankment mat |
| | OTHER NBS | | Biofilter (air purification) |
| | | | Mounds |

## Growgreen

| PROJECT | NBS CATEGORY | NBS |
|---|---|---|
| GROWGREEN | | Green roofs |
| | | Vertical greening systems |
| | | Vertical forest |
| | | Urban parks, forests, spaces |
| | | Green urban furniture |
| | | Greening transport infrastru. |
| | | Urban gardens |
| | | Inland wetlands |
| | | Floodplains |
| | | River restoration |
| | | Restoration of streams |
| | | Re-meandering |
| | | Oxbow lakes reconnection |
| | | Polder areas renaturalization |
| | | Lake restoration |
| | | Riparian woodland |
| | | Managed realignment |
| | | Coastal wetlands |
| | | Sand dunes |
| | | Shore & beach nourishment |
| | | Sustainable drainage systems |
| | | Rainwater harvesting |
| | | Pervious surfaces |
| | | Infiltration basins |
| | | Infiltration trenches |
| | | Soakaways |
| | | Rain gardens |
| | | Swales |
| | | Planted channels & rills |
| | | Detention basins |
| | | Retention ponds |
| | | Geocellular storage systems |
| | | Filter strips |
| | | Blue roofs |
| | | Groundwater recharge syst. |
| | | Constructed wetlands |

## Proglireg

| PROJECT | NBS CATEGORY | NBS |
|---|---|---|
| PROGLIREG | | Transforming former landfill sites |
| | | Regenerating soil |
| | | Community urban gardening and farming |
| | | Aquaponics |
| | | Green roofs and vertical gardens |
| | | Improving accessibility to green corridors |
| | | Embedding NBS into urban planning |
| | | Pollinator biodiversity |

## Think Nature

| PROJECT | NBS CATEGORY | | NBS |
|---|---|---|---|
| THINK NATURE | RESTORATION OF DEGRADED ECOSYSTEMS | WATER FLOW REGULATION | Restore wetlands in areas of groundwater recharge |
| | | | Reconnect rivers with floodplains to enhance natural water storage |
| | | | Re-vegetation of riverbanks |
| | | | Re-meander rivers (where they have been artificially straightened) to help reduce speed and height of flood peaks |
| | | | Use soil conservation measures (such as cover crops, wind breaks, deep-rooted plants and minimum or conservation tillage) to increase soil water holding capacity and infiltration rates |
| | | | Plant trees / hedges /perennial grass strips to intercept surface run-off |
| | | WATER TREATMENT | Use engineered reedbeds/wetlands for tertiary treatment of effluent |
| | | | Target ponds/wetland creation to trap sediment/pollution runoff in farmed landscape |
| | | | Restore grassland/low input arable in drinking water catchments |
| | | CLIMATE REGULATION | Protect forests from clearing and degradation from logging, fire and unsustainable levels of non-timber resource extraction |
| | | | Enrichment planting in degraded and regenerating forests |
| | | | Maintain and enhance natural wetlands |
| | | SOIL FERTILITY AND NUTRIENT SEQUESTRATION | Increase soil organic matter by incorporating manure, compost, biosolids or incorporating crop residues to enhance carbon storage |
| | | | Integrate biochar into agricultural soils |
| | | | Use grazing management and animal impact as farm and ecosystem development tools |
| | | | Change crop rotations |
| | | EROSION REGULATION | Retain and restore forest cover on steep slopes |
| | | | Protect remaining intertidal muds, saltmarshes and mangrove communities, seagrass beds and vegetated dunes from further degradation, fragmentation and loss |
| | | | Create new intertidal habitat through afforestation, or planting of saltmarsh or seagrass at appropriate elevations in the tidal frame |
| | | | Agro-ecological practices |
| | | | Plant trees/hedges/perennial grass strips to intercept surface run-off |
| | | | Re-vegetation of riverbanks (such as through stock exclusion, and/or direct planting) |
| | | | Replace hard engineered river stabilization with softer alternatives (e.g. willow-based) |
| | | GREEN INFRASTRUCTURE | Green Roofs |
| | | | Green Walls-Green Facades |
| | | | Private Gardens |
| | | | Green Corridors-Street plants & Trees |
| | | | Urban farms, allotments or community gardens |
| | | | Urban Forests–Woodlands-Parks |
| | SUSTAINABLE URBNIZATION IN CITIES | BLUE INFRATRUCTURE | Rivers or streams, including re-meandering, re-opening-Blue corridors |
| | | | Sustainable Urban Drainage Systems-Permeable Pavements |
| | | MATERIALS | Bio-waste based Growing Materials, including mycelium |

## Urban Green Up

| PROJECT | NBS CATEGORY | NBS |
|---|---|---|
| URBAN GREEN UP | RE-NATURING URBANIZATION | Planting and renewal urban trees |
| | | Cooling trees (species to maximize cooling effect) |
| | | Shade trees (species to spread canopies) |
| | | Arboreal Areas around urban areas |
| | | Trees Re-naturing parking |
| | | Parklets |
| | | Urban Carbon Sink |
| | | Green resting areas |
| | | Cycle and pedestrian green route |
| | SINGULAR GREEN INFRASTRUCTURE | Small-scale urban livestock |
| | | Community composting |
| | | Urban orchards |
| | | Improving Overall Efficiency of urban wastewater treatment by using by-product- |
| | | Climate-smart Greenhouses |
| | | Urban Garden Bio-Filter |
| | | Green Filter area |
| | | Green Shady Structures |
| | | Green roof |
| | | Electro wetland |
| | | Green covering shelters |
| | | Floating gardens |
| | | Vertical mobile garden |
| | | Green noise barriers |
| | | Green fences |
| | | Compacted Pollinator's modules |
| | | Natural pollinator's modules |
| | | Pollinators roof |
| | | Pollinators walls/vertical |
| | | Pollinator verges and spaces |
| | | Smart soil as substrate |
| | | Smart soil production in climate-smart urban farming precinct |
| | | Enhanced nutrient managing and releasing soil |
| | WATER INTERVENTIONS | Cool pavement |
| | | Cycle-pedestrian green paths |
| | | Green pavements – Green Parking Pavements |
| | | Hard drainage pavements |
| | | Natural wastewater treatment |
| | | Green Filter area |
| | | Floodable park |
| | | Hard drainage-flood prevention |
| | | Grassed swales and Water Retention Pounds |
| | | SUDs for green bike lane/parking |
| | | Rain gardens |
| | | SUDs |
| | | Culvert works |
| | | Urban Catchment forestry |
| | NON TECHNICAL INTERVENTIONS | Support activity |
| | | City coaching |
| | | Engagement |
| | | Educational activities |

| PROJECT | NBS CATEGORY | | NBS |
|---|---|---|---|
| NATURE 4 CITIES | OBJECTS /SHAPES AND PHYSICAL PROJECTS | ON THE GROUND | Large urban parks |
| | | | Heritage garden |
| | | | Botanical garden |
| | | | Pocket garden/Park |
| | | | Community garden |
| | | | Green cemetery |
| | | | Public urban green spaces (place, square ...) |
| | | | Hedge& planted fence |
| | | | Private garden |
| | | | Urban forest |
| | | | Flower Field |
| | | | Urban green spaces with specific uses |
| | | | Wood |
| | | | Lawn |
| | | | Single Tree |
| | | | Green tram track |
| | | | Street tree |
| | | | Green strip |
| | | | Green waterfront |
| | | | Unsealed parking lot |
| | | | Green parking lot |
| | | | Vegetable garden |
| | | | Urban orchard |
| | | | Urban vineyard |
| | | | Meadow |
| | | | Urban farm |
| | | | Quarry restoration |
| | | | Management of polluted area by plants (phytoremediation) |
| | | | Rustic plant |
| | | | Horticultural but non-invasives plant |
| | | | Indegenous species |
| | | | Non allergic species |
| | | | Diversity of plans species |
| | | | Plant with bio-filter features |
| | | | Soil & slope revegetation |
| | | | Strong slope revegetation |
| | | | Works on soil |
| | | | Structural soil |
| | | | Soil improvement |
| | | | Mulching |
| | | WATER | Excavation of new waterbody (pond, lake) |
| | | | Infrastructure removed on river (ex dam) |
| | | | Reopened stream |
| | | | Remeander river |
| | | | Re-profiling river bank |
| | | | Vegetation engineering system for riverbanks erosion control |
| | | | Revegetation of aquatic planting |
| | | | Gravity fountain (captation of a spring) |
| | | | Swale |
| | | | De-sealed area |
| | | | Floodplains |
| | | | Constructed wetland for phytoremediation |
| | | | Constructed wetland for wastewater treatment |
| | | | Use of terrace (bases on cultivation terraces principles) |
| | | ON BUILDING STRUCTURES | Intensive green roofs |
| | | | Semi-intensive green roof |
| | | | Extensive green roof |
| | | | Roof pond |
| | | | Climber green wall |
| | | | Green wall system |
| | | | Planter green wall |
| | | | Vegetated Pergola |
| | STRATEGIES & ACTIONS | URBAN GREEN SPACES MANAGEMENT | Sustainable use of fertilisers |
| | | | Integrated pest management |
| | | | Integrated weed management |
| | | | Integrated and ecological management: spatial aspects |
| | | | Integrated and ecological management : time and Frequency aspects |
| | | | Create and preserve habitats and shelters for Biodiversity |
| | | | Use of grazing animals |
| | | | Isect hotel (for wild bees) |
| | | | Beehive (for honey bees) |
| | | WASTE MANAGEMENT | Composting |
| | | PROTECTION AND CONSERVATION STRATEGIES | Limit or prevent access to an area |
| | | | Limit or prevent some specific uses and practices |
| | | URBAN PLANNING STRATEGIES | Ensure continuity with ecological network |
| | | | Take into account the distribution of public green spaces through the city |
| | | | Planning tools to control urban expansion |
| | | MONITORING | Bio-indicators |