proGIreg

Implementation Monitoring Report n.2

Deliverable 3.4

Work Package: 3

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Tables

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Partner organizations

No.	Name	Short name	Country
1	Rheinisch-Westfaelische Technische Hochschule Aachen	RWTH	Germany
2	Stadt Dortmund	DORTMUND	Germany
3	City of Turin	COTO	Italy
4	Grad Zagreb	ZAGREB	Croatia
21	Università degli Studi di Torino	UNITO	Italy
22	Consiglio Nazionale delle Ricerche	CNR	Italy
33	Ningbo Municipal Center for Forestry Science & Technology Services	FBNC	China (People's Republic of)

Abbreviations

EC: European Commission

ERDF: European Regional Development Fund

FC: Follower Cities

FRC: Front Runner Cities

GA: Grant Agreement

GI: Green Infrastructure

GIS: Geographic Information System

IP: Implementation Plan

LL: Living Lab

MS: Milestone

NBS: Nature-Based Solutions

NGO: non-governmental organization

proGIreg: productive Green Infrastructure for post-industrial urban regeneration

RA: Risk Assessment analysis

TRL: Technology Readiness Level

WP: Work Package

Executive summary

The NBS pilot implementation was managed by COTO using the tools described in D. 3.1 (Common methodology) by December 2019. The tools were designed at the early stage of proGIreg project (2018), tested within the initial phase of WP3 activities (June 2019) and reviewed during the implementation timing (2020/2021). Five "NBS monitoring phase" (June/July 2019; December 2019; June 2020; December 2020, June 2021 – the last is contained in this report) were planned and realized. The intermediate results were displayed in the first implementation monitoring report (D. 3.3) by June 2020.
The results of the WP3 monitoring activities are displayed in this second report, with a focus on the current situation (May/June 2021).
The monitoring of the implementation process has shown some indications about the complexity in planning and realizing concretely the NBS in FRC urban contexts. The most relevant of these common features are outlined here:

- the temporal distance from the moment the proposal was written (2017) to the one the FRC started their engagement in ProGIreg activities, forced the partners to face a local situation changed from the initial one (see for example the interlinkages with IGA in Dortmund).
- specifically, the property of the land or area, together with other procedural and bureaucratic and mandatory steps has greatly provoked delays and location changes (NBS 2 in Dortmund)
- while some NBS are based mainly on participation and citizen engagement others have technical features that hamper a bottom up approach and limit co-design activities (see for example NBS 4 and 7)
- the implementation phase is strictly connected to the co-design phase and to the building of a cohesive and engaged community of stakeholders (see NBS 3 type)
- the executive or physical realization of the NBS is often short, while the monitoring and accompanying activities play a crucial role and are designed to last for the whole duration of proGIreg project, and over (see NBS 8 in Turin or NBS 3.3 in Zagreb)
- the co-design and the implementation phases should encompass a viable path of maintenance and handover activities that are at this stage not always achieved and so FRC should pay attention to this sustainability topic

The outbreak of COVID-19 virus erupted by March 2020 and the restrictions imposed has seriously worsened the situation provoking further delays and the halting or cancelling many activities, just once the springtime would have allowed to restart the open-air activities. Moreover, the uncertainty about the negative effects of the pandemic as well about the ending of emergency situation has hampered also the rescheduling of the activities. By the time this report is edited the situation appears to be largely improved but we still have recorded, during the last six months period, delays due to the pandemic restrictions (because of the so called "Third wave" of virus spreading. In Zagreb the heart quake blasted by March 2020 provoked

also City's budgets cuts whose impact have forced the Municipality to redesign some NBS implementation activity.
As a result of these factors FRC are mainly still engaged in ongoing step of implementation or even at planning stage and the current planned date to complete the LL (having all NBS finished their construction phase, and being operative or running) in three FRC is 2022. Notably, Ningbo has planned to end its two NBS by June 2021.
COTO will ensure its support to FRC in monitoring and reporting the NBS implementation process **until all NBS are completed** at its core stage and the final version of the Implementation Plan will be completed.
The first chapter will detail how each NBS monitoring working phases, tasks and deliverables, were conceived and carried out by CTO and FRC. In this chapter the methodological addresses and the tools adopted are displayed: **NBS monitoring timeline file and Implementation Plan.** In the second chapter a view of the NBS in all FRC Living Labs details each intervention subdividing it by NBS type. There third chapter illustrates the current situation in each FRC regarding the implementation phase. Last chapter is dedicated to highlight some consideration and monitoring perspectives. The Implementation Plan (IP) of each FRC, annexed to the report, illustrate in great detail each Living lab challenges and goals and a comprehensive table (NBS table, chapter three of the IP) will resume all important features of each single implementation.

1 Introduction

1.1. Introduction to the project

Productive Green Infrastructure for post-industrial urban regeneration (proGIreg) is developing and testing nature-based solutions (NBS) co-creatively with public authorities, civil society, researchers and businesses. Eight nature-based solutions, which will support the regeneration of urban areas affected by deindustrialisation, will be deployed in Dortmund (Germany), Turin (Italy), Zagreb (Croatia) and Ningbo (China). The cities of Cascais (Portugal), Cluj-Napoca (Romania), Piraeus (Greece) and Zenica (Bosnia and Herzegovina) will receive support in developing their strategies for embedding nature-based solutions at local level through co-design processes.
Through the implementation of green infrastructures (GI), proGIreg intends to promote self-sustaining business models that can boost and regenerate these areas. The cooperation of public actors, civil societies, academies and industry/SMEs (the so-called “quadruple helix approach”) is fundamental to build shared practices and ensure continuity over time. Innovation will take place of three levels: on a technical level through the deployment and improvement of the NBS; on the social level through co-designing, co-creating and co-implementing GI in partnership with local communities; on the economic level, as NBS can highlight new market opportunities for the green economy development that can be used in the private sector, social entrepreneurship and public actions.

1.2. Introduction to the Tasks and Deliverables

The Municipality of Torino (COTO) is the coordinator partner of WP3 NBS pilot implementation. This WP is dedicated to:

- the definition of a common methodology for implementation (Task 3.1);
- the maintenance and follow up of the implementation (Task 3.2);
- the production of a “Living Lab Implementation Plan" in each of the four FRCs (Tasks 3.3/4/5/6).

The following table summarizes the overall structure of the Deliverables that composes and gives evidence of the WP3 COTO activities. The original timing has been changed due to some reasons that will be explained within this report.

Table 1 – WP3 Deliverables overview

Nr.	Deliverable Title	Deadline	Notes
D3.1	Report on Common Methodology for implementation incl.	M19 (Dec. 2019)	Delivered in time and amended by July 2020 (M37). In the Deliverable are explained the working methodology and the tools to be used in

	sample templates for monitoring		order to give evidence of the work done for NBS implementation in each FRC.
D3.2	Four Implementation Plans: Dortmund, Turin, Zagreb, Ningbo	M25 (June 2020)	Produced by July 2020 (M26). It consist of a four Implementation Plans, produced by each FRC. It constitutes the first draft version by documenting the implementation phase in each FRC.
D.3.3	Implementation Monitoring report 1	M25 (June 2020)	Delivered in time. The first monitoring report documented the results of the first year of NBS monitoring activities
D.3.4	Implementation Monitoring report 2	M31 (Dec. 2020)	**Postponed to June 2021 (M37).** The present report. Similarly to the first report it documents the results of WP3 coordination activity. It contains a second version of each IP, still in draft version except for Ningbo that finalized the NBS in the planned time.
D.3.5	Four implemented LLs in Dortmund, Turin, Zagreb, Ningbo with running NBS	M37 (June 2021)	**Postponed to December 2022 (M52).** It will consist in the final version of the FRC IPs.

The monitoring activities carried out by COTO in order to support FRC in implementing the NBS started earlier than the beginning of the official implementation phase (January 2020), (see D.3.1) with the aim to design, test and share working tools able to detail and check all working phases following the implementation process. By the end of June 2020, the FRC, having fully adopted the methodologies and tools proposed have produced the first draft version of LL Implementation plan (D3.2). By that time the COVID-19 have already produced consistent delays and cancellations in the planned activities forcing FRC to re-design most of them. Consequently, and having a "second wave" of the virus hit the FRC (but Ningbo) COTO asked to postponed the present Deliverable, by six months, to June 2021. Finally, the monitoring activities have already highlighted how the implementation phase will last more than the planned 18 months (January 2020- June 2021) and having exchanged updates with FRC, COTO proposed to extent it by the end of December 2022.

1.2.1 Definition of a common methodology for implementation (Task 3.1)

This task ended at M19 (Dec. 2019) with the finalization of the Deliverable 3.1 (Report on Common Methodology for implementation) which contains:

- a timeline where all NBS are detailed and split in single action and month(s) of realization
- a risk assessment analysis that investigated risks and hazards during the implementation phase by highlighting possible mitigation measures

- a template to build the Implementation Plan in each LLs with a detailed focus on each NBS type

The constant updating and revision of the tools helped the cities in distinguishing and detailing each single action within NBS projects, by describing and locating it (in the time) in a common and comprehensive timeline table. The practice of using this timeline Excel file by FRC was differently perceived among partners: while some actors have shown a good understanding of the table management, in some cases the changes in the activities during the implementation phase (that were supposed to highlight the divergences of the current situation from the planned one) has not been easily displayed.

The following pictures illustrates the changes within the timeline of the WP3 actions by comparing the initial timeline (figure 2 and 3) with the current one.

Figure 1 – Initial WP3 activity timeline

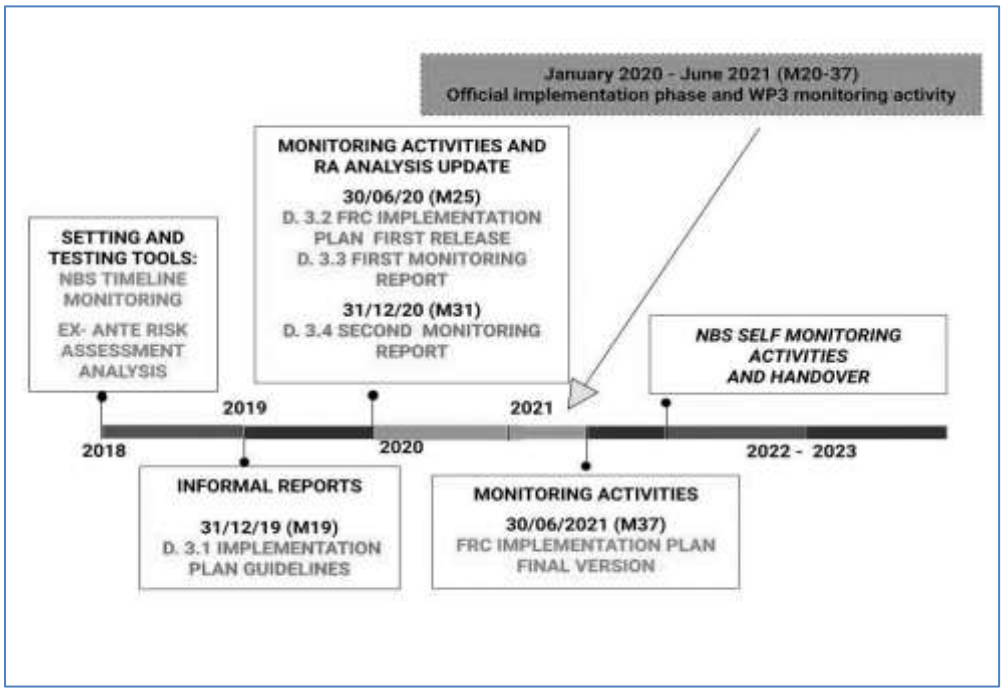
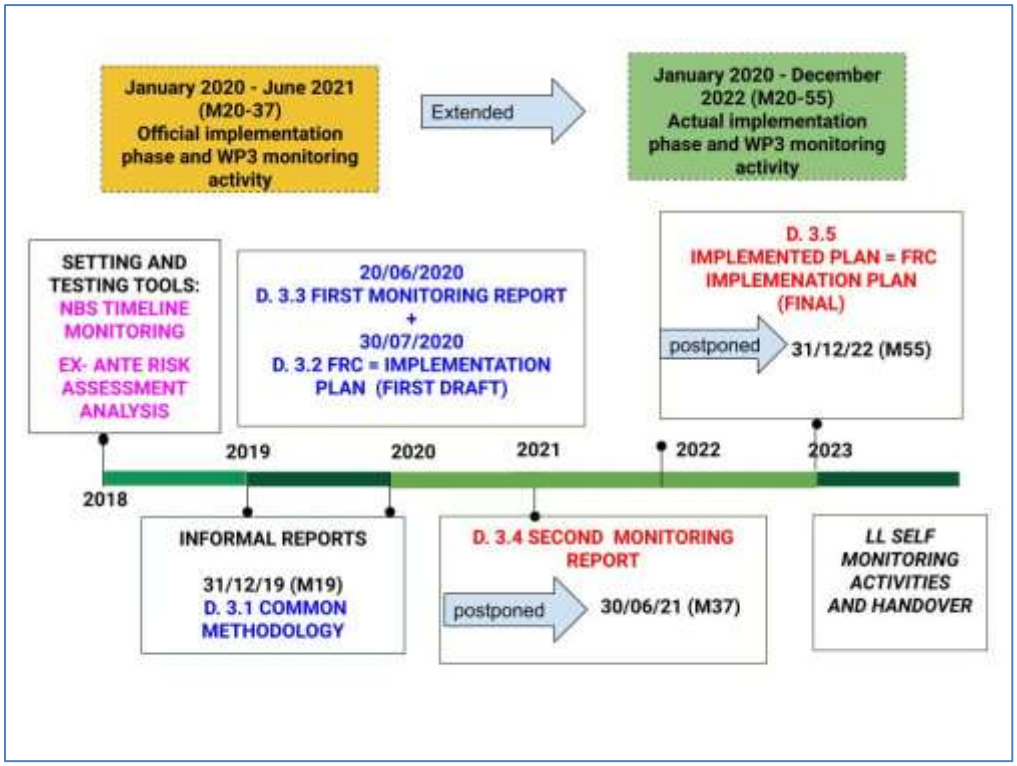


Figure 2 – WP3 activity timeline revised



While the Deliverable 3.1 and the first monitoring report (D.3.2) were produced according to the planned deadline, COTO decided to ask for a six months delay in elaborating the second monitoring report (this document), due to:

- The COVID-19 outbreaks halted or cancelled many activities not only in the ongoing working NBS (the NBS where the construction phase – the NBS physical realization- was still in progress) but also the completed one (by cancelling all the outdoor activities involving citizens) and also, sometime, the planned ones, banning planning or co-designing meetings.
- Secondly, this request for delay was decided considering the complexity of the actions to be carried out in order to complete the NBS. Even the physical construction phase usually lasted only some months of working, the co-design activities, as well as the pre-implementation activities (the procedural or administrative steps that allow the physical interventions, issues mainly internal to the city's administration) took much more effort in time-consuming activities.

Consequently, and having the COVID-19 imposed further restrictions in its second (autumn 2020) and third wave (March 2021) it was clear that the implementation phase will be not completed by the official deadline (June 2021 - M37). For this reason we've requested to postpone the production of the Deliverable 3.5 (Four implemented LLs in Dortmund, Turin, Zagreb, Ningbo with running NBS) according to the current planned implementation activities in FRC. Notably, while the City of Ningbo has completed all the NBS but one that was

cancelled by the official deadline of June 2021, some other FRC, especially Dortmund, has marked a delay, in completing all the NBS, of more than one year.
At current time it is quite easy to foreseen that obstacles could hamper or delay further the completion of some NBS date. Nevertheless, the overall deadline of December 2022 should be complied by all FRC.

1.2.2 Maintenance and follow up of the implementation (Task 3.2)

The two main tools used and updated by FRC to monitor and reports the progress of NBS implementation in each Living Lab are the (1) NBS timeline and the (2) Implementation Plan (IP). Both were illustrated in the Deliverable 3.1 and tested locally (within the Turin's partners) and internationally (during dedicated meetings with FRC).
COTO has chosen to adopt to monitor, check and compare the different implementation activities, a template scheme similar to the official GANTT chart used in proGIreg official documents in order to work on an already known and comparable template. The logic behind the table, the approach and the instructions on its usage were displayed within the D. 3.1 and further explanations were provided during meetings with all FRC or single City held during the first reporting period. Each six months FRC are asked to update their monitoring table by highlighting discrepancies from the planned timing period and commenting on eventual delays or advanced works.
The analysis of the tables **has allowed to drawn some common features of building a nature base solution** as evidenced in many proGIreg NBS experiences:

- there was a significant procedural preliminary phase, encompassing numerous bureaucratic steps, most of them within the local administration
- the physical realization usually takes a short time to be completed but it is highly dependent on seasonal factors.
- the accompanying activities were more pronounced than the co-design activities at the early stage of the project; Moreover, this kind of activities usually lasted for a longer time (exceeding the official deadline) and are likely to change according to external conditions (season and weather, school year duration, further resources to be allocated, etc.)
- the activities involving stakeholder and citizen represent the engine to run long term or sustainable initiatives (see NBS 3.2 Orti Generali in Turin or the info point in Zagreb -- NBS 3.3). Given this, the success of these activities constitutes a main critical factor of a sustainable intervention.
- the technical bio-monitoring of the selected NBS is another crucial activity of a pilot intervention that is dealing with nature. The seasonality as well weather conditions, as well the plant seeding, growing and maintaining timing and techniques are useful sources of knowledge in order to replicate the intervention.
- the maintenance is a challenging task that at the moment was solved mainly thanks to the positive and proactive approach of engaged people.

These common features reveal relevant elements be considered in further designing and planning NBS interventions in urban context of post-industrial areas.
During the implementation phase emerged the need to have a tool to display the overall situation of each NBS in each FRC in a single view. Each overall FRC table will be displayed in the following chapter three. The table reports basic information on each NBS including possible differences between planned and actual activity. The focus is on **construction/physical realizations**, established as the core element in order to identify the status of the implementation. This simplification was not always completely well perceived and moreover, in most of the cases, as illustrated, this phase doesn't conclude the effort needed to achieve the planned goals. A detailed analysis of the delays produced by the COVID-19 related restrictions will show how it affected the NBS activity in FRC.
Given this, the monitoring tools are conceived to match two different perspectives of analysis: **the process of implementation**, by monitoring the development of works and highlighting the status quo, the next step, the difficulties and achievements; the **production of concrete outcomes** realized during the project (effectiveness monitoring).

1.2.3 Production of a "Living Lab Implementation Plan" in each of the four FRCs (Tasks 3.3/4/5/6).

The Living Lab Implementation Plan is the main outcome designed to display and describe the work done to realize the NBS in each Living Lab context. Its logic and working use is fully explained and detailed in the D. 3.1.

COTO activities aimed at supporting FRC in their Living Labs were firstly dedicated to:

- capitalizing the results of spatial planning and design phase (WP2) by highlighting the results in terms of needs, challenges and goals of the proGIreg Living Labs;
- focusing the work on the building of the Living Lab management team. The need to have an organizational structure proposal to be shared with all partners and stakeholders was highly perceived in Turin, due to the great number of actions to carry out, actors (only within the City's administration there are 6 departments, 15 units and more than 30 colleagues involved) and stakeholders engaged. A document describing the management structure encompassing a description of roles and functions of each actor, and clustering the proGIreg activities (to be held locally within all WPs) was edited and discussed during the first meeting of the project.

The above topics fed the contents of the Living lab Implementation Plan (IP), conceived with the goal to realize:

- a comprehensive document containing a detailed description of the LL area and all relevant information about each NBS implemented in FRC
- a working document to be used, updated and revised during the implementation phase

The core of the IP are the NBS tables. Each single project within the 8 proGIreg NBS types has been detailed trough an easy but comprehensive template. Considering all FRC, **33 NBS**

tables produce and illustrate a great number of information and contents about NBS to be considered as a **source of knowledge** for deepening further activities within proGIreg WPs and with other Horizon 2020 sister projects.

The Implementation Plan will have, as an annex, a Living Lab Map, produced with a common layout realized by WP6. Each Living Lab Map graphically shows the outcomes that came out from the implementation of activities. It is a powerful tool in order to display the concrete results of proGIreg NBS realized in each Living Lab of FRC. It contains some brief information about the status, the localization and the partners involved in each NBS related actions. It will also be used as a tool to plan further interventions and possible replications.
The following chapters illustrate the results obtained in COTO NBS monitoring activities through the analysis of the tools used by FRC.

2 Monitoring results by NBS type

2.1 Introduction

The following chapters highlight each project managed in all LL by using the official NBS typologies identified in the proposal phase.
There is a great variety in terms of number, type of intervention and NBS selected by the cities to be implemented in respective LL. The single NBS is often composed by an articulated set of diverse initiatives planned to reach a specific target or goal.
The following tables show a comprehensive outlook of some essential information or each NBS in FRC Living Labs. We chose to highlight technical or accompanying activities or other issues depending of each NBS type.

2.2 NBS 1: Renaturing landfill sites for leisure use

This NBS was carried out only in Dortmund with two interventions, which whom one was actually completed in 2018 (Integrating solar energy production on Deusenberg landfill). The other NBS changed location and name (former name and location: Integrating sports activities on Deusenberg landfill) and is managed by two Departments of the City of Dortmund: Urban Renewal (leading) and Green Spaces. A contribution from SWUAS and Urbanisten is foreseen in conjunction with NBS 8: some park areas will receive species-rich seeds. A public tender will select the company who will install the sport devices.

Table 2 – NBS 1: Renaturing landfill sites for leisure use

FRC	Title	Brief description	Notes
Dortmund	Exercise Park in Huckarde	Installation of sport devices in a public park useable for Huckarde and Dortmund citizens and pupils from an adjacent school.	Political approval was crucial to proceed with this NBS. Workshop results in the planning process leaded to design sport devices for all ages and fitness degrees, integration of a parkour for sports lessons of the adjacent school, use of an inviting design and of unique feature exercise infrastructure

2.3 NBS 2: New regenerated soil

This NBS was supposed to be implemented in two FRC but actually the city of Ningbo was forced to cancel its realization (Transforming lake sediment into soil fertilizer) because of unsurmountable problems due to the lake polluted sediments. The NBS 2 in Turin was conceived as one of the most the relevant and innovative initiative within proGIreg project. The working team coordinated by Environment Park included all the actors representing the

quadruple helix approach: Public Sector (the Municipality, owner of the land), the research sector (University of Turin, who is in charge of the bio monitoring activities), the private sector (DUAL, who provide the soil and ACEA who provide the compost and CCS that provide the biotic compound). The citizen were involved in dedicated workshop to inform them about the project and foster their awareness. The New Soil having terminated the physical construction is currently under monitoring activities (that will last until the endo of proGIreg) in order to assess the results obtained in term of soil quality and planting sustainability.

Table 3 - NBS 2: New regenerated soil

FRC	Title	Brief description	Notes
Turin	**New soil production by Sangone Park**	Creation of an area of "urban forest" along the banks of the Sangone river through the use of regenerated soil (New Soil), based on excavated material with the addition of compost from FORSU, zeolites and innovative biostimulants. The composition of the New Soil has been defined with the main scope of minimize maintenance needs.	Several epidemiological studies show that fruits, vegetables and cereals can play a nutraceutical role for their content of many antioxidant phytochemicals such as carotenoids, ascorbic acid and polyphenols or phenolics derivatives. A commercial inoculant (MICOSAT F®) containing arbuscular mycorrhizal fungi (AMF) could improve the nutritional value in crops. The goal of this work was to evaluate the effect of AMF on the level of carotenoids production, phenols, anthocyanins and saponins, proteins, total antioxidant activity and nitrates content in fruits, vegetables, legumes and durum wheat, whose consumption is largely recommended according to Mediterranean diet.

2.4 NBS 3: Community-based urban farms and gardens

This NBS type was implemented by all FRC that tailored this typology according to their needs and opportunities. 13 different NBS are implemented within this NBS type. Community gardens, food forest, pollinator gardens, school gardens and box gardens are some of the main solutions adopted by the FRC. Similarly to other NBS these intervention relay on citizen involvement with the goal of give them an opportunity of socialize while producing food or growing plants together.

Table 4 - NBS 3: Community-based urban farms and gardens

FRC	Title	Brief description	Notes
Dortmund	**Food forest and permaculture orchard in Huckarde**	A 3000 m² food forest – a self-sustaining woodland ecosystem designed for food production – will be created together with the scouts and the members of the St. Urbanus community.	The project overlaps with NBS4, Auqaponics workshops can take place at the school. In relation to NBS8, the school itself has a project with bees to strengthen biodiversity, which takes place in a neighboring area near the forest garden of St. Urbanus. Here, a cooperation between the participants of the forest garden

			project and the students is being considered.
	Community gardening in Huckarde	A school garden will be created on part of the grounds of the Gustav Heinemann School. This school garden is to be built and run by a group of pupils. More raised beds are considered to be constructed in a number of daycares in Huckarde.	This NBS has been canceled and merged with NBS to the previous NBS (Food Forest).
Ningbo	**Planting aquatic plants along the shore of the lake**	Planting aquatic plants along the Moon Lake will beautify the environment while purifying the water quality. Aquatic plants are being used to re-nature a 5 km corridor surrounding the urban Moon lake Park.	Planted aquatic plants need to have a strong purification ability, but also need to be ornamental. The design and layout of the ecological media tank need to be carefully calculated. After being beautified, the environment of Moon Lake provides people with high-quality green space.
Turin	**Castello di Mirafiori ruins recovery**	Landscape transformation, through new plants and signposting, to enhance the area of historical-environmental interest (green area adjacent to the ruins of the Castle of Mirafiori and the altar inside the area of the Bela Rosin Mausoleum).	The engagement of Comitato Borgata allowed a deep historical knowledge of the area and ensured an important contribution for the cleaning of the ruins.
	Garden in Cascina Piemonte (Orti Generali)	Building a model of enterprise model for the transformation and management of post-industrial and metropolitan residual agricultural areas based on ecological sustainability and social equity.	The aim is to regenerate Cascina Piemonte area, which is mostly reduced to ruins because of occupations and acts of vandalism, creating new community gardens that will pursuit different goals: education, social inclusion, technological innovation, job training and integration into the labor market. 160 gardens of different charges and sizes will be realized and 330 trees will be planted.
	Pollinator friendly gardens (WOW)	Orto WOW is designed to address to topic of ecological corridors in Mirafiori South. The goals are: to recover an abandoned and underutilized former industrial lot and to return it for public use; to favor the transition of pollinating insects, following the directions of the ecological corridors identified by proGIreg; to activate local inhabitants in taking care of the new green installations, by stimulating them through citizens-science activities; to favor a collaborative setting of different stakeholders, in order to	Orto wow is composed of a number of 15of garden boxes with aromatic plants and other melliferous plants. The idea is to create a sort of “green square”, by displacing the boxes so as to facilitate the organization in the courtyard of public activities open to all (such as educational activities, public talks, convivial activities, etc..).

		guarantee the sustainability of the intervention in the future.	
	Didactic gardens in schools	Establishing vegetable gardens in all the primary schools of Mirafiori, plus two kindergarten and one vocational school, and providing educational activities focusing on the themes of sustainable agriculture, biodiversity and the NBS of proGIreg, we aim at improving the science curriculum of the schools, increase their attractiveness and raise awareness of environmental sustainability, NBS and how they can improve life quality in the cities.	The educational activities involve pupils and teachers, while the pupils' families will be involved in events and in the maintenance of the NBS. The benefits of school gardens are many: improvement in achievements scores in science, increase in focus, patience, teamwork and social skills, tendency to make healthier food choices, increase of environmental awareness. Our boxes have been placed on concrete pavements, thus increasing the green spaces in schoolyards, with benefits in terms of reduction of the heat island effect and water runoff.
	Micro vegetable gardens (OrtoMobile)	The urban laboratory "OrtoMobile" promote by City of Turin that has as its common thread " micro garden in box" interpreted as a unit minimum of "Natural Based Solution" easy to implement for all ages, with high degrees of socialization, both in the classroom and at home, with considerable potential for composition that enables the realization of simple and effective installations of indoor and outdoor areas in the schools.	This NBS encompass the following activities: the realization of a practical course for teachers to learn how to make a "vegetable garden in a box". The supply to the classes of a kit composed of suitable cassettes to the realization of the individual modules of "micro gardens", seeds (with particular attention to those suitable for pollination), potting soil, small tools, and garden care manual. The organization of events for the composition of the set-ups inside schoolyards and/or on public space of "collective gardens" by assembling the different modules of "micro vegetable garden", designing formal compositions and different colors depending on the creativity expressed and the places adopted.
	Community school gardens	The objective of "Community school gardens" project is the development of the following activities: knowledge of soil composition; creation of an educational garden inside the school; supporting the creation of collective urban gardens with a social ethical function which need to specific forms of maintenance and management, as a form of adoption of public space; experimenting with the role-playing game "Green Surge City" provided by the proGIreg project; peer to peer" experiences of	The co-implementation phase is foreseen through the signing with the school community of a "pact of collaboration" that defines the management and development of the experience, guaranteeing the activism of children.

		tutoring students of the same age or from primary or secondary schools	
	Gardens between houses	installation of wooden boxes for urban horticulture on public space in the South Mirafiori district, with the aim of improving the urban quality and quality of life in the areas, stimulating the active participation of citizens in the processes of urban transformation, creating opportunities for aggregation and cooperation among citizens on the issue of environmental sustainability and urban horticulture, technological and social innovation, care and sharing of common goods	The choice of the areas has been made by considering the following criteria: availability of water in the vicinity; exposure to the sun; concrete or asphalt paving in order to increase the green availability by installing the container gardens, instead of covering an existing green area; vicinity to social housing complexes; presence of active group of citizens in the vicinity; preference to neglected areas in need of maintenance and care, in order to maximize social benefits.
Zagreb	**The Sesvete City Garden – upgrading the park**	The existing Sesvete city garden will be upgraded with solar purifying water pumps, as the garden is watered directly with underground water. Spores were detected in the water used for the gardens so it needs to be purified.	The "City Gardens" project is an example of sustainable land use in Zagreb, improving the quality of life of citizens and the spatial quality and functions of the urban environment. The aim of the project is to enable citizens to produce food (vegetables and strawberries), herbs and flowers for their own needs.
	The Sesvete City Garden –New garden	Establishing a therapy garden in the southern part of the Sljeme factory area.by involving local NGOs. The garden will offer positive and stimulating environment to children with visual impairments and other multiple disabilities	Local users are being represented by NGOs who were actively involved in the codesign process, and influenced the design of the therapy garden so it suits the needs of the prospective users.
	Info Point	The Info point provides a venue for the proGIreg project activities and their dissemination, as well for promotion of similar and complementary activities, such as tree planting action	The NBS is linked to the city gardens. A small-scale vertical garden installation is planned to demonstrate the simple and non-expensive options for the citizens, schools, public institutions and companies. The inclusion and constant dissemination are crucial to ensure activity and awareness of the importance for the local community and beyond.

2.5 NBS 4: Aquaponics

The aquaponics technology is innovative and requires knowledges to be still explored. So, the implementation of this NBS type constitute a real test bed for experimenting these technology. All the three FRC have suffered delays in planning and implementing this NBS and are still in planning phase.

Table 5 - NBS 4: Aquaponics

FRC	Title	Brief description	Notes
Dortmund	**Community managed aquaponics system**	Two aquaponics greenhouses will be built on part of the site of the old coking plant Kokerei Hansa in Dortmund Huckarde. The greenhouses are intended to produce plants to technically advance the concept of aquaponics and serve as a learning venue for workshops with the population.	Aquaponics is soil-independent; however, further backfill may be necessary due to the contaminated site situation. As a first milestone, a comprehensive list of optimization methods has been compiled. This list is going to be detailed in a technical document. In the following steps, technical calculations are going to be carried out in order to be able to quantify the effectiveness of these methods.
Turin	**Aquaponics test**	Co-developing and testing in real conditions innovative solutions in the field of technology called aquaponics, in order to assess the potential access and market sustainability as well as the related positive effects on the communities of reference.	The City is looking for solutions that can allow an economic sustainability as well as promote the dissemination of new technologies related to urban agriculture and at the same time be able to respond to social challenges and quality of life in the target areas and promote the enhancement of social exchanges and the inclusion of vulnerable population groups.
Zagreb	**Seedling factory with aquaponics installations and green roof**	*This NBS was merged with NBS 5, see next chapter*	

2.6 NBS 5: Green walls and roofs

Four different roofs and walls have been implemented in Turin, showing us how the greatest benefits of these intervention reside in the awareness of the engaged people (pupils, users, etc.) gained through their involvement in the realization. Even the extent of the roofs/walls installed won't produce notable effects in term of temperature decreasing this NBS (this indicator will be monitored by WP4) is a remarkable example of urban transformation towards a greener and healthier city. In Zagreb they gathered this NBS with NBS n.4 with the goal to establish an ambitious green technology center.

Table 6 - NBS 5: Green walls and roofs

FRC	Title	Brief description	Notes
Turin	**Green roof on Casa nel Parco**	New Access to Green Roof on top of "Casa del Parco": realization of the physical access and the improvement of the already existing green roof at Casa del Parco, with the aim to improve its use by citizens, even disabled and aged people. The new access to the green roof at Casa del Parco will allow to use this NBS by all for recreational activities.	The new roof allows access to the roof of Casa del Parco to disabled people, fostering a sense of ownership/community and inclusivity of vulnerable categories.
	Green indoor wall in a school	Setting up of a green wall with dimensions of 20 square meters (school indoor) It will be positioned at a height between 0 and 3 m above the ground floor in a hallway corridor with a large roof-window.	The botanical choice of the indoor wall was agreed with the project group of POLITO, which is investigating in depth the issues related to the abatement of indoor contaminants due to the presence of vegetation.
	Green wall outdoor on a homeless dormitory	Setting up a green wall of 80 square meters (outdoor made with self-supporting structure compared to the anchor wall), positioned at a height between 0 and 3 m above the ground floor according to the instructions given at the time of setting up.	The botanical characteristics of the plants has been done considering the aesthetic and chromatic elements to be obtained with the green wall, on the one hand, and on the other hand identifying nursery material able to attract pollinating insects (bees, bumblebees and butterflies).
	New green roof on public building (WOW)	Realization of an extensive green roof on a public building, currently abandoned	The green roof is intended to be a "natural lawn" obtained by sowing a mixture of seeds from stable meadows of northern Italy that can be calibrated to be used from the plain to the mountain areas up to 1000 - 1500 m of altitude.
Zagreb	**Seedling factory with aquaponics installations and green roof**	A new green technology center in the Sljeme factory area: an innovative solution that integrates green roof, green wall and aquaponics technologies.	The unit will house the aquaponic system with water quality management equipment for fish, processing area, storage area, and packaging area An hydroponic system for growing plants, irrigated with water coming from the pond to the left. An open public space between the two buildings is covered by a green roof and would serve for educations, mini market, STEM workshops, plant transplanting etc. A green wall structure would be erected around the buildings, to protect the area from the sun and to collect the excess rainfall and collect it for later use.

2.7 NBS 6: Accessible green corridors

The FRC involved in implementing this NBS type have chosen to realize green pathways that will connect already existing green areas. Turin decided to work also in the realization of signals and touristic information in order to enhance the corridors and the surrounding areas.

Table 7 - NBS 6: Accessible green corridors

FRC	Title	Brief description	Notes
Dortmund	**Connection of Huckarde Borough with the Renatured Emscher River and Deusenberg Sites**	The path will be about 100 m long and 3 m wide and will be designed as a combined path for walkers and bikers. According to the adjacent path system, there will be no lighting.	This NBS is mainly a technical project which needs to meet all given technical, legal, and administrative requirements. Thus, co-design has been taken place on these levels with specialists. The Huckarde citizens have expressed their desire in the past to receive better access to the Deusenberg site from the settlement.
Turin	**Green corridor**	Ecosystem path capable of redeveloping areas that today are weakly characterized and at risk of "heat island". Pollinating insects will enter urban areas, producing a vital pollination action. It will foster processes of involvement, participation and awareness in the residents.	The composition of the intervention is designed to have pre-defined and repeatable modules and will allow the operation to be carried out in relation to the economic availability of the moment and to be increased as soon as there will be further funding. A "mosaic" methodology of project actions in a wider master plan.
	Local natural heritage enhancement in green corridor	Facilitate access to the NBS implemented by proGIreg, by placing landmarks/signs, providing information both on site and online, and organizing activities and visits for the residents.	The activity is strongly linked to NBS 6.1; the co-design of landmark/signs that are meant to signal and connect all NBS, will involve all partners responsible of the other NBS implementation in Turin.
Zagreb	**New cycling track**	A new 850 m long cycling path will connect Sljeme brownfield area with Novi Jelkovec neighborhood. The cycling track is part of the newly planned road, defined in the detailed plan of the former factory area.	The cycling track will be part of the city street and road network, and will be maintained within the regular city road maintenance program. The cycling track is expected to be used by many of the 5000 inhabitants of local housing estate.

2.8 NBS 7: Local environmental compensation processes

This NBS type doesn't include physical construction and it's related to regulatory framework, procedures and administrative protocols. The three FRC involved in this NBS have chosen different ways to approach the topic: monitoring environmental data in order to quantify their value and define compensations in involving private partners in managing GI (Ningbo); Establish a task force to define new green procedure in form of a guide (Zagreb); gather existing regulation to be used in the Living lab area to greening the city with the involvement of private sector (Turin).

Table 8 - NBS 7: Local environmental compensation processes

FRC	Title	Brief description	Notes
Ningbo	**Establishing protocols and procedures for environmental compensation at local level**	The main content of this activity is to evaluate the comprehensive management results of Moon Lake that is, collecting meteorological, hydrological, chemical and ecological data to monitor the environment of Moon Lake (mainly water environment). If the water quality meets the III level standard, then the government will pay all the costs of the project implementation.	The implementation of the ecological compensation case of Moon Lake can provide reference for the water quality management and amount compensation of other scenic lakes, so that the compensation rules can be traced.
Turin	**Strategic public-private partnership for greening the City**	The aim of this NBS is to identify, collect and display tools and concrete opportunities in order to allow the Administration to improve the green assets of the City. The engagement of the private sector can boost the development of green areas by giving win-win solutions. Green areas should be considered as one of the main "urban commons" and, in contemporary cities, their shared management can become a link between different realities, helping to build a sense of community.	This NBS gather alternative ways of managing GI involving private partners. Private parties can be involved in the development of new infrastructures - such as new green areas, playgrounds, sports areas, urban gardens - as well as in the maintenance and care of existing assets, such as green areas, trees and woods, playgrounds, dog areas, urban gardens, furniture and fountains. A privileged area of involvement of private entities is also the enrichment of the city's arboreal heritage, through interventions of urban forestation, which may involve new plantings or creation of urban forests.
Zagreb	**New protocols and changes to planning procedures and policy development processes**	Define the legal framework, point out the parts that can be changed on local and national level, and outline the necessary activities.	All city administrative bodies, companies, institutions and associations as well as public, civil, business, and scientific sectors provide active contributions in drawing-up of the city strategic documents, while the Partners' Council, consisting of prominent experts from the scientific, public, civil, and business sectors, provide a special contribution. The Partners' Council, as the advisory expert authority, participates in every phase of preparation and drawing up of the strategic documents.

2.9 NBS 8: Pollinator biodiversity

This NBS has shown to have two specific features: dealing with biodiversity thought the planting of pollinator friendly species, and the linkage with other proGIreg NBS by supplying other interventions with plant species with the same features and goals of pollinating.
The NBS in Turin achieved the goal to include in this activity disabled people in training them to monitor the butterflies. This activity has proven to be really healthy for the target group.

Table 9 - NBS 8: Pollinator biodiversity

FRC	Title	Brief description	Notes
Dortmund	**Improving and monitoring pollinator biodiversity in conjunction with NBS 3**	Pollinator-friendly plants will be introduced to the open slopes of the former-landfill site Deusenberg and the neighboring permaculture orchard (NBS 3). Local citizens will help monitoring numbers and species variety.	Experts in the field of insect diversity and general biodiversity have been invited to a collective site survey of the initially selected site with the goal of detailing the implementation. During this event, the experts came to the conclusion that the selected site is already rich in biodiversity and that the intended implementation would do more harm than good.
Turin	**Butterfly garden for disadvantaged people**	Promote the presence of butterflies in the city of Turin through the creation of a network of green areas which, with proper management and with the presence of suitable plants (food plants and nectar sources) for the life cycle, allows butterflies to cross the urban area, otherwise seen by these insects as a wall.	Supported by university researchers, people affected by mental or physical diseases, after a training course, become scientific disseminators and carry out all the project activities in some realities of the Mirafiori district: they create and take care of pollinator gardens, observe and record butterfly species, manage a website, breed caterpillars, taking part in public events and educational activities in schools, refugee centres, social housing, shelter facilities for elderly people.

3. Implementation process in Living Labs

3.1 Introduction

The implementation of NBS along all FRC living labs has been roughly affected by the spreading out of the virus COVID-19. All construction and citizen involvement actions have been halted for months. This issue not only has generated delays in activities, but also it has made the planning of the activities to be reprogrammed due to the consequences the virus (new restrictions, second and third wave, etc.). Its overall impact on the project is still unpredictable.
Nevertheless, the state of implementation is, at present time, mostly ongoing, some construction activities have started, some other are in an executive planning phase and the construction works will start before summer.
Compared with the initial planning (initial NBS timeline and proposal) some changes may appear remarkable at the detailed level of each single NBS. In fact, we still expect cases of abandonment, reframing, changing of location, but also interlinked activities (between different NBS), cross-sectoral initiatives, and unforeseen developments of further opportunities.
The following chapters detail the state of art in each FRC by giving a fixed snapshot of an evolving situation, subordinated also to the pandemic legacy. The second item elaborated in this table is the planned or actual duration of the works needed to complete this phase.
Finally, the columns “COVID-19” underline if the virus affected this phase. Notably, even the construction works have not started yet, the pandemic halted meetings, citizen participation and inspection visits.

3.2 Dortmund Living Lab

Dortmund Living Lab area (215 ha) comprises the project area in which five NBSs will be realized. The LL area is situated along the Emscher River and about 2 km west of downtown Dortmund. At its longest north-south-extension it is 4.8 km long, at its broadest extension in the northern part it is 1.25 km wide, at its narrowest part it is only 40 m wide. Dortmund Analysis Area (2,275 ha) is the adjacent area around the LL. As it is not possible to realize all NBSs within the LL, there are also places in the Analysis Area in which NBS will be realized.

As Dortmund LL is situated in the northern part of the city which is characterized by high-density built-up areas dominated by post-industrial sites and poorly connected spatially to the city centre and the rest of the city, the five implemented NBS offer an opportunity to tackle the social, spatial, economic, and environmental problems. The inter-and trans-disciplinary approach, collaboration between the different stakeholders, and empowerment of the local community to participate in the co-design and co-creation of the NBSs ensure sustainable development, improve living conditions, protect the environment in many ways, and provide economic benefits to both citizens and entrepreneurs. While NBSs will be realized in a specific district, it is believed that the NBSs will have an impact beyond the LL and the neighbouring districts will also benefit from that.

The following figure shows the current situation in each NBS. As mentioned in the D.3.1, in order to set comparable timing the table shows the duration of physical construction of each NBS. The impact of the three waves of COVID-19 related restrictions are highlighted.

Table 10 – NBS status in Dortmund

NBS n.	NBS title	Status	Construction: Start/end months	Notes about further delays	COVID-19 (07/ 20)	COVID-19 (09/20)	COVID-19 (05/21)
1.1	**Integrating solar energy production on Deusenberg landfill**	Completed	Completed in 2018		NO	NO	NO
1.2	**Exercise Park in Huckarde (Sports infrastructure in an existing park in Huckarde)**	Planned	May 22-Sept. 22		NO	NO	NO
3.1	**Food forest and permaculture orchard in Huckarde**	Ongoing working	Nov. 19 - June 21	Activities with the Scouts have been delayed. Online workshops are currently being prepared	YES	YES	YES
3.2	**Gardening in a school yard and Kindergartens in Huckarde**	Planned/ Rescheduling	This NBS measure will not be pursued for the time being due to the third wave of COVID-19, which is preventing co-design and implementation activities from being carried out with the involved actors		NO	NO	YES

4	**Aquaponics**	Planned	Apr. 21-Dec. 21		NO	NO	NO
6	**Connection of Huckarde borough with the renatured Emscher river and Deusenberg sites**	Planned	June 22-Dec.22		NO	NO	NO
8	**Improving and monitoring pollinator biodiversity in Huckarde**	Planned	Sept 20 -June 21		YES	YES	NO

In Dortmund, except for the NBS 1 completed in 2018, most of the works are still at the planning stage (5 out of 7). The NBS 3.1 “Food forest and permaculture orchard in Huckarde”, started its executive phase in 2018, but since the activities of community involvement (Scouts’ groups, Pastor of the Church of St. Urbanus) are very important, these two activities are closely linked and will need a long-term commitment, more than two years. Due to the third wave of COVID-19 restriction measures, the NBS 3.2 measure will not be pursued for the planned time being and it has to be redesigned and rescheduled. The overall situation has forced the City of Dortmund to plan the end of implementation phase up to December 2022.

With regard to the activities still in the planning phase, some delays are reported:

NBS 1.2 “Sports infrastructure in an existing park in Huckarde”. This NBS has been completely reframed because the collaboration with IGA (International Garden Exhibition 2027 an important international exhibition dedicated to gardening) has verified a substantial divergence in construction times, so it was decided to move the location of this NBS at Huckarde Park.

NBS 4, Aquaponics: A binding contract was signed with the Industrial and Monumental Foundation (IDS) in March 2020 for the use of the area of the Hansa Coking Plant, so that the planned time for the area search was exceeded by about nine months. In addition, the two-year implementation period of NBS4 could possibly be shortened, as IDS may have to terminate the contract by the end of 2022 instead of 31 May 2023 as agreed in the contract. The NBS4 site may have to be used as a parking lot for a new event hall at the Hansa Coking Plant in early 2023. The site originally planned as a car park is currently being used as a conversion road (detour) due to road repair work in the area.

NBS 6 “Connection of Huckarde borough with the renatured Emscher River and Deusenberg sites”: a new path will create a barrier-free connection to Deusenberg which will be part of the IGA. The path will be planned by the City of Dortmund, Civil Engineering Department. The technical planning has already started and the realization of the project is foreseen to be realized before the end of 2021.

NBS 8 “Improving and monitoring pollinator biodiversity in Huckarde”: has not a dedicated budget, but it will be merged with NBS3 activities. Whenever establishing an urban garden/farm, it will be integrated with pollinator improvement measures. COVID-19 pandemic has already caused around 5 months of delay.

3.3 Ningbo Living Lab

The Living Lab (2.07 km2) comprises the entire Moon Lake Street around the Moon lake. Moon Lake Street is located in the downtown area of Ningbo City, with an area of only 2.07 km2. It has jurisdiction over 7 communities, with a population of 25,750 people and a density of 12,440 inh./km2. In 2017, the green area of Ningbo City was 11.89 m2 / inh., and the green area of Moon Lake Street was about 11.5 m2 / inh., which was lower than China ’s per capita park green area of 14.01 m2 / inh.
The goal of the Living lab proGIreg activities are:

- On the lake ecological comprehensive control project within one year after the completion of the main water quality indicators will reach IV class, will reach III class for two years.
- Water quality purification and ecological restoration projects will continue to remove pollutants in water bodies through moderate human intervention; improve self-purification ability of water bodies through ecological technology.
- Through renovation, the underwater forest and water garden of the moon lake will reflect the cultural landscape on the shore, which will beautify the environment of the Tianyi pavilion and the moon lake, and strive to become a model of the park landscape and lake management, so that citizens and tourists can enjoy the scenery.

The following figure shows the situation in each NBS implemented in Ningbo.

Table 11 - NBS status in Ningbo

NBS n.	NBS title	Status	Construction: Start/end months	COVID-19 (July 2020)	COVID-19 (Dec. 2020)	COVID-19 (May 2021)
1	**Transforming lake sediment to soil fertilizer**	Cancelled	-	-	-	-
3	**Planting aquatic plants along the shore of the lake**	Completed	Mar. 2020 – May 2021	YES	NO	NO
7	**Procedures for environmental compensation**	Completed	Jan. 2021- June 2021	YES	NO	NO

Due to high levels of heavy metals in lake sediments, the NBS1 was cancelled by March 2020. The works on the lakeshore (NBS 3 and 7) were halted by the COVID-19 related lockdown and now the situation is back to normality allowing the restart of the activities with the goal to complete them by June 2021.

The NBS 2, “Planting aquatic plants along the shore of the lake”, has started its work and the green lake shore today is half converted. During the epidemic outbreak, people were asked to stay isolated. The works on the lakeshore was consequently affected and not well maintained. Actually, it’s returned to normal management and the implementation has been terminated.

NBS 3 “Procedures for environmental compensation”: after the identification of the damaged ecological space of the city, the gathering of an integrated dataset of meteorological, hydrological, chemical and ecological parameters has started in order to assess the size of environmental damage and the extent to which stakeholders are affected. When COVID-19 hit China (January 2020), the collection of water samples has been stopped and water quality monitoring was halted. Currently, the outdoor activities are allowed, so the collection of water samples has re-started.

3.4 Turin Living Lab

The implementation area which hosts the NBS is Mirafiori Sud District. This neighborhood of 1.149 inhabitants is placed in the southern edge of the City's borders, traced by the Sangone River. Mirafiori Sud is a post-industrial district that has had a remarkable growth during the 50s-60s thanks to the car industry (especially FCA). As Mirafiori Sud is a peripheral urban area, it is characterized by a poor quality of the urban environment (green and grey infrastructures) and social issues such as social segregation, poverty and security problems. The purpose of proGIreg implementation in Turin is to address the social, economic and urban problems mentioned above by testing specific NBS by adopting the LL methodology. Through specific measures, activities and tools, this district will be regenerated, and abandoned or underused areas will be accessible again. Furthermore, the safety of these places will be improved and green economy will be supported and boosted. More specifically, the activities carried out in the LL are supposed to have a positive outcome in terms of education (in local schools), inclusion of disadvantaged social groups (social housing inhabitants; people with disabilities), reinforcement of social links, support of new entrepreneurship and new green jobs, and establishment of a common good regulations to apply on NBS. Likewise, residents’ mental and physical health are supposed to improve as well.
The following figure shows the situation in each NBS implemented in Turin.

Table 12 –NBS status in Turin

NBS n.	NBS title	Status	Construction: Start/end months	Notes about further delays	COVID -19 (07/ 20)	COVID-19 (09/20)	COVID -19 (05/21)

2	**New Soil in Sangone Park**	Completed	Dec.19 – Feb. 2020		NO	NO	NO
3.1	**Castello di Mirafiori ruins recovery**	Ongoing working	June 2020. – June 2021	Partially completed	NO	NO	NO
3.2	**Gardens in Cascina Piemonte (Orti Generali)**	Completed	June 2018 - May 2019		YES	YES	NO
3.3	**Pollinator friendly gardens (WOW)**	Completed	Apr. – Sept. 2020		YES	NO	NO
3.4	**School garden in box**	Ongoing working	June 2018 - May 2019 and Feb. 2021- march 2022	Installation completed– educational activities ongoing	YES	YES	YES
3.5	**Portable school gardens**	Ongoing working	June 2021 - Dec. 2022	COVID-19 restrictions halted the activities in schools	YES	YES	YES
3.6	**Community box garden**	Ongoing working	Sept. 2021 – Dec. 2021	COVID-19 restrictions halted the activities in schools	YES	YES	YES
3.7	**Gardens between houses**	Ongoing working	June 2018 - May 2019 and Feb-March 2021	Partially completed	YES	YES	YES
4	**Aquaponic test**	Ongoing working	April - Dec. 2021	Public tender ongoing	NO	NO	NO
5.1	**New green roof in Casa nel Parco**	Completed	Jan. - Dec. 2019		NO	NO	NO
5.2	**Green Wall at school (indoor)**	Completed	Aug. 2020 – Feb. 2021		YES	NO	NO
5.3	**Green wall at homeless dormitory (outdoor)**	Completed	Aug. 2020 – Feb. 2021		YES	NO	NO
5.4	**Green Roof at WOW**	Completed	Feb. – June 2020		YES	NO	NO
6.1	**Green Corridors**	Planned	mar 2021 –Oct 2021	Public tender ongoing	NO	YES	NO
6.2	**Local natural heritage enhancement**	Ongoing working	April 2021 – July 2021	work started	NO	NO	NO
7.1	**Strategic public-private partnership for greening the City**	Planned	(no physical construction)	Renamed and redesigned	NO	NO	NO

8	**Butterfly gardens for schools and disadvantaged people**	Ongoing working	Jan. 2019 - Dec. 2021	Training courses and activities with target people are continues after several halts	YES	YES	YES

In Turin there are 7 NBS (out of a total of 17) whose construction phase has already been completed, while 8 have already started work and the other 3 are in the planning phase. In Turin the COVID-19 related restrictions hit heavily proGIreg NBS activities. Construction sites are 3 - 6 months late because of lockdown during COVID-19 period (all activities under NBS 3 and 5 except for 5.1 completed before the pandemic outbreak). Activities under NBS 4, 6 and 7 are mostly in planning phase and works suffered limitedly the virus restrictions but there were administrative obstacles hampering the implementation. The operative planning of these NBSs is facing some administrative difficulties that could lead also to re-frame them (see NBS 7).

The high number of NBS implemented in Turin has required to deal with different and articulated administrative procedures of agreement and collaboration. Among the different forms of agreement COTO has worked on, the collaboration pact signed for NBS 3.3 and 5.3 turned out to be one of the most effective as it has allowed a private actor to easily intervene on a public building.

3.5 Zagreb Living Lab

The City of Zagreb has chosen a former industrial site in the eastern suburb of Sesvete, and set up a local consortium consisting of the local government body (City of Zagreb), municipal planning bureau (ZZPUGZ), Faculty of Architecture, ZIPS- a local NGO that has together with AF previously developed planning documents to resolve the development problems of the city district, since the former industry is located centrally and divides the neighborhood in half. ZIPS provides a link to the local community and ensures that the needs and aims of the local community are being recognized and respected.
Sesvete is a district of the City of Zagreb and a part of the Zagreb urban agglomeration. It is the easternmost neighborhood of the Zagreb administrative area, covering 20% of the overall surface area of Zagreb. According to the 2011 census, Sesvete has 70,009 inhabitants;
As a way of directing the future development towards a green path, the proGIreg project introduces new perspectives on soft development through small but eye-opening interventions.
The main objective of the brownfield regeneration program in the Zagreb LL is the creation of new public spaces, to ensure spaces for required public facilities and introduce principles of sustainable urban planning. The GI approach must strengthen initiatives regarding urban resilience (low water table, storm water), wellbeing programs (jogging and cycling paths, recreation areas), community activities (urban gardens, green market) and bioclimatic building principles (mitigating city heat islands, natural cooling, green roofs and facades).
The following figure shows the situation in each NBS implemented in Zagreb.

Table 13 - NBS status in Zagreb

NBS n.	NBS title	Status	Construction: Start/end months	Notes about further delays	COVID-19 (09/20)	COVID-19 (09/20)	COVID-19 (05/21)
3.1	**The Sesvete City Garden – upgrading of the existing garden**	Ongoing working	Jan. 2021 – Dec. 2021	Still in procurement phase, expected to be finished by end 2021	NO	YES	NO
3.2	**The Sesvete City Garden –New therapeutic garden**	Completed	Jan. 2021 - June 2021	/	YES	YES	YES
3.3	**Info Point**	Ongoing working	Sept. - Dec. 2018	/	YES	YES	YES
4	**Aquaponics testing installation**	Planned	Mar - June 2021	in progress, might be slightly delayed	YES	YES	YES
5	**Green Roof/Photovoltaic cells/Green wall**	Planned	Mar - June 2021	in progress, might be slightly delayed	YES	YES	YES
6	**New cycling path**	Planned	Jan. 2022 - June 2022	in progress, might be slightly delayed	YES	YES	YES
7	**New protocols and make changes to its planning procedures and policy development processes**	Planned	Sept. 2020 - June 2022	/	NO	NO	NO

The COVID-19 has strongly limited the activities of NBS 3 (Info point), but the schedule is developing in recent time and the Therapeutic Garden (NBS 3.2) has been completed and opened to the users.

4 Conclusions and monitoring perspectives

4.1 Current situation

The current situation is summarized in the following figure, where the overall NBS implementing status is displayed. Out of a total of 33 NBS projects in FRC, only 12 are completed, 10 are in the ongoing phase and 11 still in the planning phase. These percentage can rapidly change because FRC are finalizing their work in some ongoing NBS.

Figure 3: Overall NBS status

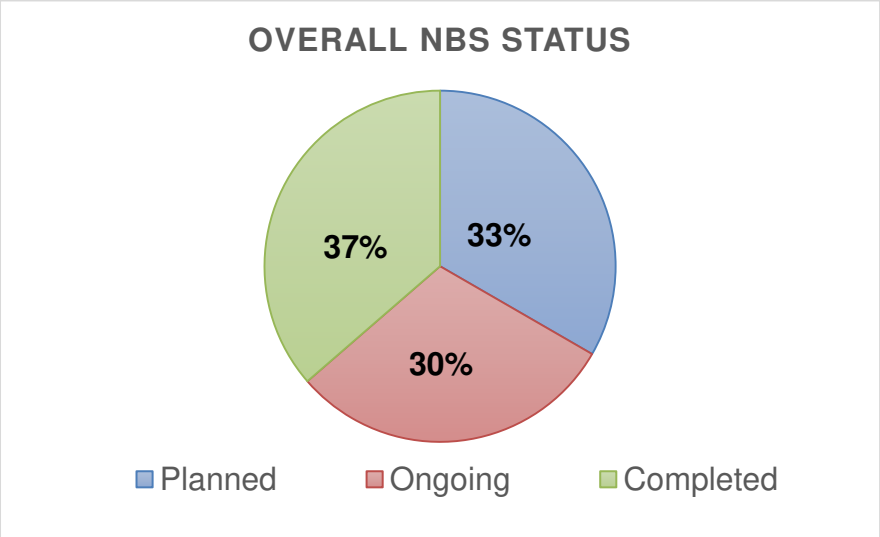
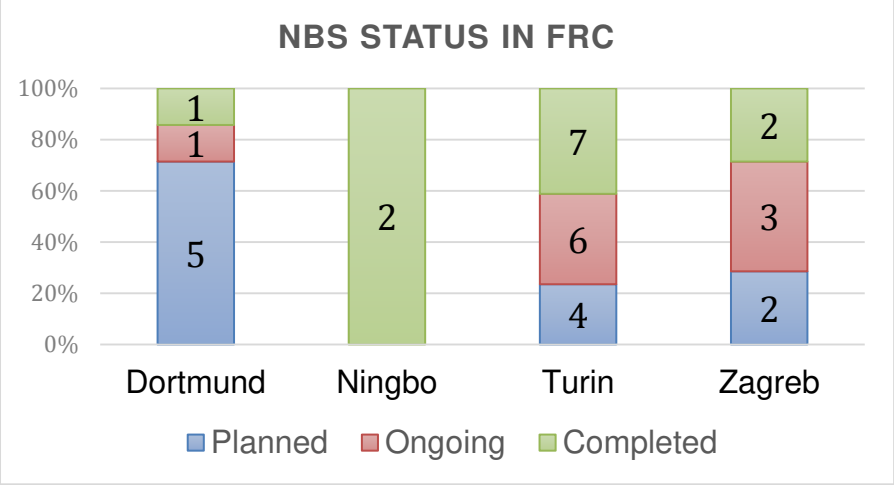


Figure 4: NBS status in FRC



The figure n. 5 details the current situation in each FRC. Actually, some FRC are finalizing the physical intervention in their NBS, like for example in Ningbo (NBS 3 and 7), Turin (NBS 3.1) and Zagreb (NBS 3.2).

As a result of these factors FRC are still engaged in ongoing step of implementation or even at planning stage and the current planned date to complete the LL (having all NBS finished their construction phase, and being operative or running) in some FRC is **2022**. (Except for Ningbo that has planned to end its two NBS by June 2021).
COTO will ensure its support to FRC in monitoring and reporting the NBS implementation process until all NBS are completed at its core stage and the final version of the Implementation Plan will be completed.

4.2 Risk assessment analysis

The risk assessment analysis was set up with the aim to identify risks and hazards that could occur during the implementation phase and cause negative impacts (or at worst block) on the realization of one or more NBS. Some factors reduced the significance of this activity:

- The heterogeneity of the interventions, related to the specific features of each NBS and each local context has hampered the identification of common risks and above all common mitigation measures.
- The COVID-19, provoking restrictions to many activities, has halted and cancelled NBS implementation steps, showing us how an unforeseen and global risk can cause or add negative impacts to a fluid and in progress activity, jeopardising not only future activities but also the one already realized.
- The different timeline of each NBS implementation complicated a coherent and comprehensive check of the risks identified (because some implementation have not started yet) and consequently the mitigation measures established in order to avoid or reduce the negative impact of risks.

Nevertheless, COTO is still engaged in this activity and it will continue to follow up this activity with FRC. According to the first NBS Implementation Monitoring Report (D.3.3), several risks have been taken into account by all of the FRC. Ranging from maintenance costs to property/ownership issues, some of them has been gaining an increasing relevance due to the COVID-19 restrictions and delays.

Moving from the conclusions of the Deliverable to future strategies of risks prevention, COTO will work together with FRC on three emerging challenges highlighted. To best address the task, FRC will be asked to update their risk assessment tables in order to understand the critical issues that have marked the last months in terms of:

- market sustainability of NBS; The monitoring report has pointed out a difficulty in designing new business models of NBS. It seems therefore not easy in all NBS to develop market-ready solutions. Future risk assessments could focus on proposing concrete future market outlets for goods and services. This activity should help to preserve the long-term economic sustainability of NBS.
- scalability and design of long-term cooperation policies. In the long run, Living Labs on NBS risk to produce a low impact in terms of cities cooperation, if shared policies of urban development are not planned by partners. The risk assessment analysis

identified the risk of “no perspective beyond 2023” as one of the most threatening. This risk needs cooperation strategies to both scale NBS in other contexts and guarantee long-term perspective to proGIreg experimentations. In the light of this, we suggest to think about future policy tools to design common strategies about NBS development.

- citizen’s engagement with a focus on the COVID-19 emergency consequences in dealing with beneficiaries and stakeholders. COVID-19 has influenced the implementation of many NBS. Many experiments have been stopped in the take-off phase. The future risk is that some of them may not be implemented or may have to limit citizen participation.

To accomplish this goal, we worked to produce a table to resume the risks that emerged in the three aforementioned fields and will engage FRC on monitoring it.

It worth resume some of the reflection points emerged during the first phase of risk assessment analysis by highlighting further considerations.

- Technical, procedural, societal and economic risks popped up in different NBS and contexts. The comparative tables (detailed in D.3.3) has allowed all the partners to share their experiences and keep to being updated.
- The mitigation measures adopted by FRCs constitute a specific set of initiatives tailored to locally based risks. So, these actions could enables the partners to be inspired from activities adopted in other contexts but there is a needs to adjust them according to local contest framework. .
- Eventually, the risk assessment has demonstrated to be an effective channel of communication and a tool that helped FRC to update and exchange information internally (with local partners) and to FRC partners.

4.3 Monitoring perspectives

As already mentioned, COTO will continue its effort in following and accompanying all FRC to finalize their Living lab Implementation Plan and complete all NBS implementation. Even the Deliverable 3.5 (Four implemented LLs in FRC) is under City’s responsibility, COTO will ensure its support in order to have coherent and comprehensive IPs. COTO believes in having helped FRC in producing, through the WP3 tools and activities, a great source of knowledge and a concrete evidence of the work done by partners. The following points confirm and integrate what has been highlight in the first monitoring report.

- **The extension of the implementation time** compared to the year and a half (January 2020 - June 2021, as planned in the project proposal and GA) represents, at present, a fact whose reasons were largely explained and are not only related to COVID-19 but also to the complexity of some interventions when dealing with nature (seasonably activities depending also to weather conditions) and with citizen engagement.
- The commitment of the Municipalities has been really relevant and pivotal in all those pre-implementation activities that have allowed to proceed towards the physical

implementation phase. The engagement of various Departments within a single but large and hierarchical institution has been a challenging issue. The bureaucratic and negotiation activities, involving administration as well as other local public and private partners, were at the same time onerous and decisive. These elements highlight the key role of the cities involved in the project as crucial actors in the implementation process. These bodies are at the same time creators but also, they depend on several bureaucratic procedures and administrative constraints.

- According to the methodology adopted we divided the overall implementation process in some sub phases (Pre-implementation; Execution/physical construction; Accompanying activities; Monitoring, maintenance and handover). As stated in the D. 3.3 the **pre-implementation phase,** i.e. all those activities that allow the NBS to be implemented in the LL, was the fundamental step in all NBS implementation. It took (and currently is still taking in planned NBS) often much longer and more difficult than the physical realization. The monitoring and maintenance issue and above all the handover phases are, in some cases, still challenging issues.
- The peculiar element of most of the NBS implemented in which the **social accompaniment and involvement activity** represents an added value of the project, and it is focused on ownership processes towards citizens (groups of residents, voluntary organizations, students and teachers, etc.). Nevertheless this activity, because its very nature, needs a long co-design and co-implementation effort in order to allow a true empowerment process
- Similarly, given the experimental nature of some NBS, **the monitoring activity** (both the one foreseen by WP 4 and the one specifically dedicated to the evaluation of the effectiveness of the implementation, see for example New Soil in Turin) needs a constant follow up and maintenance activity.
- Following a deepening analysis of the local regulatory framework in Turin and the suggestions emerged during dedicated meeting with FCR involved in this NBS (Ningbo, Turin and Zagreb) the template used to report **NBS 7** (Establishing protocols and procedures for environmental compensation at local level) implementation has been changed and the new one was adopted by FRC and is detailed in the attached IPs.

- **COVID-19** (and the earthquake of March 2020 in Zagreb), has forced to suspend and delay some actions and the future planning is still depending on virus legacy and possible further waves of pandemic infections. At the same time the pandemic allowed us to re-think the nature in the City as a fundamental source of well-being and socialization.

- The results obtained during the implementation phase as well as the difficulties and obstacles encountered lead us to consider how relevant is embedding the NBS in urban planning activities and strategies. The well-known goal is to give evidence of the multiple benefits of bringing back nature in the city and give to the nature the value and the role it deserves. ProGIreg, is still working on this domain and it's contribution can be significant.

Annexes

1 – Dortmund Implementation Plan

2 - Ningbo Implementation Plan

3 - Turin Implementation Plan

4 - Zagreb Implementation Plan

proGIreg

Dortmund Living Lab Implementation Plan

Deliverable 3.4

ANNEX 1

Work package: 3

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Lead partner: COTO

Author: Mais Jafari- DORTMUND

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16	LOHRBERG STADLANDSCHAFTSARCHITEKTUR PARTNERSCHAFT FREIER LANDSCHAFTSARCHITEKTEN MBH	LOHRBERG	Germany
32	AQUAPONIK MANUFAKTUR GMBH	APM	Germany
25	FACHHOCHSCHULE SUDWESTFALEN	SWUAS	Germany

Abbreviations

EC: European Commission

ERDF: European Regional Development Fund

D. No: Deliverable Number

FC: Follower Cities

FRC: Front Runner Cities

GA: Grant Agreement

GI: Green Infrastructure

GIS: Geographic Information System

IP: Implementation Plan

LL: Living Lab

NBS: Nature-Based Solutions

NGO: Non-governmental organization

proGIreg: Productive Green Infrastructure for post-industrial urban regeneration

SOPARC System for observing play and recreation in communities

TRL: Technology Readiness Level

WP: Work Package

DE: Germany

IT: Italy

HR: Croatia (Hrvatska)

CN: China

BA: Bosnia and Herzegovina

PT: Portugal

GR: Greece

RO: Romania

1. Introduction

1.1 Project Framework

This document is a living and working document that will produce, at the end of the implementation phase, a comprehensive description about the Living Lab (LL) and Nature-Based Solution (NBS) implemented in the City of Dortmund. The first release of the Implementation Plan IP is June 2020, the second draft version is December 2020 and the third draft is June 2021. Attached to this document is the Living Lab Vision Map that displays a graphical summary of the information provided by each NBS.

Productive Green Infrastructure for post-industrial urban regeneration, proGIreg, is a 5-year project funded by the European Commission under the Horizon 2020, a framework program for research and innovation. There are four proGIreg cities called Front Runner Cities (FRC): Dortmund (DE), Turin (IT), Zagreb (HR), and Ningbo (CN). These cities are implementing Living Labs with local citizens, research institutes, and NGOs in urban areas which are undergoing postindustrial transformation and face the challenges of social segregation, pollution, abandoned former industrial buildings, social tension, poor economy, inequality, and related crime and security problems. To counteract these problems, proGIreg Living Labs (LL) developed eight different Nature Based Solutions (NBS) which are co-designed, co-implemented, and co-developed by the residents of the living lab. Four follower cities in Eastern and Southern Europe which are Cascais (PT), Cluj-Napocac (RO), Piraeus (GR), and Zenica (BA) will continuously exchange knowledge and information with the FRCs to develop strategies for innovation and replicate the Nature Based Solutions in theirlocal contexts. In the living labs, eight NBS will be implemented including: leisure activities and clean energy on former landfills (NBS1); new regenerated soil thanks to biotic compounds for urban forestry and urban farming (NBS2); community-based urban farms and gardens (NBS3); aquaponics (NBS4); capillary Green Infrastructure (GI) on walls and roofs (NBS5); accessible green corridors for local citizens (NBS6); establishing protocols and procedures for environmental compensation at the local level (NBS7); and pollinator biodiversity (NBS8).

Through the implementation of green infrastructures (GI), proGIreg aims at promoting economically self-sustaining business models and benefits that can catalyze regeneration and sustainable development in these areas. The quadruple helix approach of involving representatives of all members of the local community in each LL including public authorities, local citizens, private investors, academics, and industry/SMEs from the co-design, to the implementation and evaluation is conceived as a fundamental part from the project's early stages. It is particularly important to build shared practices and ensure the participatory and democratic process. Inter-and trans-disciplinarily is therefore necessary for these reasons: (1) it can help resolve major challenges and conflicts of interest; (2) it is practical as it empowers the citizens and can help produce more welcomed innovations; (3) and ethical because the citizens are simply the taxpayer and the primary funder[1]. Innovation will take place at different levels: at the technical level through the inter- and trans-disciplinary collaboration between the different stakeholders and the deployment and improvement of the NBS, at the social level through co-designing, co-implementing, and co-maintaining the GI and involvement of informal

[1] Florian Schuetz, Marie Lena Heidingsfelder, Martina Schraudner. Co-shaping the Future in Quadruple Helix Innovation Systems: Uncovering Public Preferences toward Participatory Research and Innovation, 5(2) (2019), pp. 128-146

and non-public actors in course of the project, at the environmental level through focusing on climate protection green infrastructure und urban agriculture; at the economic level through NBS which are cost-effective and easy to apply by the local residents and can highlight new market opportunities for the green economy development.

1.2 ProGIreg in Dortmund

Dortmund (counting more than 600 000 inhab.) is located in Germany's most populous federal state North Rhine Westphalia and is the eighth largest city in Germany. It is also the largest city (by area and population) of Ruhr metropolis, the former center of coal mining and the steel industry in Germany. Just like the other cities of the Ruhr region, deindustrialization has forced Dortmund to transform in many ways: economically, socially and environmentally. The large-scale contaminated brownfields, former industrial and transport sites, need to be redeveloped. While the city is growing, urban areas increasingly lack good quality green and open spaces. The northern part of Dortmund is especially confronted with important regeneration challenges and social segregation with resident populations largely dependent upon public subsidy benefits. The low cost of housing makes it attractive for new immigrants from inside and outside Europe, but the poor quality of life leads to a constant change of population and the northern boroughs have difficulties in building a positive identity. In addition, the northern part of Dortmund has the youngest population and the highest unemployment rates including the highest youth-unemployment within the city and keeps losing jobs.

To improve the life quality of the population through the implementation of NBS in the LL area, the City of Dortmund has created several integrated formal and informal planning instruments at the regional, city, and district scales. At the formal level, the zoning plan (Flächennutzungsplan der Stadt Dortmund) and development plans (Bebauungspläne) and their binding documents identify the planning areas and further land use development as well as their qualitative requirements. While the area of the former Hansa coking plant was planned as an economic site, Deusenberg landfill was conceived to be developed as an open space with emphasis on nature-based measures. The Emscher River and the area along were planned to serve as a water management site along with sport and leisure activities. The HSP-site (Hoesch Spundwand und Profil GmbH) was presented as an industrial site. Hence, the zoning plan has to be changed to housing, green spaces, and economic sites.

Informal plans are not identified by planning regulations or by following formal procedures for their preparations. They are rather mostly thematic and voluntarily worked out as concepts to realize specific projects. If they are politically adopted, they can be binding within the administrative institutions on their respective level. In Dortmund LL there is a number of informal instruments of different origins, but their overall goals supplement each other in promoting the development of Green Infrastructure (GI) in the northern part of the Dortmund in general and Huckarde district in particular.

Developing GI in Huckarde is the focus of many informal initiatives. On top of that, is the local initiative "Nordwärts" [2] (2015-2025) which brings the strengths of Dortmund's

[2] Project "Nordwärts", Homepage

northern districts to the public's attention and develops numerous projects and activities to foster social and economic development and improve the identity of the LL area. Important efforts are being made and continue to improve the quality of life, health, and wellbeing of the population within the same boundaries of proGIreg LL through implementing nature-based solutions. Development of the Hansa coking plant, connecting Hurckade with the Hansa coking plant and improving the green infrastructure in Huckarde are on the top of the list of the projects of Nordwärts.

Similarly, the International Garden Exhibition Ruhr 2027 [3] (IGA 2027) which will focus on the question of how we want to live tomorrow is covering the area of "Emscher Nordwärts Dortmund" ~~of~~ and the proGIreg LL thus giving the realized NBS by proGIreg the privilege of being continued after the end of proGIreg in 2023 and presented during IGA in 2027.

The urban renewal project for the area Huckarde-Nord "Integrated Action Plan" (Integriertes Handlungskonzept IHK), initiated in 2016, aims at increasing the quality of life in Huckarde and enhancing the living conditions of its residents. Multiple measures will be implemented to increase the connectivity through GI and redevelopment of "Hansa Revier Huckarde" (Hansa coking plant, Deusenberg, and light train museum Mooskamp).

ProGIreg shares many of the development goals of the above mentioned projects through the implementation of five ~~different~~ NBS in the Deusenberg, Hansa sites, and Huckarde district that will form a systemic intervention which can simultaneously improve the social, economic, and environmental qualities of this regeneration area. The NBSs that will be implemented in Dortmund LL:

NBS 1: Renaturing landfill sites for leisure use and energy production
NBS 3: Community-based urban farming and gardening on post-industrial sites
NBS 4: Aquaponics as soil-less agriculture for polluted sites
NBS 6: Connecting the isolated Huckarde borough with the renatured Emscher River and Deusenberg
NBS 8: Pollinator biodiversity improvement activities and citizen science project

To blend the shared NBS project measures and avoid a mismatched agenda, exchange of information about the content of these projects is taking place on a regular basis. Accordingly, the content of the proGIreg NBS and these projects are subject to adjustment.

Since Dortmund LL is situated in the northern part of the city which is characterized by densely built-up areas dominated by post-industrial sites and also by poor by poor spatial accessibility to the city center and the rest of the city, the five implemented NBS offer an opportunity to address the social, spatial, economic, and environmental problems. The inter-and trans-disciplinary approach, collaboration between the different stakeholders, and empowerment of the local community to participate in the co-creation of the NBSs ensure sustainable development, improve living conditions, protect the environment in many ways, and provide economic benefits to both citizens and entrepreneurs. While the

[3] International Garden Exhibition 2027 (IGA 2027), Homepage

NBSs will be realized in a specific district, it is believed that the NBSs will have an impact beyond the LL and the neighboring districts will also benefit from that.
Lastly, proGIreg with its innovative approaches and integrated implementation process can present a comprehensive framework in which its NBS and co-creation and implementation process can be transferred and applied in new contexts.

Huckarde Living Lab Map Dortmund

The boundaries of the LL area and the exact locations of the five NBSs in Huckarde district are presented in the "LL vision map." The stage of development of these NBSs (implemented, in progress, in planning, ideas for future, implementation, etc.) is also included. Furthermore, this map illustrates the network of the NBSs through marking the physical connection between these projects. A short description of each NBS, partners, and stakeholders involved in the project are also provided. This map will be regularly updated throughout the project therefore providing a living document to track progress. In addition to being a primary tool to convey key information about the project, the LL vision map will also serve as a communication and dissemination tool for a wide range of stakeholders from the civil society citizen and organization to business and industry especially entrepreneurship stakeholders.

1.3 Management Activities

The involvement and management of a wide range of stakeholders throughout the project is a crucial component of the innovation process of proGIreg. Different stakeholders have different interests, capacities, networks, and degree of influence and are therefore involved in different phases of the project. Moreover, they can provide insights that can help in the efficient implementation of the project and thus lead to a shorter implementation time. Section 1.3 deals with stakeholder engagement and management, the relationships between these stakeholders and are their stakes in the implementation process.

To maximize the co-benefits of the NBS, co-design principles were applied at different levels, mainly at the level of the project partners and the citizens of Huckarde. To develop a mutual understanding of the co-design process at the project partners' level and to enable knowledge exchange, three co-design workshops were organized and moderated by ICLEI, namely: (1) "Mutual Understanding" in December 2018 focusing on bringing the core group of the project together and developing a common understanding of the co-creation principles and long-term expectations of the project as well as identifying relevant stakeholder from the LL and their roles and responsibilities; (2) "Innovation and Transformation" in April 2019. Although it was planned to clarify the links between innovation and transformation and how sustainable long-term societal, economic, and environmental transformation can be achieved within the LL, the discussion revolved around other issues such mainly site-search and challenges of identifying sites for some of the NBSs due to space scarcity and landownership issues; and (3) "Implementation Plan, IP" in November 2019 which introduced the methodology of the IP to the project partners and how to achieve a smooth transition from the co-design to the implementation phase. This was done through addressing the stakeholders' engagement, especially marginalized groups, by empowering them and cultivating a sense of ownership which would serve the transition and management of the NBS by the local community after the end of the project in May 2023.

In addition to the co-design workshops, a regular jour fixe meeting is organized by the City of Dortmund in which the status quo of each NBS is presented by its respective partner and planning for upcoming activities are discussed amongst the project partners.

Expertise exchange and planning for the implementation activities are also enabled through additional meetings and events organized by the partners. These meetings include: site visits of potential areas of implementations mainly carried out by the Urbanisten and The University of Applied Sciences South-Westphalia, meetings with landowners, and workshops with school students and scouts. This has in return expanded the circle of stakeholders and interactively presented proGIreg to the public.

Partners and responsibilities

The numerous meetings since the beginning of the project at the end of 2018, combined with the clear description of the role and contribution of each project partner, ensure a clear understanding of the responsibilities and the activities planned and carried out by each partner (collaboration of partners) has resulted as shown in Table 1.

Table 1: Partners NBS and their assigned responsibilities and cross-sectional activities

Partner	Specific activities	Cross-sectional activities
City of Dortmund, Department of Urban Renewal (DORTMUND)	NBS1.1: Integrating solar energy production on Deusenberg landfill. NBS1.2: Sports infrastructure in an existing park in Huckarde NBS6: Connection of Huckarde borough with the renatured Emscher river and Deusenberg.	- Overall project coordination - Organization/ participation, WP 2.1 Spatial analysis in FRCs - Organization/ participation WP 2.2 Co-design processes in FRCs - WP 3.2 coordination activities - Implementation Dortmund LL (NBS 1.2, NBS 6), WP 3.3 - NBS assessment and monitoring activities, WP 4 (D 4.1 – D 4.4) - Organization/ participation, WP 6.4 Public proGIreg conference - Communication with ICLEI (WP6) - Coordination with projects of shared development plans of Huckarde district, the International Garden Exhibition 2027 and Integrated Urban Renewal Concept Huckarde - Supporting the project partners in the site search of NBS 3, NBS 4 and NBS 8. 1,3, and 4 - Coordination between the project partners and the involved Departments in the City of Dortmund (e.g. the Contract of Use (NBS3), Building Permit (NBS4) and NBS8) - supporting activities with co-design - communication with the WP leaders - Synergies between proGIreg and other local initiatives at the City of Dortmund

Die Urbanisten (DIE URBANISTEN EV)	Systemic design External communication with ICLEI (WP6) Co-design supporting activities with UNITO (WP2)	- Site search of NBS 3 and 4 - WP 3.3 Implementation LL Dortmund (NBS 3, NBS 4) - Design, preparation of the building application of the aquaponics, construction and operation of the aquaponics plant - Design and implementation concepts for the community participation - Creating an internet homepage for proGIreg in Huckarde - Conducting workshops about aquaponics systems in local schools - Communication activities addressed to local stakeholders
Citybotanicals (HEI-TRO GMBH)	Supporting with the technical planning of the aquaponics	- Support in WP4 monitoring activities, SOPARC, pre-implementation, September 2020
LOHRBERG STADLANDSCHAFTSARCHITEKTUR PARTNERSCHAFT FREIER LANDSCHAFTSARCHITEKTEN MBH	Organization/ participation WP 2.1 Spatial analysis in FRC	- Organization/ participation WP 2.2 Co-design processes in FRCs - Creation of maps and graphic concepts
AQUAPONIK MANUFAKTUR GMBH	Development of a filter for the aquaponics system	- Optimization of the technology readiness level (TRL) of the aquaponics in collaboration with South Westphalia University of Applied Science (SWUAS)
The University of Applied Sciences South-Westphalia (SWUAS) (FACHHOCHSCHULE SUDWESTFALEN)	NBS3: Food forests and permaculture orchard in Huckarde NBS8: Improving and monitoring pollinator biodiversity in conjunction with NBS 3	- WP 3.3 Implementation LL Dortmund (NBS 3, NBS 8) - Planning, implementation and operation of aquaponics - WP 5 - WP 5.1 Improving the Technology Readyness Level of Aquaponics

A wide range of local stakeholders and beneficiaries are involved in co-design and co-implementation in addition to the project partners, and this number increases as more co-design activities take place. Each stakeholder contributes to the various project activities, depending on their interest and area of expertise.

It is, however, important to mention that the degree of involvement of the stakeholders in Dortmund differs largely between the different NBSs. In NBS3 for example, co-design and co-implementation processes have accompanied the project from its conceptual phase and further until the handover and maintenance of the project. The St. Urbanus executive board of the parish as well as the Scouts participated in a kickoff workshop (72 Hours - Action) to practice the planting activities in the St. Urbanus site in spring 2019 as a preparation step towards the actual implementation of the urban gardening there, this was followed by the planting campaign with the boy and girl scouts in October 2020. Recently, in June 17, 2021 members from the Huckarde community participated in a planting workshop at St. Urbanus and this group agreed to regularly on Saturdays. On the other hand, in NBS4 residents were not informed about the project nor included in the co-design activates as the lease contract of the aquaponics site (NBS4) was not signed yet between the owner and the NBS partners. The City of Dortmund explicitly demanded not to disclose the location~~s~~ of the intended site~~s~~ of this NBS to the residents and involve them the co-design activities before the site is officially granted for this NBS. Although the City of Dortmund has a long history of citizen involvement in planning and development processes, its concern was that a potential mistrust between the City and the residents would occur if the projects were not implemented on the tentatively announced sites and therefore the expectations of the residents would not be met and a potential sense of disappointment would be generated.

Table 2: Stakeholders and beneficiaries involvement in the co-production of NBS-Dortmund

NBS	Stakeholder	Capacity
NBS1.2	City of Dortmund	Site owner
	City of Dortmund: Department of Green Spaces	Park designer
	External landscape office Schelhorn	Service provider; Concept development Organizer of co-design workshop with the local community
	Gustav-Heinemann school	Beneficiary of NBS1.2
	Huckarde citizens	Beneficiary of NBS1.2
	Local politics of Huckarde	Approving the project before implementation
NBS3~~.1~~	St. Urbanus, the executive board of the parish	Site owner NBS3~~.1~~
	Local scouts	Beneficiary of NBS3~~.1~~ Target group for co-design and co-implementation
	Local citizens	Beneficiary of NBS3

NBS4	The Foundation for the Preservation of Industrial Monuments and Historical Culture	Owner of the site of NBS4: (1) Examination of the availability of sites at the Hansa Coking Plant for NBS 4, (2) contract partner
	Citizens of Huckarde	Beneficiaries of the aquaponics
NBS6	City of Dortmund	Site owner
	NRW.Urban, project management firm	Service provider, Project management and support for bids
	Landschaft planen + bauen, Landscape firm	Service provider, Landscape planning of the path
	Construction company	Service provider, construction of the path
	Entsorgung Dortmund GmbH (EDG, Waste management company and maintainer of the former landfill)	Maintainer of the landfill and the planned path
	Huckarde citizens IGA visitors	Beneficiaries of NBS 6
NBS8	City of Dortmund, Department of Green Spaces	Site owner of most NBS 8 sites
	Allotment association of (Glückauf Hansa)	Provider, potential site owner NBS 8
	N.A.B.U. (Nature conservation associations/ organizations)	NGO experts- site selection, co-design
	Naturfelder association	Expert, co-design, support in implementation and maintenance

As shown in Table 1, partners' responsibilities and assigned activities have been defined according to their field of expertise. The City of Dortmund is responsible for the overall coordination, implementation of two NBS, reporting to the Project Coordinator RWTH Aachen as well as the implementation progress throughout the course of the project (WP3) and carrying out the monitoring activities in coordination with the leader of WP4. In that regard, jour fixe is a central meeting in which all project activities and details are presented and discussed. The City of Dortmund also facilitates the administrative procedures that requires coordination between the project partners and the different departments in the City.

The University of Applied Sciences South-Westphalia (SWUAS) provides the scientific and practiced know-how in the area of urban gardening and innovative systems of aquaponics. Urbanbotanicals and Aquaponik Manufaktur offer the technical support for building the aquaponics. On the other hand, the NGO die Urbanisten has extensive expertise in involving local citizens in the local development projects and conduct info-events and co-design

workshops. It has a well-established reputation in that regard. Table 2 presents the stakeholders that are involved at different stages of the project as needed. The interaction between a wide range of partners and stakeholders from the four major actors in the quadruple helix approach (science, policy, industry, and society) has been achieved in the co-design and co-implementation phase. Nevertheless, the involvement of the local community was a contentious issue between the different partners in terms of as at which stage the public (beneficiaries and stakeholders) should be involved in project activities (at the conceptual, planning or implementation stage). However, we believe that diversity of opinion on this topic, while challenging, is not wrong. Depending on the situation and the type of NBS implemented, project members will have to decide what form of participation to integrate and at which implementation stage.

In addition to the diversity of partners and stakeholders involved in the project, table 1 and 2 demonstrate the collaboration between the partners on different WP, e.g. City of Dortmund and Lohrberg (WP2.1), die Urbanisten and the University of Applied Sciences South-Westphalia (NBS3 + NBS4), City of Dortmund and The University of Applied Sciences South-Westphalia (NBS8). A network of relationships, where governmental, NGO, SMSE and private organizations interact in the LL to transform various inputs into valuable outputs for the public interest.

Communication and co-design activities are performed through different tools including:

- Partners' website, in which information about the ProGIreg and the LL area are provided. The Department of Urban Renewal in Dortmund presents the project on its homepage (www.proGIreg.dortmund.de). The different co-design activities are also covered on the webpage of die Urbanisten (www.dieurbanisten.de). Recently, die Urbanisten initiated creating a website for proGIreg in Huckarde presenting the Dortmund NBS addressing Huckarde citizens and involving them in local projects activities. Currently, the webpage is in a draft form (https://huckardening.dieurbanisten.de/) and the official version will be published and advertised under (www.hansagruen.de).
- In addition to the several available communication platforms, published and printed materials (press release, leaflet, roll-up, etc.) are produced for proGIreg Dortmund.
- Workshops with the local political representatives, key actors and local communities (NBS1, NBS3 and NBS4).
- Site visits with local experts to select and evaluate potential sites for NBS8.
- Face-to-face meetings with site owners and potential partners.
- Networking with projects that share similar goals to exchange information of best practices, such as nordwärts (Kooplab).
- .

Figure 1: Development of project ides, 1st Co-design workshop, Dortmund, © ICLEI

Figure 2: Expert site visit to identify potential sites for NBS8 (Biodiversity), © City of Dortmund, Mais Jafari

Figure 3: Scouts participating in the co-implementation in St. Urbanus church, © City of Dortmund, Mais Jafari

Figure 4: 3rd Co-design workshop, Dortmund, © City of Dortmund, Mais Jafari

Figure 5: Co-design planting campaign, St Urbanus, Dortmund, © City of Dortmund, Mais Jafari

Involvement of marginalized groups

Involvement of vulnerable and marginalized groups is a core component of proGIreg in Dortmund LL. Yet this varies according to the type and location of the NBS. In some NBS, such as NBS 3, the expansion of the St. Urbanus Church network and contacting welfare organizations for the co-implementation phase after the initial phases of the project is considered. It is also conceived to consider the needs of the elderly and disabled people in the design of the urban garden. In that concern, the Urbanisten have initiated a contact with Caritas (catholic charity services organization) to involve elderly people in the St. Urbanus food forest. Similarly, unemployed people can be engaged in the aquaponics' activities (NBS 4), by training them about the aquaponics system and integrate them in the business model.

Approaching marginalized groups and speaking with multipliers has been undertaken by the project partners via personal contacts, network, and workshops and through public citizens' consultation events of IGA. In addition, the language used by the partners to communicate the project concepts and activities is rather simple so easy to understand.

Furthermore, all project partners agreed that stakeholders and beneficiaries, especially the district organizations working with marginalized groups, should be mapped in the planning phase of the NBS to ensure their integration in the co-design and implementation phases. Nevertheless, approaching these groups and communication was not encouraged by the City of Dortmund until the sites of the different NBS were officially confirmed for the use of proGIreg (see chapter 1.3).

2. Our Living Lab

2.1 Our Living Lab

Dortmund initial Living Lab area (“LL” 215 ha) comprises the project area in which five NBSs were conceived to be implemented (table 3). The LL area (figure 6) is situated along the Emscher River and about 2 km west of downtown Dortmund. At its longest north-south-extension it is 4.8 km long, at its broadest extension in the northern part it is 1.25 km wide, at its narrowest part it is only 40 m wide. However, in the course of the project implementation, the boundaries of proGIreg LL Dortmund have been changed/reduced. Since the project was initiated in 2018 in the northern part of Dortmund, where proGIreg is implemented, several projects are created to improve the quality of life in Huckarde and to develop the Hansa coking plant and the Deusenberg. On top the umbrella project "Nordwärts" (2015-2025), from which proGIreg originally adopted part of its boundary (215 H). The same boundary of proGIreg is also conceived for the International Garden Exhibition Ruhr 2027-IGA 2027, which has a higher priority and a different time frame, so that proGIreg has to leave some of its parts (Deusenberg) and find another location for the NBS sports infrastructure in Deusenbeg. In the southern part of the LL, a new urban renewal project is being implemented on the former HSP site (Hoesch Spundwand und Profil GmbH) and therefore no proGIreg NBS will be created in this area. Figure 6 shows the current boundaries of DO-LL. Aside from these reasons, locating the Dortmund NBSs on a smaller area is part of an overall concept by the Dortmund partners to develop a network of green spaces that are within walking distance and in close proximity to each other (figure 7).

Dortmund Analysis Area (“Analysis Area”, 2,275 ha) is the adjacent areas in a 500 to 2000 m wide buffer around the LL. As it is not possible to realize all NBSs within the LL, there are also places in the Analysis Area in which NBS may be realized. The effects of realized NBS may have a direct impact on the Analysis Area as numerous inhabitants are living in several settlement areas directly adjacent to the Living Lab: Huckarde in the North-West, Deusen in the North-East, Dorstfeld in the South-West, the Rheinische Straße quarter respectively the Union quarter in the South. The total number of residents in the analysis area is 56,812. The borders of the analysis area are highlighted in Figure 5, and this is the area in which district level analysis and assessment of WP4 is performed.

The Emscher River is a strong natural feature in the LL Area. It is about 83 km long in the heart of the Ruhr Area. It has its wellspring in Holzwickede, east of Dortmund and it flows into the Rhine. It was used as an open waste-water canal from the end of the 19th century and during industrialization. Originally the slow 109 km long river was characterized by a manifold flora and fauna. In the middle of the 19th century with increasing industrialization and population growth the Emscher was used as a wastewater sewage canal for cities, mining companies and industry. In only few years the flora and fauna disappeared more or less completely. Land subsidence up to 20 m caused by mining activities led to changes in drainage of the Emscher. Especially during flooding the polluted water remained longer in its floodplains thus yielding to more epidemics. As a corrective, the technical development of the Emscher started in the beginning of the 20th century in order to bring the wastewater as quickly as possible out of the densely populated region in an open concrete canal. Due to land subsidence, the Emscher was redirected twice to a new course. Since the early 1990s, large-scale restoration, called the Emscher re-conversion has been made and the newly restored Emscher valley is becoming an increasingly attractive location for people to live in. Within a short period of time. The adjacent footpath and cycle path of the Emscher, which runs along Huckarde is well integrated into the regional path network, but in some sections local connections to the district of Hurckade are missing.

In the northern part of the Living Lab postindustrial monuments and sites are to be found. The Hansa coking plant is situated in that part. It was one of the major coal mining sites in Dortmund which went into operation in 1927 and was closed in 1992. Nowadays it is a listed monument of industrial heritage, a popular museum of regional interest, and a location for summer events. The coking plant is also a place used by schools to illustrate the industrial history of the Ruhr valley, structural change, or “industry nature”.

North of the freight train tracks the light rail traffic museum “Mooskamp” is located on the former train depot of the Hansa coking plant. The popular museum keeps 25 old locomotives which still use the tracks north and east of the coking plant. Moreover, the museum is a location where long-term unemployed persons are given a chance for reintegration into labor market by participating in special training programs for restoring and repairing the machines.

East of the Hansa coking plant the former landfill Deusenberg is situated with extensions of 500m x 1,000m. For about 70 years 11 billion m^3 of household garbage was dumped there until 1992. Today the recultivated 50 m high hill is accessible and allows a spectacular sight. On the slopes 150,000 trees and shrubs have been planted. On top of the slopes, a 3.56 MW photovoltaic power plant has been in use since 2017. Some constructed paths are part of a mountain bike area, others are designed for pedestrians (overall length: 6 km). So far, the Deusenberg is only accessible from the eastern side from the Emscher pathway.

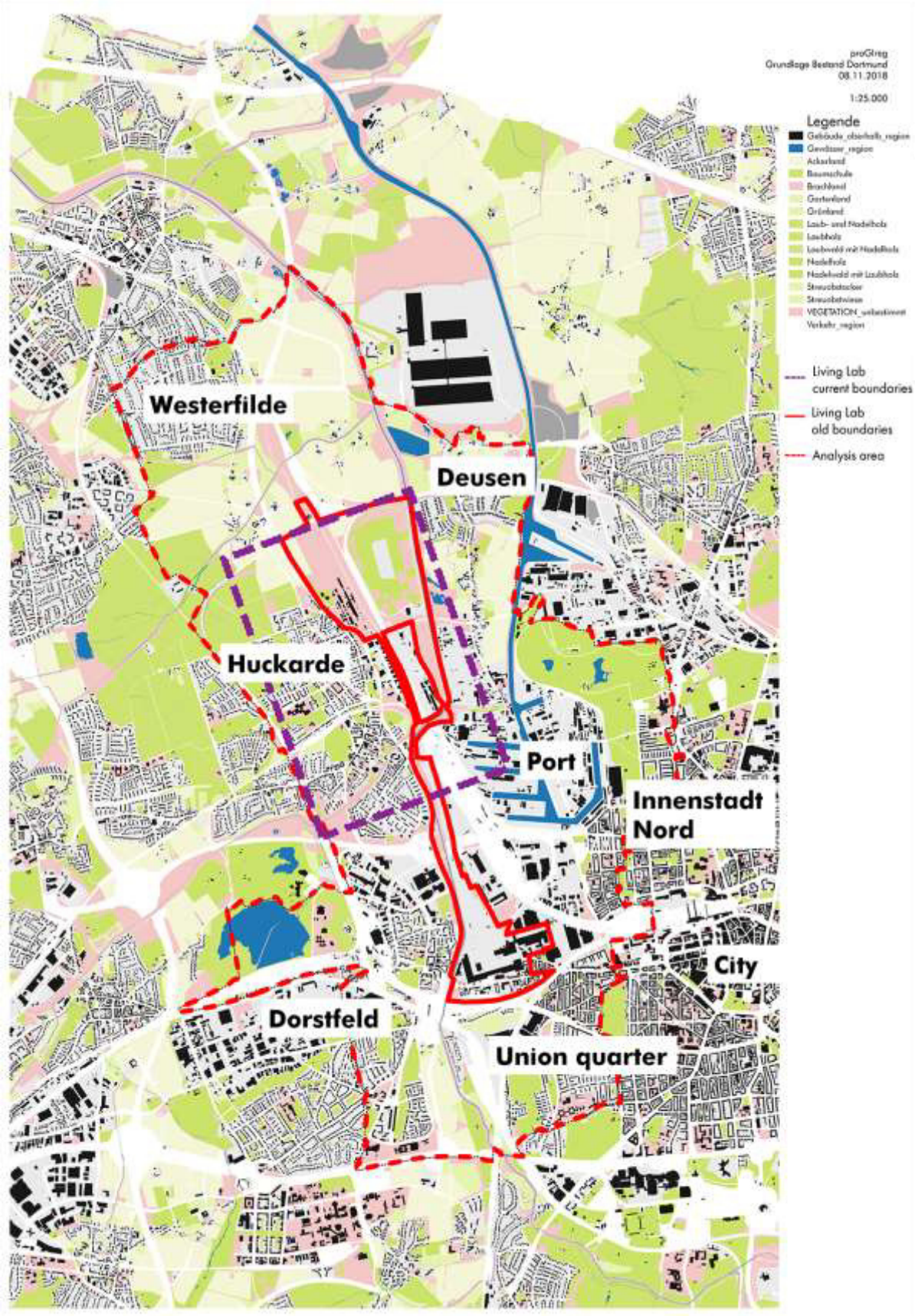

Figure 6: Dortmund Living Lab current boundaries, old boundaries and Analysis Area

The Analysis Area encompasses several settlement areas which are either directly adjacent to the Living Lab (Huckarde, Dorstfeld, Union quarter, and Deusen) or are separated by green corridors (Westerfilde) or industrial sites adjacent to the canal port (Innenstadt-Nord).
Huckarde-Nord is the former settlement for workers of the Hansa coking plant. The closing of the coal mine in 1980 and the coking plant in 1992 led to a severe social decline which still affects the settlement. Today, Huckarde is one of the poorer and more deprived neighborhoods of Dortmund. Therefore, it will be a focus area of the project and will be directly benefiting from the implemented NBS within its boundaries.
Deusen as a former worker settlement is located east of the Deusenberg and the Emscher River. It is a small, popular and socially stable settlement. Dorstfeld is separated from the Living Lab by the Emscherallee, a major road in Dortmund, and adjacent noise protection walls. Therefore, only two streets allow access from the Living Lab to the settlement.

Even though the Living Lab and Dorstfeld are neighboring areas, there are only few links existent. Southeast of Deusenberg, the wastewater treatment plant Deusen is located. It was put into operation in 1994 as the first of four central plants along the renatured Emscher. It clarifies predominantly industrial wastewater and wastewater of 140,000 inhabitants. As part of the Industrial Heritage Trail the two digestion towers are illuminated by green light at night.
Further details on the Dortmund LL and on the implemented NBS can be found in D2.2.

Figure 7: Dortmund Living Lab in relation to the boundaries of other projects (see attachment Living Lab vision map)

ProGIreg in Dortmund:

Out of eight NBS developed by proGIreg, 5 NBS will be realized in Dortmund. They are inspired and supported by nature and compatible with the formal and informal plans of the Living Lab and adjacent areas as mentioned in chapter 1.2.
The NBS which will be implemented in Dortmund are listed in Table 3. The different activities in NBS 1 and NBS3 are split as they have different implementation timing and development process.

Table 3: NBS projects in the LL area in Dortmund

NBS type	NBS Title
NBS 1: Leisure activities and clean energy on former landfills	Integrating solar energy in Deusenberg landfill and Huckarde district Sports infrastructure in an existing park in Huckarde
NBS 3: Community-based urban farms and gardens	Food forest and permaculture orchard in Huckarde NBS3.2: Community gardening in Huckarde
NBS 4: Aquaponics as soil-less agriculture for polluted sites	Aquaponics
NBS 6: Accessible green corridors	Connection of Huckarde borough with the renatured Emscher river and Deusenberg sites
NBS 8: Pollinator biodiversity	Improving and monitoring pollinator biodiversity in Huckarde

While Dortmund LL has several weaknesses such as a high rate of social welfare recipients and above-average unemployment rate as well as lack of urban green infrastructure, there are great opportunities as this area is undergoing regeneration at the regional and district levels and is made attractive to a wide range of groups from mixed socio-economic backgrounds. According to the SWOT Analysis made in D.2.2, the main domains of Dortmund LL have been divided into:

- socio-cultural inclusion
- human health and wellbeing
- ecological and environmental situation
- economy and labor market

The spatial structure of the LL area is strongly influenced by its industrial history. Many housing projects were built in the early 1900s around the coal mines and steel factorization for the workers. With the decline of these industries and little investment to modernize the workers' housing area, some settlements were in poor condition until the 1950s. In the period after the WWII there was a construction boom, as the city was heavily bombed during the War.

2.2 Our Living Lab challenges and goals

This section deals with the challenges that the LL area of Dortmund has faced since the conceptual phase through the co-design and implementation of the NBS. In addition to the citizen participation in co-designing the NBSs, land ownership is another key problem that has hindered the involvement of citizens in the co-design, as it is difficult for the partners to communicate the planned activities of the NBS to the local people without providing information on the planned locations for this NBS.

Challenges at all NBS level

- Projects starting from scratch are difficult to be realized within the given time frame of WP 3. Since all Dortmund projects started from scratch, site search, building networks, project planning and realization took/ take time and are very difficult to be realized within the given proGIreg-timeframe. This is especially the case for NBS dealing with construction projects (NBS1, NBS4 and NBS6). Design and administrative procedures cannot be accelerated and are time-consuming. It is foreseeable that the Dortmund construction of some of NBS will not be finished by June 2021

- Finding sites for the implementation of some of the NBSs and the landownership issues have been one of the main challenges in Dortmund LL. This consequently caused unforeseen delays in the implementation time. The sport infrastructure of NBS1.1 was conceived to be realized on the Deusenberg landfill, yet this was not possible within proGIreg because the area of Deusenberg should be reserved for future projects of IGA 2027. This wasn't clear until early 2020 when the coordination team (Dortmund) started considering other site alternatives in the Huckarde district. As a result, NBS1.2 will alternatively be realized in a neighborhood park in the Huckarde district (Gustav Heinemann Park). Urban gardening and biodiversity projects are also planned to be realized within the same park (NBS3 and NBS8), and this makes it a good alternative for integrating different NBSs with close proximity to each other, thus making it attractive for the users of the park. The design of the park and the involvement of the local residents in the co-design and co-implementation are on top of the planning

- The effort of planning NBS is disproportionately greater than the realized projects. This has clearly manifested in the case of NBS3 where a number of different potential locations were identified for urban farming. Ongoing meetings and negotiations with the landowner were in many cases not successful and therefore more alternative locations had to be identified. Many landowners are interested in a clear plan of what will be implemented on their land. The process-oriented approach of co-design is difficult to communicate in such a context and makes negotiations more difficult. The only project, which is currently implemented is located in a backyard of St. Urbanus Catholic Church. This project presents a good practice of proGIreg principles of involving the locals in the co-design and implementation of the urban gardening activities such as food forest and raised-bed gardens. Another site that has been identified for NBS3 is the Gustav-Heine-Mann Park which is owned by the City of Dortmund. Currently, the Urbanisten are preparing the content of the Contract of Use to be signed by them and the Department of Green Spaces in Dortmund

- The lack of knowledge and experience of the formal procedures for obtaining authorizations and permissions for implementation was another challenge. Several formal requirements were not known to the project partners and were therefore not included in the implementation time plan. This in turn led to delays in co-design and implementation. For example, for NBS involving agricultural activities on post-industrial sites, soil investigations should be made unless no edible plants were to be planted. The acquisition of building permits or search permits for an explosive materials has also led to delays. The intensive and time-consuming work of these Formalities (obtaining permits, explosive tests, political approval, negotiations with landowners, contracts of use, etc.) wouldn't be materialized in the end product.

- The lack of incentives for citizens, landowners and stakeholders to participate in the project is an obstacle to involving them in the design and implementation activities. Their convictions about the expected positive or negative results of their participation as well as the uncertainty beyond the project duration made some landowners hesitant to enter into a partnership with proGIreg. The appreciation of intangible results ranges from the personal to the collective and social level of the various actors (citizens, landowners, stakeholders, etc.). In view of this, it is crucial to present the expected results of the NBS at the different levels to the stakeholders, such as: gaining new experiences and expanding one's own skills by participating in NBS 3 and 8 (personal level); movement, socialization and time in natural environments (NBS 1 and 6) bring positive results at a collective level. And finally, to improve the quality of the green spaces and eco-system in Huckarde and to gain a sense of belonging and a sense of achievement by doing something useful and for a greater purpose and by helping less privileged and marginalized groups at a social level (all NBS).

- Local NBS descriptions for FRC were prepared towards the end of 2017/ beginning of 2018. Since then, some NBS settings have changed due to reframing or ongoing planning procedures, which created a new setting for the NBS and thus made it necessary to adapt the descriptions although not fitting anymore. Alternatives can hardly be worked out and approved.

- NBS 1 and NBS6: Time loss due to reframing NBS as both NBS 1 (relocation from Deusenberg to Gustav-Heinemann-Park in winter 2019/2020 due to IGA planning) and NBS 6 (change from the north-south route to the west-east route in autumn 2019 due to lack of accessibility) had to be redesigned, the planning procedures are taking longer than originally expected. It will not be possible to implement the project within the specified time frame (by June 2021).

In addition to the challenges of implementing the various NBS, the Dortmund project team identified various ecological, economical, procedural, societal as well as other risks as follows:

1. Ecological risks:

- The contamination of the soil from its former use as a cooking plant is still too strong to be used for urban agriculture. This cannot be determined without technical tests. This happened in the case of NBS 3.2, where no edible plants are allowed to be planted in Gustav-Heinemann-Park.

2. Economic risks:

- Money for NBS implementation may not be sufficiently due for unforeseeable reasons (more expensive technical Equipment than expected, damage, extreme weather conditions like hail or storm...) or poor economic Decision making in the management team, additional money is needed for insurance for equipment.
- Undetected soil contamination on the NBS sites can lead to additional costs.
- Risk of incorrectly calculated long-term costs (maintenance - especially for fruit trees), or lack of long-term budget
- While some NBS such as NBS1, 6 and 8 can be easily maintained beyond the term of proGIreg, especially that the City of Dortmund is the main partner of these projects and implements them on city-owned land and in cooperation with other city departments and other long-term projects like IGA, it might be a challenge to ensure the sustainability of other NBS such as NBS 3 and 4, especially with regard to the financing aspect.

3. Procedural risks

- Other projects or politics, which have their own planning purposes and currently focus on the Living Lab, could force changes to the NBS concept. This is a challenge in the case of NBS 1.2 and is foreseen as a potential risk for other NBS. Possible resistance from user groups and stakeholders could also impose changes on the NBS.

- It may not be possible to implement all the ideas resulting from the citizens' empowerment with regard to the design, construction and operation of aquaponics installations, as they may not correspond to the specific description in the building permit, which must be detailed in advance in order to obtain the building permit.

4. Other risks:

- The implementation of all NBS is seen as a joint effort of all internal and external project partners from different disciplines. Open, constructive and trusting work is the basis for a good result. Nevertheless, the heterogeneity of the field of specialization of the various partners could possibly lead to differences of opinion and interpersonal confrontations

- Lack of agreement on the responsibility for maintenance / liability for the safety of users in urban gardening / food forest, resulting in insufficient quality of facilities (e.g. waste collection, control of tree stability, condition of paths / accessibility, etc.)

- Every city uses uncalibrated measuring instruments and customized methods for data collection. The data will hardly be comparable within FRC and FC. In addition, the time periods for measurements, e.g. of air quality and temperature, are too short to derive reliable results. It will be difficult to obtain NBS-derived impacts from the data.

- In addition to the predictable risks, there are low probable events that might affect the implementation of the NBS, one example of these event is the potential risk of shortening the two-year implementation period of NBS4 as IDS may have to terminate the contract by the end of 2022 instead of 31 May 2023 as agreed in the contract. The NBS4 site may have to be used as a parking lot for a new event hall at the Hansa Coking Plant in early 2023. The site originally planned as a car park is currently being used as a conversion road (detour) due to road repair work in the area. This kind of risk

was never anticipated by the project partners and occurred shortly after signing the contract with IDS. This issue has already been covered in the monitoring deliverable (D.3.3.), please refer to that document for further details.

Prevention is better than cure

In order to enhance the NBS opportunities and reduce implementation threats, the project team developed the following risk mitigation measures, which subsequently correspond to the risk categories mentioned above:

- In the NBS, where edible plans are to be grown, soil contamination tests must be carried out. In case of slight contamination, the soil can be cleaned at a reasonable cost or covered with a layer of uncontaminated soil. In the case of high contamination level, other alternative activities can be carried out on site, such as biodiversity fields (NBS 8) with flowers etc., or production must be converted to a soilless system (mobile units, raised bed gardens etc.).

- Local and vernacular plant species which are able to survive and prosper under local conditions have to be selected and planted

- Regular update of project calculations. In case of larger implementations proGIreg money can be seen as leverage money and added with other financial sources (third party or companies/ funding programs/ crowd funding, etc.). Additional revenue streams or new business models have to be detected to allow higher budgets. Include economic expertise into the project.

- Inclusion of budget for adjustments (buffer) in the financial plan of each NBS.

- Taking into account the interests of the other projects proGIreg collaborates with and find a win-win solution or at least a compromise that meets the interests of all projects. A regular exchange of information within the projects and within the LL are important during the entire course of the project.

- Valid laws and regulations must be taken into account when planning NBS implementations and integrated from the beginning in order to strive for feasible ideas as early as possible in the process. Involve other city departments in the planning process.

- Careful documentation of work progress. Store data decentrally, assure clear documentation of contacts and activities. New key person should be appointed and start the job as quickly as possible.

- The users of the NBS have either to prove their expertise or have to be trained by the partners (e. g. for Aquaponics a group of experts from die Urbanisten, APM, heitro and/ or SWUAS).

- The co-design process and involvement of local people and citizens has to be taken serious to attract as many people as possible. Events (workshops on aquaponics, fruit trees, permaculture, etc.), information via local press, school visits or active identification and addressing of specific interest groups. Similarly, courses and informal meetings can be offered for people closely and/or loosely attached to the NBS implementations to have their interest over the project lifetime.

- Carefully select the locations of the NBS. Locations within/near public spaces where many people are present can help against possible vandalism. Light protection measures (e.g. fences, gates, video surveillance) can also be helpful. Empowerment of the citizen and promotion of public ownership of the NBS.

- Start working on follow-up concepts early, convince partners of integration into future projects as soon as possible. Planning of the technical parts and buildings shall be done with regard to easy disassembly and movability.

COVID-19 and its impact on the planning and implementation activities of NBS Dortmund

The spread of the COVID 19 pandemic has caused various negative impacts on the implementation of some NBS and has led to the postponement or cancellation of some physical and co-design activities. The following is a summary of the impact of COVID-19 on the various NBS in Dortmund:

NBS 1: Leisure activities and clean energy on former landfills
NBS 1.1: Integrating solar energy production on Deusenberg landfill
Completed since 2017. No delays due to COVID-19

NBS 1.2: Sports infrastructure in an existing park in Huckarde
Delay in obtaining the political approval to realize NBS 1.2 as the meeting for presenting ProGIreg to the representatives of the local politics in Hurckade was postponed. It was then obtained in a following meeting. No delays on the implementation/execution as it hasn't started yet.

NBS 3: Food forest and permaculture orchard in Huckarde
Several months delay in the execution of NBS 3.1 since the COVID-19 outbreak: (1) workshops with the local citizens have been canceled; (2) delays in delivering planting materials to the site of St. Urbanus; (3) delays in planting the intervention area together with the scouts.

NBS 4: Aquaponics
No delays due to COVID-19. Currently the focus is on obtaining the building permit and Construction work hasn't started yet.

NBS 6: Accessible green corridors
No delays due to COVID-19. Construction work hasn't started yet

NBS 8: Pollinator biodiversity
Delay due to COVID-19. Start of implementation had to be shifted from spring 2020 to fall 2020. Seeding started in spring. No citizen physical participation in the co-design is possible at this point due to corona social distancing measures.

Although COVID-19 lockdown has not caused major delays at the NBS implementation level per se, it is worth mentioning that the project partners and stakeholders, have had to change

their daily life in unprecedented ways. Working from home, shifting to online education and teaching, challenges for working parents due to the closure of daycare and schools, etc. all these changes caused rapid slowdown of the pace of everyday life.

3. The NBS in Dortmund

In this chapter, the NBS, which is being implemented in Dortmund, is discussed in detail. The completion of the planned and then carried out activities for the implementation of the individual NBS took place in cooperation with the project partners. The information contained in the NBS tables is also included in the Living Lab Vision Map. The information contained in the individual tables will be regularly updated by the project partners.

Table 4: Five NBS to be implemented in Dortmund

NBS type	NBS Title (CTRL+ click to jump to each action)
NBS 1: Leisure activities and clean energy on former landfills	**Errore. L'origine riferimento non è stata trovata.**
	Errore. L'origine riferimento non è stata trovata.
NBS 3: Community-based urban farms and gardens	NBS 3.1: Food Forests and Permaculture Orchard in Huckarde
NBS 4: Aquaponics	NBS 4: Community managed aquaponics system
NBS 6: Accessible green corridors	NBS 6: Connection of Huckarde Borough with the Renatured Emscher River and Deusenberg Sites
NBS 8: Pollinator biodiversity	NBS 8: Improving and Monitoring Pollinator Biodiversity

NBS 1.2 Exercise Park in Huckarde

	
1. General information	
Compilation date and update	Third draft version, June 2021
NBS type	Renaturing landfill sites for leisure use
NBS title	(Integrating sports activities on Deusenberg landfill) replaced by “Exercise park” (internal work title in Dortmund)
Brief project synthesis	Project planning phase: Installation of sport devices in a public park useable for Huckarde and Dortmund citizens and pupils from an adjacent school. The park belongs to the City of Dortmund, and the Eastern part of it was offered to realize NBS 1 by the Department of Green Space at the City of Dortmund (Grünflächenamt) by the end of January 2020. The overall idea is to offer devices to stimulate physical exercises as prophylaxis and as an adjustment to mainly sitting activities during daily routine. Being located in a public park (Gustav-Heinemann-Park), the devices are supposed to be public and invite every person who would like to use them. This approach supplements project ideas of the Integrated Action Concept for Huckarde respectively the Concept of Green Spaces for Huckarde which currently is in a project defining phase.
Area of implementation	In the western part of today`s Gustav-Heinemann-Park a brick manufacture was operating between 1900 and 1925. Until the end of the 1960´s, all buildings were deconstructed, and the park area was partly filled with material from the brick manufacture and mine dump. The park was designed and realized in the 1980´s. The sport devices are supposed to be located within the Gustav-Heinemann-Park, a 4 ha public park located within the Huckarde district. The park has a West-East extension. On the one hand, it serves as a transition space between the residential settlement of Huckarde and the Gustav-Heinemann-School respectively the regional suburban train station in the West. On the other hand, the park offers some devices for

	stopovers: a playground for small kids, play devices for children, table tennis, a boule facility, and many benches and stones as sitting devices. Address: 44369 Dortmund GPS coordinates: B 51,5331, L 7,4091
Target groups (beneficiaries)	Dortmund and Huckarde citizens, joggers, members of sports clubs, pupils from the adjacent school (Gustav-Heinemann School)
Timing (start and end date)	Start: January 2020 (conceptual phase) Targeted end: December 2022 (end of construction)
Main responsible partner	Department of Urban Renewal, City of Dortmund (lead)
ProGIreg partners involved	SWUAS and Urbanisten with NBS 8: some park areas will receive species-rich seeds
Other stakeholders involved	Department of Green Spaces, Dortmund (planning) - Gustav Heinemann School - Sports clubs using the gym of the Gustav Heinemann School - local politics
Total Budget	120,000 Euro (proGIreg money for NBS 1) + additional 40,000 Euro from the City of Dortmund (proGIreg overhead) Additional money possible, but not secured yet (e.g. external supporters – depending on the project layout)
2. Pre-implementation activities	
Planning and preparatory activities	In spring 2020 preparing working steps were still ongoing due to the reframing process of NBS 1. By investigating the external parameters in order to identify the scope within the project ideas may be realized, several restrictions have been identified: - the necessary political support is only possible, if a convincing concept is worked out which overlaps with other development plans (e.g. Freiraumkonzept Huckarde/ concept of green spaces for Huckarde) - The deposited soil in the park does not meet the necessary quality for areas next to sports devices and needs to be exchanged – which is very costly thus not allowing a wide-stretched but rather a punctual location of the devices. Conceptual options which needed to be harmonized with responsible departments respective planning processes are: - NBS 1 may be realized in combination with a new exercise loop which also takes course through the park (planning idea of Freiraumkonzept Huckarde). - A school next to the park (Gustav-Heinemann School) would like to have more exercise tools on its schoolyard – this is the result of a questionnaire from 2019 for the Masterplan Sport. Due to liability reasons the school cannot use the public park area as a playground during

	breaks. Nevertheless, the sports teachers are interested in using sports devices in the park during sports lessons and showed interest in a parkour. This is highly appreciated, especially during corona global pandemic as the park enables social and physical distancing (SOPARC report (WP4), 2020). In August 2020, proGIreg and NBS 1 has been introduced to leaders of local parties as most parties have been skeptical about former plans (before proGIreg) to integrate sport activities into Gustav-Heinemann-Park. In September 2020, a workshop took place with 15 persons from selected local multipliers, local politicians and colleagues from various departments at the City of Dortmund (Sep, 2020). A wide range of design possibilities was presented by Mr. Schelhorn, the moderator and leading person for the intersection of landscape architecture and sports/ health issues (external Landscape office). Workshop results for the planning process were: design for all ages and fitness degrees, integration of a parkour for sports lessons of the adjacent school, use of an inviting design and of unique feature exercise infrastructure Before planning started in December 2020, the boundaries for the location of the exercise park were clarified with the Department of Green Spaces. Local politicians approved further planning in December 2020 of one voice. In spring 2021 the idea to involve the Huckarde citizens into the early designing process via an online questioning tool was proposed by the NBS team but turned out to be not feasible at this early point of time and was canceled. In spring/ summer 2021, soil examinations will be taken and analyzed by an external service provider. The soil disposal around devices will be a noticeable share of the overall costs of the Exercise park. To be able to use more money for movement devices the selection of devices will focus mainly on those which can be installed with fewer intervention into the ground. An unused boules lane in the Gustav-Heinemann-Park will be deconstructed and the area seeded with lawn. The call for bids will start soon. Part of the boules lane will be later used to position sports devices. The political decision for the construction of the movement park will be prepared on the basis of the draft plan which is in the works. The targeted date for political approval is September 2021.
Administrative procedures	Working steps after first concept has been worked out: stakeholder workshop (September, 2020) 1- Political approval of concept (December, 2020 2- project plan (draft, June 2021) 3- legal and political approval for construction plans (June – October 2021)

	4- functional request for design proposals jury session to choose winning design (jury with Huckarde multipliers) 5- construction plan and specifications for tenders 6- construction Handover (target: December 2022) All necessary steps of the planning process will be worked out in close collaboration with other city departments which are in charge of specific details. Exceptions may be public participation and construction – they might be done by external companies
Technical and social analysis	Following the social analysis of WP 2, a warfare material analysis has been done (2020) and will be complemented by a warfare detection in fall 2021. Soil analyses will follow after political approval to realize the NBS, if necessary (during construction phase in 2022). Draining aspects of the path are technically doable but are connected with large legal approval procedures.
Other activities	Depending on the final concept; not clear yet.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Department of Urban Renewal, Dortmund: lead for NBS 1
2nd Partner and role/function	Department of Green Spaces, Dortmund: planning and maintenance of NBS 1
3 rd Partner and role/function	Construction company (not identified yet)- Co-implementation Involvement of a job creation company has been checked, but is not possible due to time constraints and level of difficulty in regard of the construction task. It will be checked whether an involvement will be possible for the removal of the boules lane.
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	Workshop I during conceptual phase (September 2020): - invitation of pupils speaker and sports teacher of Gustav Heinemann School - invitation of leaders of all Huckarde sports clubs - invitation of leaders of local political parties At the end of the workshop the stakeholders were asked to give input for the use and design of the exercise park. The proposals have been integrated into the draft version of the plan.

Notes on major achievements/success factors/critical issues/barriers (to be updated) (link to WP5)	Political approval was crucial to proceed with NBS 1. Some years ago, the idea to integrate sport devices into Gustav-Heinemann-Park already has been discussed, but no political support was possible at that time. In August 2020, proGIreg and the idea NBS 1 were presented to leaders of all political parties in Huckarde. NBS 1 was presented as a process open for everybody´s ideas. The presentation and following discussion slowly changed attitudes and helped to gain support. When these persons were taking part in the workshop three weeks later they were creatively giving ideas for the movement park. In December 2020 further planning of NBS 1 gained political approval of one voice. Due to poor soil quality a soil examination will be necessary in order to realize mandatory protection for users. Soil exchange will be costly thus requiring a noticeable sum of the overall project budget.
Current situation and next steps (to be updated)	Current situation: See “Planning and preparatory activities”, “Stakeholder engagement” and “Notes on major achievements”. Next steps will be to work out a draft of the design for the movement park and to receive political approval for the functional request for design proposals, a jury session to decide on the winning design plan which will be further worked out with the winning landscape architect company.
5. Other activities	
Synergies with other proGIreg activities	NBS 8 in Gustav Heinemann Park WP 4: General questionnaire, NBS-visitor questionnaire, SOPARC, economic and labor impact questionnaire (SOPARC was postponed from Spring 2020 until September 2020 because of COVID-19)
Links with other external project or activity	The contents of the project will be harmonized with: - Concept of Green Spaces for Huckarde (Freiraumkonzept Huckarde) A cooperation with Masterplan Sport is not possible as proGIreg projects need to be realized earlier in Huckarde than Masterplan Sport projects.
Business model (link to WP5)	Still unclear; business model will be worked out based on final design plan. It will be likely, that the Department of green spaces will take over the maintenance of the devices after the construction. Devices will be placed in a public park and free of charge.
Technology Readiness Level (TRL) (link to WP5)	On the Deusenberg, TRL 8 was given and TRL 9 was aspired for. For the Gustav-Heinemann Park, the Grant Agreement does not give any hints. Nevertheless, TRLs can be transferred to the new location.
Communication activity (link to WP6)	Intense internal communication with various city departments: - Department of Urban Renewal (IGA 2027, Concept of Green Spaces for Huckarde, etc.) - Department of Green Spaces (location, planning process) - Department of Environmental Affairs (soil, legal approval)

	- Department of Sports and Leisure (Masterplan Sport, sports clubs) - Department of Youth Welfare (playground planning) - Department of City Planning (strategic playground planning) - Citizens Services (local and political affairs) External communication: - The regional government Arnsberg (Bezirksregierung Arnsberg)- warfare material survey - Local politicians - Local sports clubs - Teachers from adjacent school communication measures: - City department internal meetings - Workshop I (see Planning and preparatory activities) -
6. State of Play and Monitoring	
Current situation (to be updated)	NBS 1 is still in the planning phase and not completed. Too early for the main outcomes
Next steps (to be updated)	Too early for input
Notes/critical issues/barriers (to be updated) (link to WP5)	Loss of time due to local fixation on Deusenberg according to specifications of Grant Agreement and related dependence on IGA planning process until end of 2019. New NBS-concept starts “from scratch”: time-consuming conceptual harmonization to identify the range of possibilities for the project and realize necessary project preparations (as political support, soil analyses, etc.). Finalizing the construction of the movement park is targeted for December 2022, but not secured.
7. NBS maintenance and outlook	
Maintenance	City of Dortmund, Department of Green Spaces (likely)
Sustainability after project conclusion	Too early for input
Additional resources	Not available yet.

NBS 3.1: Food Forests and Permaculture Orchard in Huckarde

1. General information	
Compilation date and update	Third draft version, June, 2021
NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	Waldgarten St. Urbanus (Forest Garden St. Urbanus)
Brief project synthesis	A 3000 m² food forest – a self-sustaining woodland ecosystem designed for food production – will be created together with the scouts and the members of the St. Urbanus community. The food forest of St. Urbanus will be built through workshops with the community and the boy and girl scouts from Deutsche Pfadfinderschaft Sankt Georg (DPSG). The workshops also should empower people to take care of the garden in the long term. It is intended that people will take over sponsorships for parts of the food forest. The food forest should also be a place of education for the local population to learn about sustainable cultivation methods for their own garden areas.
Area of implementation	The food forest will be built on an unused area of the church community center. At the rear end, the area is bordered by a tributary of the Emscher, which was known as the dirtiest river in Germany due to industrialization until its renaturation (see chapter 2.1). Address: *St. Urbanus Haus*, Am Dieckhof 6, 44369 *Dortmund Huckarde* GPS coordinates: 51.530686, 7.418268
Target groups (beneficiaries)	Boy and girl scouts, St. Urbanus community, citizens of Huckarde,
Timing (start and end date)	November 2019 –December 2021
Main responsible partner	South Westphalia University of Applied Science
ProGIreg partners involved	Die Urbanisten e.V.

Other stakeholders involved	- Kath. Kirchengemeinde St.Urbanus (land owner) - Boy and girl scout - Local citizens of Huckarde - Experts in urban gardening and permaculture/food forest
Total Budget	7000 €
2. Pre-implementation activities	
Planning and preparatory activities	In 2018, the parish of St. Urbanus had cleared a part of the land of its community center from dense wild growth - their idea was to plant some fruit trees in 2019. After ~~we~~ the project partner, die Urbanisten were able to establish contact with the church community through a contact at the Emschergenossenschaft, it became clear that a cooperation would be fruitful. After discussions with Pastor Michael Ortwald there was a verbal approval (no rent or use contract) to use part of the St. Urbanus for NBS3 and that the design and implementation should be done together with the boys and girls scouts and users of the site from the neighboring residential area.
Administrative procedures	The church community had to make a formal decision in the executive committee about the cooperation with the Urbanisten within the framework of the project. This required several meetings in which the process of the co-design and the implementation of the food forest had to be explained. An enquiry was made to the local soil protection authority as to whether soil samples were required for soil contamination test. As no industrial uses were known in the past, this was not necessary.
Technical and social analysis	Permaculture experts were consulted to determine whether the area was suitable for the establishment of a food forest.
Other activities	A local company that prunes trees has brought its green waste to the area from November 2020. These wood chips are needed in large quantities for the construction of a food forest and would have been very expensive to buy.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	South Westphalia University of Applied Science Budget management, advising, technical and organizational barriers
2nd Partner and role/function	Die Urbanisten e.V. Planning, Co-design, co-implementation, participation, workshops
3rd Partner and role/function	…
4. Co-design activities and stakeholder engagement	

Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	The area has been used for activities by the local scouts. Their wish was to make the area more bee-friendly even before the forest garden was built and to use raised beds as design elements. Following are the co-design events to activate the various stakeholders and local community in the design, implementation and management of this NBS: - Workshop (72-Hour) in May 2019, four raised beds were created over a weekend, which were set up together with many helpers and planted with bee-friendly flowering plants and vegetables in St Urbanus. This event marked the beginning of the co-design process with the scouts and the executive board of the parish. In several talks the ideas of the participants were taken up and it was discussed how these can be implemented in a food forest. Together with an expert in permaculture, a plan was drawn up, adapted to the conditions of the site with different focal zones. In March 2020, a presentation of the concept took place in the community center. - Planting campaign (Pflanzaktion St Urbanus) in in the forest of St. Urbanus in October 2020. 35 soft fruit bushes and 20 wild fruit trees were planted (raspberries, blackberries, gooseberries, rock pear, elderberry and cherry). Participation was limited to 10 people because of COVID-19 social distancing. - Online information evening on 02.06.2020. Due to the social distancing measures of the third wave of COVID 19, this workshop was held in an online format. Members of the project partners, 9 external participants and permaculture experts attended this workshop. By advertising the online workshop in various project channels and social media platforms, some new interested people from the local community are involved now in the project. The permaculture expert kicked off the workshop with a presentation about urban forests and gardens. In addition, a video of the current state of the forest garden was recorded in advance and shown during the event: https://www.youtube.com/watch?v=drvqEAkBM4I. Afterwards, the group discussed the next steps for the further development of the forest garden project. - The forest garden group met on 17.06.2021 and new plants were planted. Participants from the church community and the surrounding neighborhoods participating in the panting, irrigation and Soil Fertilization activities. It is planned that regular on-site meetings will be held on Saturdays and the snowball effect will involve more and more users.
Notes on major achievements/success factors/critical issues/barriers (to be updated) (link to WP5)	**Achievements:** The co-design activities, including the first workshop (72-hour) in May 2019, the planting campaign in October 2020 and June 2021, are considered a successful implementation of the co-design and this NBS is gaining more and more acceptance and popularity in the local community in Huckarde. **Success factors:** The work with the church is uncomplicated and not bureaucratic. There are active and engaged people in the community. **Critical issues:**

	The workshops planned for spring 2020 were canceled and postponed due to the corona virus. **Barriers:** the implementation of joint planting activities was either cancelled or postponed several times due to the social distancing of COVID-19
Current situation and next steps (to be updated)	The active development of the garden was planned for spring 2020. Due to measures taken because of the corona virus, these had to be repeatedly postponed. However, from May 2020 onwards, the garden was set up in small groups of two people in the community. Die Urbanisten have written instructions and recorded videos to explain the work steps. Wood chips were first applied to the area before the first trees, shrubs, herbs, and vegetables were planted.. In October, 2020, 35 soft fruit bushes and 20 wild fruit trees were successfully planted through co-design activities (see Stakeholders, engagement processes, in co-design and co-implementation). In June 2021, the planting concept was further developed in a participatory approach and new plants were identified by the NBS team and members from the local community. Regular in-person meetings are planned for the future. In fall, a workshop is planned with experts to educate the participants about gardening techniques and methods
5. Other activities	
Synergies with other proGIreg activities	WP4: monitoring and assessment activities (General questionnaire, visitor questionnaire, economic and labor impact questionnaire air quality, air temperature, particulate biomonitoring) NBS 4 activities NBS 8 activities
Links with other external project or activity	Other urban gardening projects in Dortmund from die Urbanisten
Business model (link to WP5)	The community can imagine to sell homemade products from fruits of the food forest at their festivals.
Technology Readiness Level (TRL) (link to WP5)	-
Communication activity (link to WP6)	- Die Urbanisten reported on its blog (dieurbanisten.de) about the activities. - The local newspaper Ruhrnachrichten reported on the project. - Die Urbanisten gave a presentation about the project at a climate protection event of the Dortmund church communities. - In June 2020, the new website about the urban gardening activities of the living lab in Huckarde was created in collaboration with the City of Dortmund and ICLEI (hansagruen.de). - Short videos of this NBS are released in YouTube https://www.youtube.com/watch?v=drvqEAkBM4I. Co-design

	activities of this NBS are communicated through the various channels of the project and the website for citizen participation activities of the city initiative "Northwards". - Whatsapp
6. State of Play and Monitoring	
Current situation (to be updated)	New plants and herbs are planted in St Urbanus, responsibilities for maintaining the food forest are distributed among the garden group including (plant signage, irrigation plan, plant monitoring, etc.)
Next steps (to be updated)	*As soon as* coronavirus improves, more in-person meetings will be carried out and planting activities will continue.
Notes/critical issues/barriers (to be updated) (link to WP5)	The implementation of joint planting activities was either cancelled or postponed several times due to the social distancing of COVID-19
7. NBS maintenance and outlook	
Maintenance	The boy and girl as well as members of the local community of Huckarde scouts will play an active role in the garden maintenance. Community members will have the possibility of taking sponsorship for parts of the food forest.
Sustainability after project conclusion	The community is very committed to advancing and sustaining the project. Once a food forest has been established, it requires little maintenance.
Additional resources	www.hansagruen.de www.progireg.dortmund.de

~~NBS 3.2:~~
~~Gardening in a school yard and Kindergartens in Huckarde~~

The project partner responsible for this NBS decided not to pursue the NBS 3.2 for several reasons: this NBS were conceived to be co-implemented with the students of GHS-School and the young children of the selected daycare centers and due to the third wave of COVID 19 and extended physical distancing measures, co-creation of this NBS is not possible. The project partners will use the personnel capacities that become available to the further implementation of NBS3 at St. Urbanus.

NBS 4: Community managed aquaponics system

1. General information	
Compilation date and update	Third draft version, June 2021
NBS type	Aquaponics as soil-less agriculture for polluted sites
NBS title	Community managed aquaponics system on the site of the coking plant Kokerei Hansa - Hansaponik
Brief project synthesis	Two aquaponics greenhouses will be built on part of the site of the old coking plant Kokerei Hansa in Dortmund Huckarde. The greenhouses are intended to produce plants to technically advance the concept of aquaponics and serve as a learning venue for workshops with the population.
Area of implementation	The NBS is going to be implemented on the site of the Kokerei Hansa (former coking plant) Address (entrance): Emscherallee 11, 44369 Dortmund GPS coordinates: 51.541558, 7.410900
Target groups (beneficiaries)	The main beneficiaries of this activity are: Citizens of the neighborhoods of Huckarde. School students
Timing (start and end date)	Implementation/construction Phase Start: Fall 2021 (depends on receiving the approval of the building permit from the Department of Building Regulations (Bauordnungsamt), City of Dortmund. Possibility of delay) End: End of 2021 (Possibility of delay)

Main responsible partner	Die Urbanisten e.V.
ProGIreg partners involved	South Westphalia University of Applied Science Aquaponik Manufaktur GmbH Heitro GmbH Department of City Renewal (Amt für Stadtentwicklung), City of Dortmund
Other stakeholders involved	The Foundation for the Preservation of Industrial Monuments and Historical Culture (Stiftung Industriedenkmalpflege und Geschichtskultur) (land owner)
Total Budget	123.000 € for the construction and equipment of the greenhouses (die Urbanisten e.V.) 50,000 € for research into TRL optimisation (FH SWF) 12.500 € for events and creation of a filter system (heitro) + Additional Budget shifting/reservation of about 63,000 Euros from the project partners FH SWF, HEITRO and Dortmund to the Urbanisten
2. Pre-implementation activities	
Planning and preparatory activities	The search for an area for the aquaponics system proved to be very difficult. The location at the Hansa Coking Plant was considered at a very early stage and was unrivalled in terms of its location in the Living Lab as well as its prospects as a future hot spot for the International Garden Exhibition IGA 2027. Due to its historical importance and the high number of visitors, the industrial monument offers maximum public visibility and follows exactly the priorities of the project to implement nature based solutions on post-industrial wastelands. These characteristics were the reason to exhaust all possibilities to use this area. This was then made binding in February 2020 after some delay. The preparation of the building application for the greenhouse aquaponics is another important preparatory milestone. The completion of the application took the project partners a considerable amount of time and effort and went through a multiple review process by the Department of Building Regulations of the City in the City of Dortmund. It is currently still in the examination process and has not yet been approved for starting with the construction phase. An intermediate step will be the tendering of construction bids.
Administrative procedures	The owner of the site (IDS) demanded a deposit of 10.000€, which the designated tenant of the aquaponics site, Die Urbanisten, could not cover this amount from the project budget. This had to be clarified with the PO with the help of the RWTH. The urbanists did

not have the funding to cover this amount. The project partner Dortmund is not the tenant or main project partner of this NBS to cover the deposit and is supporting in a coordinating capacity, especially in clarifying the procedures for obtaining the building permit by the Building Regulation Department, City of Dortmund. It had additionally worked out a political decision to support with the deposit in case no other solution was realizable. After extended negotiations and a time-consuming process of developing alternative solutions, the University of Applied Sciences South Westphalia became an official tenant, thus solving the stalemate. Parallel to the negotiations for the area, the technical plans for the building application were prepared and a draft of the building proposal was submitted to the Department of Building Regulations for preliminary review and feedback in June 2020. The final draft of building application which was submitted in November 2020 went through several review process since then. During the examination of the building application, new conceptual and technical problems arose, namely:

1- The gaseous emissions from the contaminated soil of the aquaponics site, the former Hansa coking plant, raises the question of whether the food produced can be edible or not.
2- Building permit and business model, the building permit of the greenhouse would be issued for the construction of the greenhouse for agricultural activities, but not for public use by interested citizens, because there is no evidence of the stability of the structure in the event of heavy snowfall and high wind speeds, so the public must be excluded from access to this NBS and thus from the business model.
3- Technical issues related to the animal experimental nature of this NBS.

Overcoming these technical barriers would result in significant changes in the co-design concept and business model of this NBS. This was communicated with the project coordinator (RWTH Aachen) and accordingly with the Project Officer (EU Horizon 2020). In order to discuss these points as well as the issues raised by the Project Officer regarding necessary adjustments in the implementation of NBS 4 in the Dortmund LL and its alignment with the project scope and feasibility, the project coordinator RWTH Aachen organized an extraordinary meeting with all proGIreg boards on 11 February 2021.

It was agreed by the project partners upon this meeting that despite the mentioned barriers, the implementation of this NBS will still be possible within the scope of the project as well as the public participation through alternative formats. In addition, monitoring activities will continue to be applied to this NBS. In the meantime, the project partners URBA and SWUAS are working to completing the additional requirements of the building application (registered

	plot number, accessibility to the site, rain water drainage, etc.) as requested by the Building Regulations Office at the City of Dortmund. The partner City of Dortmund, the Department of Urban Renewal, supports substantially in the coordination with the relevant departments and accelerates the processing of the application in a shorter time frame. The bidding documents will be prepared once the building application is approved by the Department of Building Regulations for construction.
Technical and social analysis	Aquaponics is soil-independent; however, further backfill may be necessary due to the contaminated site situation. Aquaponik Manufaktur GmbH and SWUAS are working on the elevation of the technology readiness level (TRL). As a first milestone, a comprehensive list of optimization methods has been compiled. This list is going to be detailed in a document by these partners. Calculations for Thermal Storage and Biomass heater are currently being made at the SWUA to insure the stability of the experimental structure of the green houses.
Other activities	
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Die Urbanisten e.V. Implementation, citizen participation
2nd Partner and role/function	South Westphalia University of Applied Science Economic viability, technical and organizational hurdles, operational optimization
3 rd Partner and role/function	Heitro GmbH, supporting with the technical planning of the aquaponics Aquaponik Manufaktur planning the foils greenhouses and the hydroculture and aquaculture of the aquaponics system.
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	The landowner of the coking plant (Foundation for the Preservation of Industrial Monuments and Historical Culture) was engaged in the process since the first co-design workshop in December 2018. The aquaponics building application was not approved for use by the general public because the structural design of the foil greenhouse is certified for agricultural uses only. Additional calculations of the building's structure and load-bearing capacity would otherwise be required. As a consequence, the foil structure

	cannot be used by the general public and all co-design activities must take place outside the greenhouse. This issue was raised and discussed in a project meeting (see Administrative Procedures) and new solutions were proposed by the project partners to adapt the "rent-a-raft" concept. Further, the Urbanisten can offer visitor tours of the facility, but visits during extreme weather conditions will be excluded. Those who are interested in the project can become members of the Urbanisten to participate in other organized project activities. Workshops can also be organized outside the greenhouse and venues of the Hansa Coking Plant.
Notes on major achievements/success factors/critical issues/barriers (to be updated) (link to WP5)	The project lead partner, Dortmund, requested a clarification of the scope and content of co-design before the partners begin planning this NBS with the citizen, and therefore discouraged communication about this NBS especially before the contract for the site was signed and guaranteed as this might potentially lead to mistrust between the citizen and the project partners if the sites were not guaranteed for implementation as originally communicated, and thus introducing the public in the project's next phase, namely in the implementation of this NBS within certain considerations (see the section before). Therefore, the already limited slim possibility for a co-design process on this NBS has been further narrowed. Another barrier is the longtime required to prepare the complete proposal for the building permit of the aquaponics, especially that an architectural firm is needed for completing technical requirements of such a complicated building application. The implementation of the aquaponics required also additional funds. The Urbanisten communicated this issue with the PO. The need for the additional funds and the additional funding opportunities were also discussed among the partners in February 2021 and all Dortmund partners agreed to the construction of the greenhouse and secured the funding gap by budget shifting/reservation of about 63,000 Euros among the project partners. A prerequisite for receiving the shifted 44,000 euros from the City of Dortmund was to investigate whether the concept of the current building application can go beyond the scientific experimental status and ensure the safety of the products for the conception. Solution: A subsequent amendment to the building permit after ensuring food safety will be submitted to the Building Regulations Office to meet the required prerequisite.
Current situation and next steps (to be updated)	- Obtaining the building permit is currently the main focus of this NBS. The aquaponics building application still requires some changes and the Urbanisten are currently coordinating with relevant parties (IDS, contracted architectural firm) to complete the application and submit these changes by the end of June. The bidding for construction services will follow next.

	- Ongoing preparations for the communication campaign of this NBS to the public. SWUAS and the Urbanists will use the Hansagruen LL website to establish a blog to communicate the planned activities of this NBS and to allow more interactive communication about this NBS.
5. Other activities	
Synergies with other proGIreg activities	WP4: monitoring and assessment activities (General questionnaire, air quality and air temperature, economic and labor impact questionnaire, environmental footprint) Link with the activity "Spatial analysis and analysis WP2.1 framework" Link with NBS3" Community-based urban farming and gardening on post-industrial sites
Links with other external project or activity	Workshops about aquaponics were held by die Urbanisten in Dortmund schools, in which the students could build their own aquaponics system for their school, and then operate by themselves. This was also done to attract schools to the topic of aquaponics and establish cooperation for the further project.
Business model (link to WP5)	Currently being revised
Technology Readiness Level (TRL) (link to WP5)	Research is being conducted into increasing the technical readiness level by improving energy and resource optimization. Thermal Storage and Biomass heater experiments are being conducted in the South Westphalia University of Applied Science (SWUAS) to ensure some construction aspects of the two green houses. Due to some requirements from the department of building regulations at the city of Dortmund concerning the building permit of the two foil greenhouses of the aquaponics, it was decided to start with the trial part in University of Applied Sciences. This not only provides preliminary test results, but also allows more or less unavoidable errors to be sorted out in advance. Two test sets are being put up: 1) A thermal storage system which in the first run shall collect and store solar heat as a passive system (low tech), and, after having been upgraded with a solar thermal panel, shall function as a combined system. In-house thermal calculations are to be verified in order to obtain more predictive power. The system will be built inside the greenhouse 2) A simple biomass heater is being built inside a winter garden. First trials will allow for corrections until winter, when the biomass heater will be used as the sole heating source. A larger system (biomeiler) is being planned for late autumn, which should contribute to the heat energy for a commercial greenhouse during the winter

	- Phyto- and Zooplancton Experiments in different locations As a trophic level in the aquaponics system, phyto- and zooplankton cultures will be used as a substitute for pellet feed. For this purpose, various test cultures are set up prior to the construction of the greenhouses. These are initially used to experimentally determine the productivity of the cultures. These are Gammarus and Daphnia cultures. Further Phytoplankton cultures with the floating alga Chlorella are used as food for the zooplankton cultures.
Communication activity (link to WP6)	Currently being revised.
6. State of Play and Monitoring	
Current situation (to be updated)	A Pessl iMETOS 3.3 Pro weather station has been implemented at the site which is monitoring the following environmental parameters: air temp, air pressure, rel. humidity, global radiation, wind speed, soil temperature and leaf humidity.
Next steps (to be updated)	After the erection of the greenhouses, a wide range of sensors is going to be deployed in the greenhouses by SWUAS, with the goal of quantifying the effects of those energy optimization methods that were promising enough to be implemented in experiments.
Notes/critical issues/barriers (to be updated) (link to WP5)	Issues and barriers: Long duration of the search for an area and negotiations Long timeline and high costs of the institutional bureaucracy to obtain authorizations and permissions. The business models are changed
7. NBS maintenance and outlook	
Maintenance	During the proGIreg project timeline the system is going to be operated and maintained cooperatively by Die Urbanisten and SWUAS.
Sustainability after project conclusion	SWUAS has submitted a research project proposal for the continuation of research at this site and system with a focus on operational optimization with artificial intelligence. The proposal was rejected. SWUAS could continue to operate the facility for research purposes after the proGIreg project timeline. As the facility (Hansa coking plant) is supposed to become part of the international gardening exhibition IGA in 2027, the project team is optimistic that a solution is going to be found for maintaining and further developing the system by the time proGIreg ends.
Additional resources	

NBS 6: Connection of Huckarde Borough with the Renatured Emscher River and Deusenberg Sites

1. General information	
Compilation date and update	Third draft version, June 2021
NBS type	Making post-industrial sites and renatured river corridors accessible for local residents
NBS title	Connection of the Huckarde borough with the renatured Emscher River and Deusenberg sites
Brief project synthesis	The former Deusenberg landfill has been recultivated since 1992 and was opened to the public in 2004. Since then, it has been a popular destination for various leisure activities like walking, jogging, cycling, mountain biking, birdwatching, etc. Access to the top of the Deusenberg is mainly possible from the northeastern side via several paths and stairs. The other three expositions are “gated” by train tracks (west, north), a fenced maintenance and work facility as well as a fenced lot with a degassing installation for the landfill (south). In the northwestern area an unofficial trail connects the path system with the Deusenberg trails. A second inoffical trail exists in the southeast, connecting the Emscherpath with an existing paved road which is also accessible to workers to maintain the landfill via a gated property. The Deusenberg will be part of the exhibition area of the International Garden Exhibition in 2027. It will be necessary to offer a barrier-free connection from an existing parking lot to the exhibition area. Therefore, the hidden, unofficial path in the southeast will be reconstructed. Another connection is planned (an IGA-project with a budget of ~ 5 million Euro) via a bridge, linking the area north of the Hansa coking plant and the Deusenberg by crossing the train tracks. In the past years, the Huckarde citizens have been asking local politicians for a better connection between the settlement and the Deusenberg leisure area. NBS 6 therefore meets their desires. The first step was to identify a realizable connection.

	The path will be about 100 m long and 3 m wide and will be designed as a combined path for walkers and bikers. According to the adjacent path system, there will be no lighting.
Area of implementation	The reconstruction of the path is planned on an area which partially belongs to the City of Dortmund. The reconstruction of the path is planned on an area that is partly owned by the city of Dortmund managed by EDG (Dortmund disposal company; affiliated to the City of Dortmund). In former times, when the landfill was actively filled, a road existed there but was deconstructed after 1992. Today, the path is hidden and hard to be seen from the Emscher path, as dense vegetation (trees, shrubs) hides the small “entrance.” It is still located at the slope toe with a comparably low gradient in comparison to the adjacent landfill.
Target groups (beneficiaries)	The path will be constructed for walkers/ joggers and bikers (without motor). Perspecitvely, IGA visitors will use it.
Timing (start and end date)	Start: January 2019 End: December 2022
Main responsible partner	Department of Urban Renewal, City of Dortmund (~~lead~~ project management)
ProGIreg partners involved	None
Other stakeholders involved	NRW.Urban (support for bids) Landscape planner (Landschaft planen + bauen), Construction Company (~~both~~ not identified yet), EDG (responsible for Deusenberg administration)
Total Budget	180.000 € (proGIreg budget) 6.000 € (feasibility study; federal money from Huckarde integrated action plan)
2. Pre-implementation activities	
Planning and preparatory activities	Internal assessment check: A north-south running path on a fenced property would have been the shorter connection between the Huckarde settlement and the Deusenberg. Nevertheless, there would have been the laborious process for Dortmund to buy the lot with the path. In order to build a barrier-free path, intense interventions in vegetation and topography would have been necessary. The north-south path may be realized in the future as an additional connection which doesn´t have to be barrier-free. Opening the fence and using the informal path for the public is not possible mainly due to liability questions, necessary investments for fences, and a construction site within the next years.

	Feasibility Study (finished in 6/2020): Therefore, in September 2019 the decision was taken to realize the east-west connection from the Emscherpath. An external office was authorized to work out the best layout of the east-west path regarding interventions and aspects like vegetation, landscape, soil, and costs. The final version was checked by several departments of the City Dortmund. Soil examination: As the ground consists of fillings an external soil expert analyzed the ground. Due to contaminations a soil expert will be needed during the construction phase. Preparation of the Planning Process: As the Department of Green Spaces/ City of Dortmund did not have capacities to plan the path and manage the process, NRW Urban as an external company had to be hired (September-November 2020) in order to prepare the call for bids for the planning process which took place in April 2021. Planning Process: The path ~~will be~~ is currently planned by the ~~-~~external landscape planning company Landschaft planen + bauen". An accompanying landscape management plan is also required. Plans for approval will be handed in in June 2021. In May 2021 during a videoconference with all concerned internal and external stakeholders (12 persons) the project was presented and critical aspects commonly reviewed. Urban replotting: The path will be constructed on two plots which both belonged to the City of Dortmund, but were administered by two different departments. To ease construction and later maintenance the plot of the City of Dortmund was transferred to the EDG.
Administrative procedures	In December 2020, local political approval was gained to assign a landscape planner.
Technical and social analysis	NBS 6 is mainly a technical project which needs to meet all given technical, legal and administrative requirements. The whole area is covered with more or less contaminated deposits, but not with landfill material. In the first step a warfare material survey was done (November 2019), but a detector survey is needed in fall 2021 before construction. As the path will be open to the public, no specific social analysis was needed next to the one worked out in the Spatial Analysis. As the path will be barrier-free, extensive soil removals will be necessary at the highest point. Here, the baseplate of a former building must be removed. As the ground consists of contaminated deposits, the removed material needs to be deposited.
Other activities	Close internal harmonization of NBS 6 with IGA planning group.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Department of Urban Renewal, Dortmund.

2nd Partner and role/function	Local garbage company (Entsorgung Dortmund GmbH, EDG)
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	At the current stage, NBS 6 is mainly a technical project which needs to meet all given technical, legal, and administrative requirements. Thus, co-design has been taken place on these levels with involved internal and external specialists. As expert knowledge is necessary at this point, the public could not be involved. Nevertheless, the Huckarde citizens have expressed their desire in the past to receive better access to the Deusenberg site from the settlement. This desire will be met via NBS 6. The involvement of citizens has been discussed with stakeholders. Due to the formal process and the fact that approved plans cannot be changed later on without considerable extra time no opportunities for co-design have been identified.
Notes on major achievements/success factors/critical issues/barriers (to be updated) (link to WP5)	The feasibility study is a good basis for the planning process as some aspects have already been worked out by identifying and jointly agreeing upon them by the involved departments of the City of Dortmund. Thus, the planning process can be shortened as the sketch path should fit into the administrative and legal framework. Nevertheless, several legal proceedings on private respective public levels have to be passed (duration: about 4 months) before construction will be possible.
Current situation and next steps (to be updated)	- Preparation of path plan and accompanying landscape management plan (June 2021) - Legal approvals - Political approval for construction (October 2021)
5. Other activities	
Synergies with other proGIreg activities	None
Links with other external project or activity	- International Garden Exhibition 2027 - Concept of green spaces for Huckarde New sports activities are planned at several locations all over Huckarde (Concept of green spaces for Huckarde). First ideas are existing that adjacent to the eastern end of the foot path a sports area for young people (e.g. pump track) may be located. The lonesome location is predestined for agile activities of young adults whereas within settlements quieter activities rather should be located. In the meanwhile a public involvement process for the Deusenberg has been taken place. The results will be integrated into the “framework plan Deusenberg”.

	WP 4: General questionnaire, SOPARC, economic and labor impact questionnaire (SOPARC was postponed from Spring 2020 until September 2020 because of COVID-19).
Business model (link to WP5)	The public path will be built with proGIreg-money. The local garbage company which takes care of the maintenance of the Deusenberg, will also maintain the new path after realization. A respective formal usage contract will be worked out later in 2021/ 2022.
Technology Readiness Level (TRL) (link to WP5)	Current TRL: 8 The site for the path is already attractive as the Deusenberg has a diverse path system and the Emscher has been renatured with an adjacent regional bike route (Emscher Radweg). Future TRL: 9 The accessibility to the Deusenberg will be improved by a multi-useable barrier-free path; it might stimulate physical exercise for walkers, joggers, and cyclists. Moreover, for handicapped persons, the Deusenberg path system will be better accessible. In addition with the bridge above rail tracks the overall path system around Deusenberg will be improved and better embedded into the local and regional path system.
Communication activity (link to WP6)	Communication activities were mainly focused on the internal harmonization processes – first in combination with the feasibility study, later with NRW Urban and currently with affected stakeholders. Once final plans for construction are worked out, local politicians will approve the project within a public meeting in fall 2021. The Dortmund public will be informed about the path later.
6. State of Play and Monitoring	
Current situation (to be updated)	April 2021: Landschaft planen + bauen was contracted to plan the path. Planning process and intense harmonization of the planning and the required approval process is taking place.
Next steps (to be updated)	June – September 2021: legal approvals of the plans October 2021: political approval for construction Fall 2021: call for bids for construction company
Notes/critical issues/barriers (to be updated) (link to WP5)	Assigning NRW.Urban for project support has been time consuming; Project management with an external company requires more active involvement for the Department of Urban Renewal. During the cooperation with NRW.Urban it became obvious that project management has to stay at the Department of Urban Renewal (=lead) and that NRW.Urban will be involved for specific tasks only.
7. NBS maintenance and outlook	
Maintenance	Local garbage company (Entsorgung Dortmund GmbH), which maintains the complete path system at the Deusenberg.

Sustainability after project conclusion	The path will be open for the public. During the IGA 2027 it will be the only barrier-free access to the Deusenberg.
Additional resources	www.hansagruen.de www.progireg.dortmund.de

NBS 8: Improving and Monitoring Pollinator Biodiversity

1. General information	
Compilation date and update	Third draft version, June 2021
NBS type	Pollinator biodiversity improvement activities and citizen science project
NBS title	Improving and monitoring pollinator biodiversity in conjunction with NBS 3
Brief project synthesis	Pollinator-friendly plants will be introduced to the open slopes of the former-landfill site Deusenberg and the neighbouring permaculture orchard (NBS 3). Local citizens will help monitoring numbers and species variety.
Area of implementation	During the planning phase a lawn of approximately one hectare size on the eastern side near the top of the Deusenberg, the former landfill, had been selected for the implementation of this NBS. An on-site survey, conducted with experts in the field of biodiversity, revealed that regarding biodiversity the selected site is already valuable. Several protected plants and birds were identified. Subsequently, the survey group inspected other potentially suitable places in Huckarde and was able to identify several sites that are very promising regarding the implementation. The selected sites are lawns in public parks that are currently not very rich in biodiversity and which are under management of the City of Dortmund. The selected sites are linked to one another so that in the end they will form a biodiversity pathway. Apart from the obvious benefit for humans, this is also beneficial for the biodiversity since it allows for the insects in question to migrate easily between the patches.
Target groups (beneficiaries)	Citizens using the public park pathways are going to be able to follow the path of wild flowers. The park is not only a single spot for

	recreation, but it is also used as a pathway connecting different parts of the neighborhoods. Therefore, it is going to be visible to a large range of citizens who are using the pathways for their daily task and not only to those visiting the park for relaxation.
Timing (start and end date)	Due to the Corona virus pandemic the start of the implementation had to be shifted from spring 2020 to fall 2020 and again due to technical reasons to spring 2021. The seeds have been ordered and delivered and seeding started in spring 2021 in two sites. New potential spots have been identified in cooperation with the Department of Green Spaces and the citizen-led association Naturfelder. Converting new spots in the project area is going to be an ongoing task until the end of the project and beyond. A nonprofit and citizen-led association is established and it substantially helps in spreading the awareness about this NBS and evolving local citizens in the implementation and later on in the maintenance of these spots and other integrated spots. Implementation is planned to end in ~~June~~ December 2021.
Main responsible partner	SWUAS
ProGIreg partners involved	City of Dortmund, the Department of Green Spaces is going to take care of seeding and maintaining the biodiversity spaces of this NBS our project. Die Urbanisten e.V., APM, SWUAS working on the Co-Design concept.
Other stakeholders involved	N.A.B.U. (environmental association), Entsorgung Dortmund GmbH (EDG, waste management company and maintainer of the former landfill) and B.U.N.D., Klimabündnis Dortmund.
Total Budget	
2. Pre-implementation activities	
Planning and preparatory activities	Most of the sites that have been selected in the co-design process are under management of the same entity that is also going to perform the actual implementation. Thus, most of the preparatory activities are going to be performed internally at this city department. The seeds have been collectively chosen with input of the biodiversity experts. Seeds have been purchased twice, in the first time by SWUAS (15% flowers and 85% grass) and was used by the city of Dortmund, Department of Green Spaces. They were purchased again by the Department of Green Spaces and delivered to SWUAS in week of May. Cost was covered by for by SWUAS.
Administrative procedures	The Department of Green Spaces is an active part of a city wide initiative project called “Stadtgrün naturnah”, which can be translated

	into “green city spaces close to nature.” This fits very well with the goals of the proGIreg project. In order to establish a continuation of these activities beyond project runtime, SWUAS and Die Urbanisten established an NGO that carries on scouting for additional areas and works on the realization of converting these additional plots. Founding an association dubbed Naturfelder Dotmund e.V. is an administrative procedure that is going to be assisted by APM and Die Urbanisten. Ideally interested citizens effectively found the association themselves.
Technical and social analysis	The technical analysis was performed on a site survey supported by biodiversity experts. It led to a different selection of the spaces than had initially been selected by the project team. No additional societal analysis has been performed.
Other activities	The implementation partners are communicating this activity within other public events such Campus for Future/Dortmund and other online events with the goal of raising awareness for this important topic.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	SWUAS: administrative coordination and procurement of seeds, Founding of Naturfelder Dortmund e.V. association
2nd Partner and role/function	City of Dortmund, Department of Green Spaces: soil preparation, seeding and mowing Die Urbanisten e.V.: public communication within other living lab events. Media campaign for citizen activation. Founding of Naturfelder Dortmund e.V. association by interested and activated citizens.
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	Experts in the field of insect diversity and general biodiversity have been invited to a collective site survey of the initially selected site with the goal of detailing the implementation. During this event, the experts came to the conclusion that the selected site is already rich in biodiversity and that the intended implementation would do more harm than good. Subsequently, this group could identify several other spaces that are more suitable for the implementation. The selection of seed and flower species has been discussed within the expert group, yielding a selection of regionally produced seeds that are deemed most beneficial for the task. Project partner aquponik manufaktur GmbH had already founded an association called Naturfelder e.V. that is converting plots into flower

	meadows in Issum, Germany. This concept has been taken up and adapted for the Dortmund Living Lab in collaboration with the Urbanisten and SWUAS in Autumn 2020.The goal of the association is to establish a group and, with the help of citizens, obtain suitable areas in Huckarde and transform them into flower meadows, nature reserves and insect habitats. Thus, the creation of NBS8 becomes an ongoing process that goes beyond the areas and time frame identified in the project. It further aims to activate citizens in the realization of flower meadows for the preservation of insect biodiversity. Members of the association are activists and experts from the fields of agriculture, permaculture and nature conservation. So far, the Naturfelder Association, in cooperation with the regional association EGLV (Emschergenossenschaft and Lippeverband), has carried out soil preparation, seeding and irrigation at various sites in Huckarde; further potential sites are yet to be identified.
Notes on major achievements/success factors/critical issues/barriers (to be updated) (link to WP5)	One major obstacle of the LL Dortmund is the lack of available implementation spaces. Therefore, the main effort has been put into the procurement of project area spaces. Within the living lab partner group, there has been a lingering controversy about how to proceed conceptually to tackle this challenge. The initial approach has been focusing on the initial selection of implementation spaces by the project partners, space-concept people. This led to the situation that LL partners had to negotiate with land owners (both public and private) for the procurement of the spaces. This in turn led to the land owners asking for concepts before these concepts could have been developed in a co-design process together with the citizens, moving the project partners away from a moderation role into an undesired actor role. It is almost impossible to procure spaces from land owners without a technological concept, just on the notion that concepts are going to be developed with stakeholders from the general public. It has also been difficult to convince land owners that they are meant to be part of the stakeholder group which is going to develop the actual concepts. The stakeholder site survey on the site initially selected by the project team showed not only that the co-design yields conceptually preferable solutions, but also that the perceived lack of implementation spaces could be solved in dialogue with other stakeholders, in this particular case simply another department of the City of Dortmund that had authority over spaces which had been deemed not available for the proGIreg project. Thus, the reversal of the approach to the people-concept-space led to a satisfactory outcome on all sides.
Current situation and next steps (to be updated)	Current: The implementation stakeholder has been identified and has been active in developing the implementation details.

	Resources, in this case seeds, are ordered twice. No other resources are required. The Green Spaces Department has begun seeding activities. Soil preparation has begun at two of the five identified sites (part of Gustav Heinemann Park and the allotment association). Although a part of Gustav Heinemann Park encountered a technical barrier due to large construction rubble that can damage the back-milling machine, the milled (partial) areas were successfully seeded. Additional areas were milled at the allotment association and will be seeded shortly after a 2nd milling. This was only possible because the members of Naturfelder have offered to take over the irrigation, since the Department of Green Spaces has no capacity for this. Next step: The biodiversity spaces are going to be implemented in other sites. Citizens are going to be activated and encouraged to form an association dubbed Naturfelder Dortmund eV. 4th quarter 2020 – 2nd quarter 2021.
5. Other activities	
Synergies with other proGIreg activities	A surplus of seeds is going to be ordered. Smaller spaces on the implementation sites of NBS 3 and NBS 4 are going to be converted into pollinator diversity sites by the respective stakeholders. These spaces are intended to raise awareness for NBS 8 and to drive attention to the main NBS 8 implementation spaces.
Links with other external project or activity	The “green city spaces close to nature” project group in the Department of Green Spaces (Grünflächenamt) is going to integrate the proGIreg NBS 8 activities conceptually into their main activities, probably adapting communication strategies. Contact with Naturfelder e.V. has been established. This association is willing to share resources like branding and website with new Naturfelder associations and to act as an umbrella organization.
Business model (link to WP5)	Only theoretical business models have been developed so far, entailing a flower shop partially harvesting the biodiversity spaces for the sale of wild flower bouquets. This business model has to be further developed. An implementation on the selected spaces would be conceptually difficult since the public spaces are there for the benefit of the general public. Thus, a monetization of these spaces is not allowed. Hopefully, the benefit of the biodiversity sites can be communicated to the citizens of Huckarde, possibly leading to the availability of privately owned spaces which could allow for the pursuit of this business model.

	Member fees of Naturfelder associations form a base funding stock for the activities of these associations. Members are going to actively search for sponsoring partners in the local contexts. Perspectively crowdfunding campaigns are going to be run for converting potential plots into pollinator meadows.
Technology Readiness Level (TRL) (link to WP5)	The TRL of the implementation in the NBS is already rather high due to the fact that it is technologically not very challenging to prepare the space and sow the seeds. The main issue with the resources was that all stakeholders agreed that regional quality seeds shall be used in order to prevent non-local species from spreading. Only one supplier of seeds can guarantee the required quality of seeds. A wider range of suppliers would be desirable. This goal cannot be achieved by the Living Lab Dortmund.
Communication activity (link to WP6)	Die Urbanisten e.V. have setup a website for the communication of public LL Dortmund activities with a blog and with forums (HansaGrün | Huckarde blüht auf! (hansagruen.de). The NBS activities are going to be integrated into this communication approach. The website of the Naturfelder Association is another effective platform for spreading the awareness of this NBS and biodiversity and attract more citizens to be engaged in this NBS. Additional spaces at the implementation sites of NBS 3 and NBS 4 are going to be prepared as pollinator biodiversity sites, drawing attention to this topic during public events of those NBS implementations.
6. State of Play and Monitoring	
Current situation (to be updated)	Since the procedural focus of the LL coordinator has been “space-concept-people,” there has been no activity in the direction of activating citizen science until the first potential sites were identified by expert site mapping visit in March 2019. Project partners were discouraged to communicate with the general public before the spaces had been secured. Currently, the Corona virus pandemic is standing in the way of citizen science activation. The idea of SWUAS to adopt the NGO association Naturfelder e.V. into the Dortmund context to enable a stronger cooperation with the public and to secure more spaces, and therefore allow that the people-concept-space approach.
Next steps (to be updated)	Due to Corona social constrains, it is not planned in the near future to activate young citizens and children in the monitoring the biodiversity in this onsite pre-implementation activities. Due to the lack of implementation spaces and the resulting struggle to find spaces due to the above mentioned space-concept-people

	approach, project partners had to spend significant parts of the implementation time budget for the procurement of spaces, leaving only a rather scarce time budget for these kind of activities. Previous experience shows that this kind of public activation is very time demanding. The time budget for this task is very limited, thus the partners are attempting to evoke a self-dynamic, activation of citizens to build the desired organizational structure themselves, with the help of the proGIreg partners. This is achieved with a media campaign that is run in collaboration between Die Urbanisten, APM and SWUAS. The remaining partners are supporting this thread by piping the generated communication into their respective communication channels.
Notes/critical issues/barriers (to be updated) (link to WP5)	Biodiversity monitoring is a time consuming task that has no immediate monetary benefit. Thus, this is a task that is usually delegated to volunteers, young children, and school children supervised by their biology teachers, possibly supported by local environmental activism groups. The lack of monetary incentive is the main barrier for biodiversity monitoring.
7. NBS maintenance and outlook	
Maintenance	The Department of Green Spaces is going to take over the maintenance of the implementation sites. The NGO Naturfelder Dortmund e.V. is going to support the maintenance of the locations converted during the proGIreg time frame.
Sustainability after project conclusion	Most likely the same department is also going to maintain the implemented sites beyond the proGIreg project time frame.
Additional resources	https://www.naturfelder.de https://www.naturfelder.de/dortmund

4. Living Lab results and perspectives

4.1 Conclusions of the Implementation phases

This report is the official third draft of the Dortmund Living Lab Implementation Plan. It provides a detailed overview of the monitoring activities of Dortmund NBS implementation progress (WP3) submitted in June 2021. The updated LL Map is attached to this report.

The IP report begins by outlining the framework of proGIreg and underlines the need and necessity of developing nature-oriented solutions and green infrastructure in Dortmund and especially in the post-industrial northern part along the Emscher River. This has been at the center of the formal and informal planning agenda in Dortmund since the early 1990s and will remain so in the coming decades. The Nature Based Solutions of ProGIreg are part of this overall concept.
Since the start of proGIreg in August 2018, five NBS in Dortmund have been selected for implementation (NBS 1, 3, 4, 6 and 8). With the exception of **NBS 1.1 (Integrating solar energy production on Deusenberg landfill)**, which was completed in 2017, seven projects within these NBS are now in the planning and implementation phase.
The City of Dortmund, Department of Urban Renewal is the lead partner and implementation partner of **NBS 1.2 "Sports infrastructure in an existing park in Huckarde**". This NBS was originally planned on the Deusenberg and all planning efforts were invested in this direction until the end of 2019, when this NBS had to be completely reframed as the Deusenberg area has to be reserved for the IGA (International Garden Exhibition 2027). This resulted that the project had to be relocated and this NBS is currently planned in part of Gustav-Heinemann-Park in Huckarde. Since January 2020, The Department of Urban Renewal has been involved in the ongoing planning and coordination with the Department of Green Spaces regarding implementing this NBS. An external landscaping firm was engaged to develop the concept for this NBS and to organize the co-design workshop with the stakeholders from Huckarde community (representatives from the sport clubs in Huckarde, Gustav-Heinemann-School, Department of Green Spaces, etc.). Currently the Department of Green Spaces is designing the sketch plan which is supposed to be finished by the end of June 2021 and will be the basis for the political approval in fall 2021 as well as for acquisition of additional funding. Construction work is expected to be completed in winter 2022. The City of Dortmund, Department of Green Spaces, will be responsible for the management and maintenance of this NBS after realization and the end of proGIreg in May 2023.
The City of Dortmund, Department of Urban Renewal, is also the main implementation partner of **NBS 6 “Connection of Huckarde borough with the renatured Emscher River and Deusenberg sites”**. The new path will create a barrier-free connection to Deusenberg which will be part of the IGA. The company NRW Urban is supporting in the bidding process and the Landscape firm (Landschaft planen + bauen) is planning the path.The technical planning has already started and the realization of the project is foreseen to be realized by the end of 2021.
South Westphalia University of Applied Science is the main partner of **NBS 3~~.1~~ (Food forest and permaculture orchard in Huckarde)** and is collaborating closely with die Urbanisten in the realisation of this NBS. The preparation and co-design activities started in May 2019, scouts, pastor of the church St. Urbanus and perspectively the residents of Huckarde are actively involved in the planning and implementation activities. Their involvement is of crucial

importance for this NBS, as they will continue to use and maintain this NBS beyond the term of proGIreg.
Die Urbanisten is the main partner of **NBS 4 (Aquaponics)** and work closely with the South Westphalia University of Applied Science in realizing the aquaponics. This NBS will be realized on the former Hansa Coking Plant. A binding contract was signed in March 2020. A building permit is required for the construction of the two greenhouses. The actual start of construction was ~~is~~ scheduled for autumn 2020, the end of 2021.This NBS has further encountered major obstacles in recent months, mainly (1) the gaseous emissions from the contaminated soil of the aquaponics site, the former Hansa coking plant, which raises the question of whether the food produced can be edible or not; (2) building permit and business model, the building permit of the greenhouse would be issued for the construction of the greenhouse for agricultural activities, but not for public use by interested citizens, because there is no evidence of the stability of the structure in the event of heavy snowfall and high wind speeds, so the public must be excluded from access to this NBS and thus from the business model; (3) technical issues related to the animal experimental nature of this NBS. These issues, as well as the necessary adjustments in the implementation of NBS 4 in the LL Dortmund and its fit with the project scope and feasibility were discussed in a special meeting with all proGIreg boards on February 11, 2021. It was agreed by the project partners that despite the mentioned barriers, the implementation of this NBS will still be possible within the scope of the project as well as the public participation through alternative formats. In the meantime, the project partners URBA and SWUAS are working to complement the aquaponics building proposal (Site accessibility, drainage, etc.) as requested by the Building Regulations Office at the City of Dortmund.

The South Westphalia University of Applied Science is the main partner of **NBS 8 (Improving and monitoring pollinator biodiversity in Huckarde)** and works closely with the City of Dortmund (Department of Green Spaces) on implementing this NBS on five sites in Huckarde. This NBS is linked to NBS3 activities. Whenever establishing an urban garden/farm, it will be integrated with pollinator improvement measures. Due to the pandemic COVID-19 there was a delay of about 5 months. The start of implementation had to be postponed from May 2020 to September 2020 and then to spring 2021. The citizen-led association Naturfelder "Nature Fields" is in the process of being legally established by the project partners URBA and SWUAS in autumn 2020 and the members of the association are activists and experts from the fields of agriculture, permaculture and nature conservation. The goal of the association is to establish a group and, with the help of citizens, obtain suitable areas in Huckarde and transform them into flower meadows, nature reserves and insect habitats. Thus, the creation of NBS8 becomes an ongoing process that goes beyond the areas and time frame identified in the project.

The first chapter also deals with the involvement of multi-stakeholders throughout the project, the dynamics between these stakeholders, their roles and the management activities in order to maximize the benefits and achieve an efficient implementation of the project.

A description of the spatial, natural and socio-economic fabric of the LL area is also presented in this report, as it is essential to understand the need for nature-oriented projects in the LL area in Dortmund. Furthermore, it is relevant to the challenges and obstacles that arise during the implementation phase (site search, soil contamination, landownership, co-design, involvement of marginalize people). This would not have been easily achieved

without referring to WP2 "Spatial Analysis", which provides comprehensive information about the Dortmund Living Lab, adjacent areas and an overview of the historical development and spatial transformation of the LL area.

An online questionnaire on the risk and mitigation measures identified in the first project year was completed in February 2020 in cooperation with our project partners as part of WP3, D3.3. The preparation of the first draft of this report started in February 2020 and was continuously updated. An unforeseen event that has significantly influenced the implementation of the Dortmund NBS is the occurrence of COVID-19. In the period from 15 March until now, many social distance and mobility restriction measures were imposed by the German government to combat the spread of the coronavirus. Although some of the restrictive measures have been lifted multiple times, public events are still effortful to organize under COVID 19 precautions and still generally not advised. As a result, many of the events planned by proGIreg have either been postponed or cancelled, but new methods have been developed by the project partners as alternatives to physical meetings, such as online meetings, dissemination of NBS activities and upcoming events via the proGIreg Huckarde website and blog, and the recording of tutorial videos on the implementation process (NBS3.1). The return to normality after COVID-19 is still unclear, and people are still obliged to limit contacts, to meet outdoors if possible, to wear face masks inside building and to keep a minimum distance of 1.5 meters to people. Apart from the fact that this is a precautionary measure against COVID-19, a third wave of COVID-19 new ~~variant~~ is expected in autumn and the containment of this pandemic is not yet completed.

4.2 Results obtained and points of criticism

All NBS in Dortmund aim to improve the quality of life of citizens in the LL area by attracting them to open urban spaces and gardens, thus promoting social, health, environmental and economic benefits. With the exception of NBS 1.1 of energy production at the Deusenberg landfill, all NBS promote social inclusion and cohesion in this socially polarized part of Dortmund. This is to be achieved both through the implementation of the NBS and GI and by involving citizens and marginalized groups in the co-production of the various NSB projects (people with special needs, the elderly, children, refugees, etc.). In order to assess the impact of these NBS, several "NBS monitoring tools" demonstrated by WP4 in cooperation with the project partners were carried out in the LL area. For this purpose the General Questionnaire (GQ) was conducted in October-December 2019 to collect data on social, health and economic indicators at LL and district level. Further monitoring activities are carried out at the NBS level. The analysis of the results of the monitoring activities before, during and after implementation will provide comprehensive information about the LL area and allow for a tangible and validated assessment of the benefits achieved through the implementation of these NBS and allow for a comparison of the results of proGIreg Dortmund with the other three front runner cities.

Some NBS in Dortmund encountered significant delays namely NBS1.2, as this NBS was conceived for implementation at Deusenberg and the decision to realize IGA 2027 was taken after signing proGIreg grant agreement. The landfill at Deusenberg will be part of the IGA 2027 area and as IGA has a higher priority and is expanding over a longer period than proGIreg, the NBS 1.2 was moved to Gustav-Heinemann-Park. The adaptation of the project ideas to the IGA framework and the examination of the project ideas with other City departments for

implementation possibilities began in January 2020. In addition, the formal administrative process of implementation in coordination with the city departments involved, as mentioned in Chapter 3.2, indicates that the completion of this NBS will take place in autumn 2022, almost one year after the planned implementation period of the NBS.

Despite the technical challenges involved in implementing NBS 1.2, such as reframing this project and relocating it from Deusenberg to Gustav-Heinemann-Park, harmonizing it with the Huckarde Open Space Concept and the bureaucratically ridged execution process, the materialized result serves the citizens of Huckarde and provides them with a natural environment with sports infrastructure to improve their physical and mental health. Low-income groups will particularly benefit from this NBS as they will have free access to the sports equipment. The school adjacent to the park (Gustav-Heinemann-School) is also interested in this project and would like to run sports equipment in their schoolyard. The impact of this NBS will be measured by the SOPARC monitoring activities of WP4, D4.2 before and after implementation. After implementation, a monitoring tool "visitor questionnaire" will also be used to assess the social and health benefits of this NBS.

NBS 4 (Aquaponics) is a powerful technology to provide the citizens of Huckarde with local food without chemical intervention or fertilizers. The soilless plant cultivation is sustainable and enables resource-saving, where nutrient and water consumption as well as CO2 emissions can be significantly reduced. This technology is particularly valued in Dortmund LL, as the soil in many areas is heavily contaminated and does not allow plant growth. On a social level, the greenhouses are envisioned to be a place of learning for workshops with the citizens of Huckarde, yet this can only be realized through short guided tours to the green houses and workshops on the site of the former coking plant outside the greenhouses (see Chapter 3). In addition to the mentioned advantages, the two greenhouses will serve as a scientific experiment and further advance the technical optimization of aquaponics. The Department of Agricultural Economics at South Westphalia University of Applied Science has been operating an aquaponics plant in Soest since 2015 for teaching and research purposes, and teaches the subject "Urban Agriculture". The main areas of research in Soest are phytopathology, technical optimization of aquaponics and the development of economically viable business models. From 2016 to 2019, the University of Applied Sciences was an active member of the completed European research network COST Action Aquaponics FA135, for whose final report the University of Applied Sciences was in charge of chapter 16, which illuminates the economic aspects of aquaponics. Within the project proGIreg the focus of the research shall be on the technical optimization of resource consumption and on the development of new business models.

NBS 6 fulfils the wish of the citizens of Huckarde expressed to the local politicians to connect their settlement with the recreation area Deusenberg and the banks of the Emscher. Access to open spaces and leisure activities would promote positive social inclusiveness and strengthen social cohesion in Huckarde. The social and health impact of this NBS will be investigated within the framework of monitoring activities of WP4, the SOPARC. The pre-implementation of SOPARC place in September 2020.

Parts of NBS 1, 3 and 4 will be planted with flowers to attract pollinators. The implementation of NBS8 in parts of the other NBS aims to improve pollinator biodiversity, raise awareness of biodiversity and draw attention to the main areas of implementation of NBS 8.

The degree of citizen participation varies in the different NBS in Dortmund and is generally low at this stage of implementation due to the reasons mentioned in the previous chapters and currently to the social distancing measures because of coronavirus (see chapter 2). Although citizen participation is fundamental in WP2 (co-design) and WP3 (implementation) and is perceived by the project partners as an essential part of the NBS, the needs, capacities and perspectives of local citizens of Huckarde are not systematically and empirically collected in the co-design phase. The project partners are aware of this challenge and are collaborating, with support of the City of Dortmund, to create innovative forms of interaction with the different citizen groups (e.g. potential stakeholders, NGO representatives, experts in the site selection and design of the NBS).

Against this background, the implementation of the NBS requires reaching out to citizens and actors on the ground to gain their support, in particular in providing sites for implementation and perspectively managing and maintaining the NBS after implementation. In order to induce public support the following issues should be considered in the development of the co-design framework

- Presentation of the project objectives (short and long term) to the public and different actors and sharing the problems and opportunities in the LL area.
- Highlighting the co-benefits of the project and that the implemented NBS will benefit all sides and that is therefore a win-win situation, e.g. addressing the environmental, social and economic co-benefits
- Involvement of representative stakeholders who are influential, have built trust with their community and aware of their needs and can trach out to social groups in the LL area
- maintain regular contact with all parties involved during the various phases of implementation and inform them if changes occur in the overall project

Furthermore, proGIreg is a trans- and interdisciplinary project involving multi stakeholders and actors. Although the diversity of the actors involved encourages innovation, confrontations and matters of controversy have emerged and led to potential conflicts between the unsatisfied partners and stakeholders. Team meetings, constructive criticism and defining a clear team culture that all partners agree to, apply help to resolve disagreements and build trust between the project partners[4]. In this respect, the co-design workshops prepared and organized by ICLEI have been a successful tool to defining a common language between the project partners and achieving positive results in terms of disagreeing agreeably.

As highlighted in chapter 2.2 and also in the monitoring deliverables (D.3.3 first implementation monitoring report), administrative procedures and bureaucracy, especially in the NBS, which require cooperation and signing contracts with the city departments, have lengthened the preparation and planning phases and often led to delays in implementation. Nevertheless, one of the findings of this project is that although decision-making in such a hierarchical and consensual working culture can take a long time, once the decision has been taken after consultation with all stakeholders and involved city departments, implementation takes place quite quickly because all partners and stakeholders have been involved and the decision is final.

[4] Meyer, E. (2014). The culture map: breaking through the invisible boundaries of global business. First edition. New York: Public Affairs

Furthermore, comparison of proGIreg FRCs and knowledge transfer of approaches to co-design, gaining political support for innovation projects, challenges and solutions, innovative ways of dealing with long public administration and bureaucratic procedures must be strengthened. The same applies to encouraging more knowledge exchange with the follower cities.

4.3 Further integrations

As mentioned in chapter one, proGIreg is part of an overall development concept for the LL area in Dortmund. Several formal and informal planning initiatives such as Nordwärts, IGA and the Integrated Action Plan for Huckarde work together in this respect and have a common goal. The existing plans complement each other, but in other positions they have different concepts and timelines, and for the realization of these projects it is crucial that the project partners involved regularly exchange information and coordinate their actions and cooperate with each other. In light of this, the broad planning context of proGIreg poses a challenge, as it needs to be constantly updated and supplemented in order to harmonize with the other projects, especially IGA 2027. On the other hand, this offers a possible perspective to continue proGIreg projects also after 2023 and to integrate them into IGA and to present them to a broad international public during IGA.

Knowledge and experience exchange is a contentious process in proGIreg Dortmund, among others, is the exchange with one of Nordwärts projects. Within the framework of the ten-year "nordwärts" project, various externally funded projects are being initiated and the KoopLab project (integration through cooperative open space development) is one of these projects that promotes open space development in a cooperative manner and improves it through the participation of people with and without a history of migration. The spatial focus of the project is on the so-called "arrival quarters". These are those districts that are particularly affected by social disadvantage, migration and population density. These characteristics apply to the LL area in Dortmund and the project partners exchanged ideas with KoopLab on how the socio-ecological integration of immigrants can be promoted through modern participation processes. Furthermore, learned from their experience how neighborhood residents' access to the resource of "space" can be strengthened through demand-oriented planning and the development of (semi-)public spaces, thereby increasing the quality of life and living in the district as a living space for all. The project is funded by the Federal Ministry of Education and Research (BMBF) and runs parallel in the cities of Hanover and Leipzig[5]. The meeting to exchange ideas with the Coordinator of Kooplab took place in July, 2020.

Future integration with other projects cannot be anticipated at the point. By the end of the implementation phase in December 2022 there will be more information available on that aspect.

[5] More information about KoopLab can be found in this link

Annex 1: Dortmund Living Lab Map

Lage und Umsetzungsstand Huckarde Living Lab, Dortmund

Huckarde Living Lab Dortmund

Living Lab Plan | Living Lab Vision map

Update: 06 2021

Ziel 1 Zur Stärkung des sozialen Zusammenhalts und der Identifizierung mit dem Stadtteil sollen in Huckarde neue Grüne Infrastrukturen entstehen und die Angebote an die Bevölkerung sich gärtnerisch zu betätigen, verbessert werden.
Goal1 Implementing Green infrastructure and gardening activities to improve the social situation of Huckarde settlement and to foster the identity of the area.

Ziel 2 Beteiligung der Bürgerinnen und Bürger bei der Planung und Unterhaltung von „grünen Projekten".
Goal2 Involving citizens in the design and management of NBS-Projects.

Ziel 3 Beförderung von neuen Geschäftsmodellen, die auf der Idee von natürlichen Kreislaufwirtschaft beruhen.
Goal3 To promote new professionalism and business models based on natural solutions.

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NBS 1 –Sportangebote im Gustav-Heinemann-Park

Ort: Gustav-Heinmann-Park, Dortmund Huckarde

Beschreibung: Öffentlich zugängliche Bewegungselemente, die Bürger verschiedener Altersgruppen zum Ausprobieren und Trainieren einladen und die einen gesundheitsförderlichen Ausgleich zu überwiegend sitzenden Tätigkeiten im Alltag darstellen.

Partner: Stadt Dortmund, Amt für Stadterneuerung

Weitere Akteure: Gustav-Heinemann-Schule, Huckarder Vereine

NBS 1 – Sports infrastructure within the existing park of Huckarde

Location: Gustav-Heinmann-Park, Dortmund Huckarde

Description: Publicly accessible movement elements which invite citizens of different age groups to try out and exercise and which represent a health-promoting balance to predominantly sedentary activities in everyday life.

Partners: City of Dortmund, Department of Urban Renewal

Other stakeholders: Gustav-Heinemann-School, Huckarde Associations

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NBS 3 – Waldgarten in St.Urbanus

Ort: Gemeinde St.Urbanus, Dortmund Huckarde

Beschreibung: Auf dem Gelände der St. Urbanus Gemeinde in Huckarde entsteht auf einer Fläche von 3000 m² ein Waldgarten, in dem vorwiegend essbare Pflanzen in mehreren Vegetationsschichten angepflanzt werden. Der Waldgarten ist ein Beispiel, wie Gärten in der Stadt produktiv und umweltgerecht gestaltet werden können. Er wird in mehreren Workshops von der Gemeinde aufgebaut.

Partner: Fachhochschule Südwestfalen, die Urbanisten e.V.

Weitere Akteure: Kath. Kirchengemeinde St.Urbanus

NBS 3 – Food Forest in St.Urbanus

Location: Parish of St. Urban, Dortmund Huckarde

Description: A 3000 m² food forest – a self-sustaining woodland ecosystem designed for food production – will be created on an of the St. Urbanus parish. The food forest of St. Urbanus will be built on workshops with the community and is to serve as an example of how gardens in the city can be designed in a productive and environmentally friendly way.

Partners: South Westphalia University of Applied Science, die Urbanisten e.V.

Other stakeholders: the parish of St. Urbanus (landowner)

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NBS 4 – Aquaponik

Ort: Kokerei Hansa, Dortmund Huckarde

Beschreibung: Auf einer Fläche des Industriedenkmals Kokerei Hansa entsteht eine Stadtfarm, die Fisch- und Pflanzenzucht unter einem Dach vereint. Aquaponik heißt dieses Kreislaufsystem, welches dazu beitragen kann, die Menschen in der Stadt mit gesunder und umweltschonend produzierter Nahrung zu versorgen. Die Anlage dient gleichermaßen als Forschungsobjekt zur Optimierung technischer Aspekte und als Lernort für Workshops für die Bevölkerung.

Partner: Die Urbanisten e.V., Fachhochschule Südwestfalen, Aquaponik Manufaktur GmbH, Citybotanicals GmbH

Weitere Akteure: Stiftung Industriedenkmalpflege und Geschichtskultur

NBS 4 – Aquaponics

Location: Hansa coking plant, Dortmund Huckarde

Description: Two aquaponics greenhouses will be built on a part of the site of the old coking plant Kokerei Hansa in Dortmund Huckarde. The greenhouses are intended to produce sustainable food for Huckarde, to advance the concept of aquaponics technically, and to serve as a learning venue for workshops with the population.

Partners: Die Urbanisten e.V., South Westphalia University of Applied Science, Aquaponik Manufaktur GmbH, Citybotanicals GmbH

Other stakeholders: The Foundation for the Preservation of Industrial Monuments and Historical Culture (land owner)

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NBS 6 - Verbesserte Zugänglichkeit von Freiflächen

Ort: Halde Deusenberg, Dortmund Huckarde

Beschreibung: Seit der Einstellung des Betriebs 1992 und der anschließenden Rekultivierung hat sich die ehemalige Mülldeponie Deusenberg zu einem beliebten Naherholungsziel entwickelt. Die Zugänglichkeit auf die Halde besteht fast ausschließlich von Osten; an den Huckarder Siedlungskörper ist die Halde daher nicht gut angebunden. Seit Jahren besteht der Wunsch der Huckarder Bürger, die Zugänglichkeit auf die Halde zu verbessern. Daher soll eine barrierefreie Wegeverbindung am südwestlichen Hangfuß gebaut werden.

Partner: Stadt Dortmund, Amt für Stadterneuerung

NBS 6 - Accessible green corridors

Location: landfill Deusenberg, Dortmund Huckarde

Description: Since the closure of the site in 1992 and its subsequent recultivation, the former Deusenberg landfill site has developed into a popular local recreation destination. The slag heap is almost exclusively accessible from the east, which means that it is not well connected to the Huckarde settlement. For many years, the citizens of Huckarde have wanted to improve access to the slag heap. Therefore, a barrier-free path connection is to be built at the south-western foot of the slope.

Partners: City of Dortmund, Department of Urban Renewal

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NBS 8 – Biodiversität für Bestäuberinsekten

Ort: an verschiedenen Orten in Dortmund Huckarde

Beschreibung: An den Standorten der NBS 3 und NBS 4 sowie an mehreren Orten in Huckarde werden bestäuberfreundliche Pflanzen ausgesät. Die einzelnen Standorte sind miteinander verbunden, so dass sich die Insekten einfach zwischen den verschiedenen Grundstücken hin- und her bewegen können. Darüber hinaus profitieren auch die Menschen von der visuellen und ökologischen Aufwertung.

Partner: Fachhochschule Südwestfalen, die Urbanisten e.V.

Weitere Akteure: Stadt Dortmund, Grünflächenamt, N.A.B.U, Entsorgung Dortmund GmbH

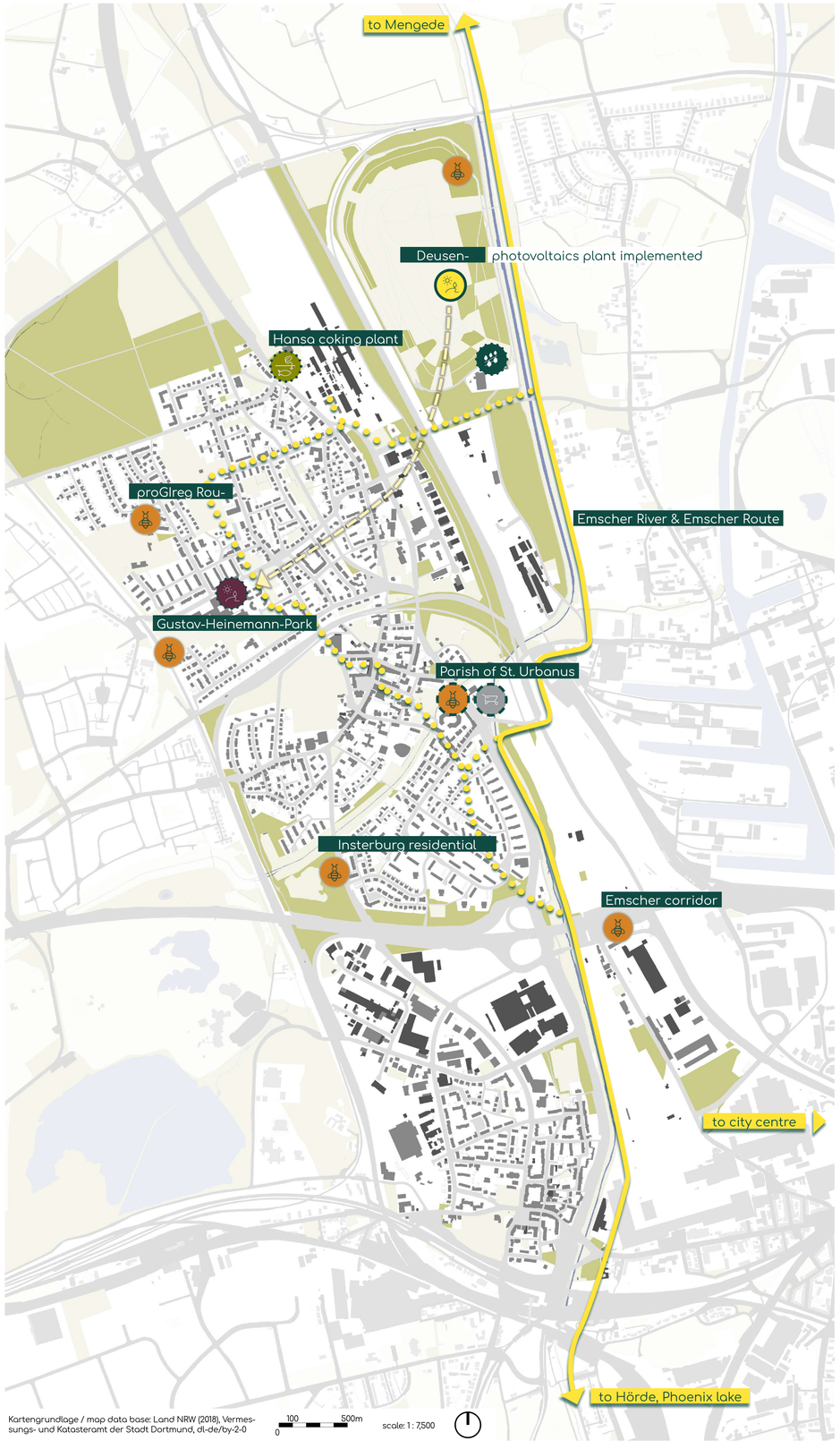
NBS 8 - Pollinator biodiversity

Location: at serveral locations in Dortmund Huckarde

Description: At the sites of the NBS 3 and NBS 4 implementations and at several locations in Huckarde, pollinator-friendly plants are planted. The selected sites connected to eventually form a biodiversity pathway.This benefits both humans (color, scent, contemplation) but also enhances the biodiversity within the area by allowing insects to migrate easily between the different patches.

Partners: South Westphalia University of Applied Science, die Urbanisten e.V.

Other stakeholders: City of Dortmund, Department of Green Spaces, N.A.B.U. (environmental association), Entsorgung Dortmund GmbH, (EDG, Waste management company and maintainer of the former landfill)



Kartengrundlage / map data base: Land NRW (2018), Vermessungs- und Katasteramt der Stadt Dortmund, dl-de/by-2-0

0 100 500m

scale: 1 : 7,500

Naturbasierte Lösungen
Nature-based solutions

NBS 1
Freizeitaktivitäten und Produktion regenerativer Energien auf ehemaligen Halden
Leisure activities and clean energy on former landfills

NBS 3
Gemeinschaftsgärten und urbane Landwirtschaft
Community-based urban farms and gardens

NBS 4
Aquaponik
Aquaponics

NBS 6
Verbesserte Zugänglichkeit von Freiflächen
Accessible green corridors

NBS 8
Biodiversität für Bestäuberinsekten
Pollinator biodiversity

Umsetzungsstand
Implementation status

- umgesetzt / in Nutzung — implemented
- in Umsetzung — in progress
- in Planung — in planning
- Idee für die Zukunft — idea for the future
- Emscherweg — Emscher Route
- proGlreg Rundweg — proGlreg Route

Legende
legend

- Gebäude Wohngebiet — Residential buildings
- Industrie-/ Gewerbenutzung — industrial or comercial use
- Grünflächen — green spaces
- Wald — forests
- Emscher — Emscher River

Productive Green Infrastructure for post-industrial urban regeneration (proGlreg)

Email: proGlreg@stadtdo.de
Website: www.proGlreg.eu

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Planerstellung
map design

lohrberg stadtlandschaftsarchitektur
Partnerschaft Freier Landschaftsarchitekten mbB

Projektpartner
project partners

Stadt Dortmund Amt für Stadterneuerung
Fachhochschule Südwestfalen University of Applied Sciences
die urbanisten
aquaponik manufaktur
CITYBOTANICALS

proGIreg

Ningbo Living Lab Implementation Plan

Deliverable 3.4 – ANNEX 2

Work package: 3

Dissemination level: PU

Lead partner: COTO

Author: Tian Ruan - FBNC

Due date: 30/06/2021

CONTENTS:

Tables

Partner organizations

No.	Name	Short name	Country
33	Ningbo Municipal Center for Forestry Science & Technology Services	FBNC	China (People's Republic of)

Abbreviations

EC: European Commission

ERDF: European Regional Development Fund

D. No: Deliverable Number

FC: Follower Cities

FRC: Front Runner Cities

GA: Grant Agreement

GI: Green Infrastructure

GIS: Geographic Information System

IP: Implementation Plan

LL: Living Lab

NBS: Nature-Based Solutions

NGO: non-governmental organization

proGIreg: productive Green Infrastructure for post-industrial urban regeneration

TRL: Technology Readiness Level

WP: Work Package

1. Introduction

1.1 Project framework

Productive Green Infrastructure for post-industrial urban regeneration (proGIreg) is developing and testing nature-based solutions (NBS) co-creatively with public authorities, civil society, researchers and businesses. Eight nature-based solutions, which will support the regeneration of urban areas affected by deindustrialization, will be deployed in Dortmund (Germany), Turin (Italy), Zagreb (Croatia) and Ningbo (China). The cities of Cascais (Portugal), Cluj-Napoca (Romania), Piraeus (Greece) and Zenica (Bosnia and Herzegovina) will receive support in developing their strategies for embedding nature-based solutions at local level through co-design processes.

1.2 ProGIreg in Ningbo

Ningbo is a sub-provincial division in northeast Zhejiang Province in the People's Republic of China which is of similar status to a prefecture-level city. In 2019, the city has a registered population of 6.085 million, and the regional gross domestic product (GDP) is 118.5 billion yuan, an increase of 6.8% over the previous year. Ningbo has an elevation of about 5 meters and belongs to the north subtropical monsoon climate.

As the city can be considered to be a typical case of rapid urbanisation in the eastern coastal region of China, it is facing many challenges concerning green and blue areas which are contaminated in quality and reduced in quantity due to the construction and spread of grey infrastructure (i.e. for transportation and buildings). As such, Ningbo has been listed as one of the pilot cities which are participating in a series of action plans launched by national and provincial governments to address soil and water challenges.

Although Zhejiang's water resources per unit area can rank fourth in China, 80% of water resources are distributed in mountainous areas, so eastern Zhejiang (including Ningbo), where the population is concentrated and the economy is developed, is a key area of water scarcity. In addition, there are four outstanding problems in Zhejiang water resources, including the large gap between supply and demand, prominent structural contradictions, serious pollution, and low effective utilization. Therefore, in 2013, the Zhejiang Provincial Party Committee proposed the introduction of the "Five Water Treatment" to transform and upgrade water management by controlling sewage, preventing flood, draining flooded fields, guaranteeing water supply and emphasizing water conservation.

Ningbo has been at the forefront of urban river management in China. It has taken the lead in adopting the PPP (public-private-partnership) management model to comprehensively harness and conserve the city's rivers. The black water bodies in urban rivers have been completely eliminated, and the river management in Ningbo has reached the stage of ecological restoration.

Due to rapid economic development, rapid population growth, and rapid industrialization and urbanization, the overall soil quality of Ningbo has shown a downward trend. In particular,

the risk of heavy metal pollution still exists, organic pollution is prominent, and the pollutants are gradually migrating to agricultural products and water bodies. Problems such as insufficient development and utilization of contaminated sites have caused serious threats to agricultural products and human health, and will affect social harmony and stability. In 2013, the Ningbo government issued a clean soil action plan to strengthen the comprehensive remediation of soil pollution sources, soil pollution monitoring and control, and pollution site remediation.
When considering that these action plans are dominated by diverse governmental agencies, however, the key question concerning local government and multiple stakeholders is how top-down plans for regeneration of the existing green and blue infrastructure associated with intensive investments can be implemented effectively at local level. There is an urgent need for the transfer of transdisciplinary research to the top-down co-actions and the city-level co-practices when implementing NBS in partnership with local communities in Ningbo.

1.3 Management activities

Compared with other FRC, Ningbo has fewer activities and only involves 3 NBS. And we only have two official partners, namely The Institute of Urban Environment, Chinese Academy of Sciences (IUE-CAS) and Forestry Bureau of Ningbo City (FBNC), but this does not affect our co-design and cooperation process.

IUE-CAS also plays a key role in Spatial analysis Co-design processes as well as to implement the LL in Ningbo. Furthermore, they are actively involved in Socio-cultural inclusiveness, Human health and wellbeing, Ecological and environmental restoration and Economic and labor market benefits, as one of the Non-European partners in China.

FBNC is actively involved in a number of other tasks relevant for the development of the LL in WP2, WP4 and WP5. Furthermore, they will also promote the results within the framework of trainings in Task 6.2 (training events) and in Task 6.3 (EdX MOOCS training module with global outreach).

The working group in Ningbo can be divided into three:
Engineering Construction, activities related to engineering construction, such as the extraction of lake bottom sediments and the cultivation of aquatic vegetation, etc., are all the responsibility of FBNC (the person in charge is Yiping Xu)

Quality monitoring, activities related to monitoring, such as soil quality monitoring, lake water quality and plankton monitoring in Living Lab, etc., are the responsibility of IUE-CSA (the person in charge is Yaoyang Xu)

Cross-sectional activity, activities related to the organization of various event meetings, the submission of materials, etc. are the responsibility of IUE-CAS (the person in charge is Tian Ruan)

Of course, some technical work is done in cooperation with some unofficial enterprises, such as Tianhe Aquatic Ecosystem Engineering Co., Ltd. to help us take soil and water samples for water quality monitoring. Ningbo Chenyu Construction Engineering Technology Co., Ltd. and Ningbo Huanhu Construction Co., Ltd. are responsible for the construction and

maintenance of LL Green Lakeshore. The Ningbo government has also given us great support in the process of environmental compensation. Therefore, our work is based on a model led by two major institutions, involving multiple enterprises and strongly supported by the government.

The responsibilities of the two main partners are clear and listed in Table 1.

Table 1- Partner and activity

Partner	Specific activities	Cross-sectional activities
The Institute of Urban Environment, Chinese Academy of Sciences (IUE-CAS)	Water quality, soil and plankton monitoring activities (WP4) Procedures for environmental compensation Co-design supporting activities with UNITO (WP2)	Spatial analysis Co-design activities
Forestry Bureau of Ningbo City (FBNC)	New soil Green lake shore	Co-design activities

We divide responsibilities according to the type of NBS, which can fully cater to the professional fields that various institutions are good at.
New soil, jointly responsible for IUE-CAS and FBNC, IUE-CAS is in charge of soil quality inspection in the early stage, FBNC is in charge of planting vegetation in the later stage
Green lake shore,mainly responsible for FBNC, design and plant aquatic plants in the lake of LL;
Environmental compensation procedures, IUE-CAS is mainly responsible for monitoring the water quality in LL to help obtain government compensation.

Table 2- Cluster/NBS/Activity table

Name of the cluster	NBS	Activities
New Soil	2.1 New regenerated soil thanks to biotic compounds for urban forestry and urban farming	Use improved sediment fertilizer for urban greening
Green lake shore	3.1Community-based urban farms and gardening on post-industrial sites	Planting aquatic plants along the shore of Moon lake
environmental compensation	7.1 Local environmental compensation processes	Environmental monitoring in Moon lake

2. Our Living Lab

2.1 Our Living Lab

The Living Lab (2.07 km^2) is the entire Moon Lake Street where the Moon lake is located. Moon Lake Street is located in the downtown area of Ningbo City, with an area of only 2.07 km^2. It has jurisdiction over 7 communities, with a population of 25,750 people and a density of 12,440 inh. / km^2. In 2017, the green area of Ningbo City was 11.89 m^2 / inh., and the green area of Moon Lake Street was about 11.5 m^2 / inh., which was lower than China 's per capita park green area of 14.01 m^2 / inh. Therefore, Ningbo's green infrastructure construction needs to be continuously strengthened.

Table 3 – Basic data

	Municipality of Ningbo	**Moon Lake Street (LL)**
Inhabitants (2017)	5,969,300	25,750
Surface area	9816 km²	2.07 km^2
Density	608 inh./ km^2	12,440 inh./ km^2
Average green area density	11.89 m^2/inh.	11.5 m^2/inh.

Based on the previously drafted SWOT analysis (see D.2.2), we found that there are weaknesses and challenges in this area as well as strengths and opportunities.

In terms of social and cultural inclusion, although the population of Moon Lake Street and its 7 communities has witnessed a decreasing trend, it is still very dense – considering that the Street also accommodates the 28-hectare park, its density of over 12,400 inhabitants / km^2 (2017) represents an important defining characteristic, and providing environmental services and NBS to ensure quality of life is a challenge which proGIreg will have to address. However, there are also many primary and secondary schools, theatres, large leisure sports venues and museums, with the Analysis Area being an attractor at district level. The area is very accessible via subway, and it is convenient to meet people's needs for education and culture.

In terms of human health and well-being, Moon Lake Park is located in the center of Moon Lake Street. It covers an area of 28 hectares, and it is a municipal conservation zone for history and culture in Ningbo. There are a large number of attractions and leisure facilities around, while the residents of 7 communities can easily enter the green space for walking and entertainment.

In terms of ecological and environmental restoration, the “Shi qing hu xi” reconstruction project on Moon Lake Street is located on the west side of the lake, north to Zhongshan Road, west along Changchun Road, east to Haoyue Street, Gongqing Road, and south to Guijing Street. The construction scale of the " Shi qing hu xi " project is about 0.2 km^2, and the buildable area represents around 0.163km^2. The Chinese-protected area is about 0.027km^2, and the historic building is 0.039km^2. However, Moon Lake Park is located in the urban area, surrounded by many old neighbourhoods, with high land prices and large transformation costs.

In terms of the economy and the labor market, Moon Lake Street is a mature tourist area with many hotels and restaurants, providing a large number of jobs for the labor force. Since the western part is mostly an attraction, the company's corporate land is mostly distributed on the east and south sides. Moon Lake Street is dominated by the service industry, and its industrial structure is relatively simple, which is vulnerable to market shocks. But nowadays, Chinese people are paying more attention to the quality of life. Tourism and leisure are very popular, which provides support for the economic growth of Moon Lake Street.

Given that Ningbo has already implemented the NBS measures for improving the water quality of the man-made Moon Lake, they are currently only being monitored. Further LL implementation will need to be contextualized within the already-performed implementation (aquatic filtering plants, fry fish, pumps for oxygenizing the water, water filter, new bamboo plantings) and to support the past and ongoing initiatives with complementary NBS 2, 3 and 7 of proGIreg.

2.2 Our Living Lab challenges and goals

Although Moon Lake Street is prosperous and full of tall buildings, there are many old residential quarters, old buildings, old streets, and old markets behind the high-rise buildings, with aging equipment and facilities and many remaining problems. Ten of the 11 residential quarters in the streets are old ones that have been built for more than 15 years. There are many problems such as aging infrastructure, insufficient modern facilities, and difficulties in coordinating group interests. In 2013, the Zhejiang Provincial Party Committee proposed the introduction of the “Five Water Treatment” to transform and upgrade water management by controlling sewage, preventing flood, draining flooded fields, guaranteeing water supply and emphasizing water conservation.

In recent years, there have been perennial outbreaks of algae in the moon lake, and some polluted water bodies with seasonal stench have appeared, which has affected the life and leisure quality of residents, and also seriously affected the image of Ningbo city and the beauty of Tianyi pavilion - the moon lake scenic area. Therefore, it is urgent to improve the water quality of the moon lake.

The goal of Living Lab:

On the lake ecological comprehensive control project within one year after the completion of the main water quality indicators will reach IV class, will reach III class[1] for two years.

Water quality purification and ecological restoration projects will continue to remove pollutants in water bodies through moderate human intervention; improve self-purification ability of water bodies through ecological technology.

Through renovation, the underwater forest and water garden of the moon lake will reflect the cultural landscape on the shore, which will beautify the environment of the Tianyi pavilion and the moon lake and strive to become a model of the park landscape and lake management, so that citizens and tourists can enjoy the scenery.

3. The NBS in Ningbo

Table 4– NBS summary template table

NBS type	**NBS Title** *(CTRL+ click to jump to each NBS)*
NBS 2: New regenerated soil thanks to biotic compounds for urban forestry and urban farming	NBS 2: Transforming lake sediment into soil fertilizer ***(cancelled)***
NBS 3: Community-based urban farms and gardens	NBS 3: Planting aquatic plants along the shore of the lake
NBS 7: Establishing protocols and procedures for environmental compensation at local level	NBS 7: Procedures for environmental compensation

[1] In China, water quality is divided into five levels from good to bad: I, II, III, IV and V. If the water quality is worse than the V class, it is called inferior V class water.

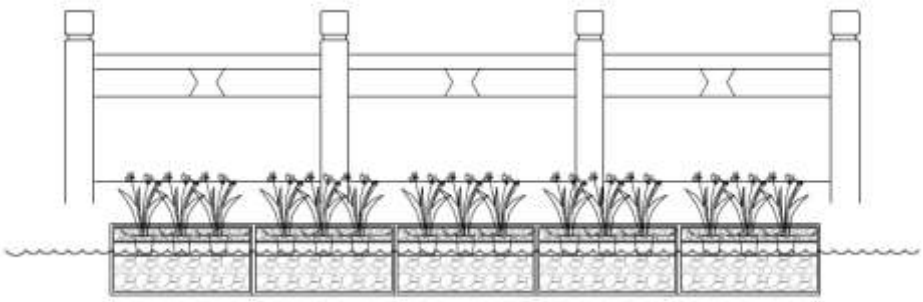
NBS 2: Transforming lake sediment into soil fertilizer

1. General information	
Compilation date and update	Final version
NBS type	New regenerated soil thanks to biotic compounds for urban forestry and urban farming
NBS title	Transforming lake sediment into soil fertilizer
Brief project synthesis	This NBS is for reusing lake bottom sediments and turning waste into treasure. At the bottom of Moon Lake in the LL area, there are many sediments such as sludge. They will release harmful substances to the water body, so the lake must be dredged. However, the lake area is huge, and more than 50,000 m^3 of sediment have been removed. Modifying these sediments into soil fertilizers for planting vegetation will greatly protect the environment and save resources.
Area of implementation	This NBS is going to be implemented in an area of 20 ha green space surrounding Moon Lake park. Address: No. 183, Xianxue Street, Haishu District, Ningbo Coordinates: 29° 52′ 09″ N, 121° 32′ 21″ E.

Target groups (beneficiaries)	The main beneficiaries of this activity are residents living around Moon Lake Park and people who come to the park for tourism.
Timing (start and end date)	Implementation phase. Start: 01/2019 End: 12/2020
Main responsible partner	The Institute of Urban Environment, Chinese Academy of Sciences (IUE-CAS)
ProGIreg partners involved	Forestry Bureau of Ningbo City (FBNC)
Other stakeholders involved	Tianhe Aquatic Ecosystem Engineering Co., Ltd. It is responsible for lake dredging. Ningbo Tianyige museum & Moon Lake Scenic Area Management Committee.
Total Budget	Total budget of the implementation: 500,000€
2. Pre-implementation activities	
Planning and preparatory activities	This project comes from the Moon Lake Water Ecological Comprehensive Improvement Project. Moon Lake is mother lake of Ningbo, and it is also a landmark and business card of Ningbo City. Moreover, in order to cooperate with Tianyi Pavilion and Moon Lake to create a national tourism 5A-level scenic spot, there is an urgent need to improve the water quality of Moon Lake and beautify Moon Lake Park to adapt it to the requirements of 5A-level scenic spots.
Administrative procedures	The funding for this project comes from 2 parts: the Ministry of Science and Technology of China and the Ningbo government.
Technical and social analysis	Before the sediment is converted into soil fertilizer, the physical and chemical properties of the soil will be analyzed first to ensure that the sediment will not cause secondary pollution to the soil.
Other activities	Laying a layer of "ecological phosphorus removal agent" on the bottom of the lake can inactivate the phosphorus activity in the water. In this way, not only does the phosphorus content of the water decrease in a cliff-like manner, but also cuts off the nutritional line of cyanobacteria.
3. Management structure and responsibilities	

Main partner (coordinator) and role/function	The Institute of Urban Environment, Chinese Academy of Sciences (IUE-CAS) Organize the transformation of Moon lake sediment into soil fertilizer.
2nd Partner and role/function	Forestry Bureau of Ningbo City (FBNC) Select plant species and use regenerated soil fertilizers for plant cultivation
3 rd Partner and role/function	Tianhe Aquatic Ecosystem Engineering Co., Ltd. Mainly carry out drainage, dredging and water storage of lakes
6. State of Play and Monitoring	
Current situation (to be updated)	Due to high levels of heavy metals in lake sediments, the activity was cancelled

NBS 3: Planting aquatic plants along the shore of the lake



1. General information	
Compilation date and update	June 2021 – Final version
NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	Planting aquatic plants along the shore of the lake
Brief project synthesis	Moon Lake is an urban lake located in the urban area, and as a tourist area, there are many hotels and restaurants nearby, and the lake water body is often polluted. The water quality of lakes needs to be purified urgently. Planting aquatic plants along the lake can beautify the environment while purifying the water quality. Aquatic plants are being used to re-nature a 5 km corridor surrounding the urban Moon lake Park.

Area of implementation	This NBS is going to be implemented in an area of 5km (about 21,641m^2, Including 1,918 m^2 of emergent plants and floating plants, and 19,723 m^2 of submerged plants) surrounding Moon lake Park. Address: No. 183, Xianxue Street, Haishu District, Ningbo Coordinates: 29° 52′ 09″ N, 121° 32′ 21″ E.
Target groups (beneficiaries)	Schools and residents near Moon lake Park, as well as citizens of Ningbo City and tourists.
Timing (start and end date)	Start: 06/2019 - End: 12/2020
Main responsible partner	Forestry Bureau of Ningbo City (FBNC)
ProGIreg partners involved	The Institute of Urban Environment, Chinese Academy of Sciences (IUE-CAS)
Other stakeholders involved	Ningbo Tianyige museum & Moon Lake Scenic Area Management Committee Work Committee of Moon Lake Street
Total Budget	Construction costs: 200,000 €
2. Pre-implementation activities	
Planning and preparatory activities	The purpose of planting aquatic plants is to purify water quality. First, you need to choose the type of aquatic plant to ensure that it does not bring the risk of biological invasion. Then it needs to go through rigorous calculations to choose the planting location and design the ecological media box.
Administrative procedures	The funding for this project comes from 2 parts: The Ministry of Science and Technology of China and the Ningbo government.
Technical and social analysis	Planted aquatic plants need to have a strong purification ability, but also need to be ornamental. The design and layout of the ecological media tank need to be carefully calculated. After being beautified, the environment of Moon Lake provides people with high-quality green space.
Other activities	Install an internal circulation system in the lake to realize the self-purification of the whole lake water every 16 days.

3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Forestry Bureau of Ningbo City (FBNC) Mainly responsible for the selection and cultivation of aquatic plants.
2nd Partner and role/function	Ningbo Yilian huimo Information Technology Co., Ltd. Responsible for the production of ecological media box mold.
3 rd Partner and role/function	Ningbo Chenyu Construction Engineering Technology Co., Ltd. Responsible for embankment repair.
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	**Co-design in planning and preparatory activities** The design of the green lake shore requires the joint participation of experts and scholars, local residents, government departments and enterprises. **Co-implementation and maintenance:** Experts from FBNC and other research institutions choose species, considering ornamental and purification capabilities and avoiding biological invasion and plant withering. It is also necessary to plan the planting of submerged plants and emergent plants. Ningbo Yilian huimo Information Technology Co., Ltd. needs to design ecological media tanks to cultivate aquatic plants. Tianhe Aquatic Ecosystem Engineering Co., Ltd needs to calculate the size, location and spacing of ecological media boxes, and is also responsible for plant maintenance and management.
Notes on major achievements/success factors/critical issues/barriers **(to be updated)** **(link to WP5)**	**Major achievements:** Large aquatic plants has been planted along the shore of Moon Lake to purify water quality and beautify the environment. Enhance the image of Tianyi Pavilion- Moon lake Scenic Spot and the charm of Ningbo City. Provide high-quality green space for surrounding residents. **Success factors:** Local policies require water treatment, the project has sufficient funds and professional staff to implement the project, and residents are eager to improve the quality of green spaces.

Current situation and next steps **(to be updated)**	We have Discussed the related scheme of the green corridor with the park manager, municipal departments, streets and citizens to solicit opinions from different stakeholders.
5. Other activities	
Synergies with other proGIreg activities	Planting aquatic plants can play a role in purifying the water body and bring benefits to the success of Ningbo NBS7- Procedures for environmental compensation activity.
Links with other external project or activity	The cultivation of aquatic plants was successfully experimented in Qinglin Bay Park in Haishu District. Drawing on the successful experience of purification and replenishment of water treatment in Hangzhou West Lake, and on this basis, it has made innovations, and proposed to improve through internal circulation purification. The main technologies include bidirectional living water and purification technology, stepped underwater forest technology and so on.
Business model (link to WP5)	Planting aquatic plants can improve the water environment, purify water quality and enhance the appreciation of Moon Lake. At the same time, the improvement of the overall environment of the Moon Lake is conducive to tourists coming to watch and play, which in turn brings social and environmental benefits, and also promotes the development of the Moon Lake and its surrounding industries.
Technology Readiness Level (TRL) **(link to WP5)**	Planting Aquatic Plants along the shore of the lake The TRL before was 7, which will be achieved through the proGIreg implementation of TRL9
Communication activity (link to WP6)	A video has been made about the progress of Ningbo Moon Lake NBS project, including the planting of aquatic plants and the introduction of plants. Next, continue to promote the NBS3 case of Moon Lake on the Internet, promote the dissemination of NBS knowledge and improve the NBS of multi-stakeholder.
6. State of Play and Monitoring	
Current situation (to be updated)	The work of NBS3's Planting aquatic plants along the shore of the lake has been completed.
Next steps **(to be updated)**	At present, it is still in the follow-up monitoring and maintenance stage. Samplings are taken once a week and drones are arranged to take photos to observe the growth situation of vegetation.

Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	China is about to enter the New Year typhoon season, typhoon will have a greater impact on aquatic plants, which is a problem we need to pay more attention to.
7. NBS maintenance and outlook	
Maintenance	There are specialized technical personnel responsible for the management and maintenance of aquatic plants.
Sustainability after project conclusion	Haishu District Government and Moon Lake Street Administrative Committee will continue to support the management and maintenance of aquatic plants.
Additional resources	

NBS 7: Procedures for environmental compensation

1. General information	
Compilation date and update	June 2021 – Final version
NBS type	Establishing protocols and procedures for environmental compensation at local level
NBS title	Procedures for environmental compensation
Brief project synthesis	This activity is based on the PPP (Public-Private Partnership) project of Moon Lake Water Ecological Comprehensive Improvement Project. PPP means that in the field of public services, the government adopts a competitive approach to select social capital with investment, operation and management capabilities. The two parties conclude a contract based on the principle of equal negotiation, and the social capital provides public services. The government pays compensation to the social capital based on the results of public services. The main content of this activity is to evaluate the comprehensive management results of Mook Lake, that is, collecting meteorological, hydrological, chemical and ecological data to monitor the environment of Mook Lake (mainly water environment). If the water quality meets the III level standard, then the government will pay all the costs of the project implementation.

	Note: According to the environmental functions and protection objectives of surface water, they were divided into five categories in order of functions. Ⅰ class is mainly used in the source water, national nature reserve; Ⅱ class is mainly suitable for centralized surface water level protection zones for domestic and drinking water, rare aquatic habitats, fish spawning grounds, larvae of larval feeding, etc.; Ⅲ class is mainly suitable for centralized surface water level protection zones for domestic and drinking water, shrimp, wintering grounds and migration channels, aquaculture, fishing areas and area; Ⅳ class is mainly suitable for general industrial water area and not direct contact with human body of recreational water area; Ⅴ class is mainly suitable for agricultural water area and the general landscape requirements waters.
Area of implementation	3 observation sites in Moon Lake Coordinates: 29° 52′ 20″ N, **121**° 32′ 06″ E. 29° 52′ 14″ N, **121**° 32′ 22″ E. 29° 51′52″ N, **121**° 32′ 15″ E.
Target groups (beneficiaries)	Residents living around Moon Lake Park and people who come to the park for tourism.
Timing (start and end date)	Water environment data collection started in June 2019, but the comprehensive evaluation is at the end of 2021.
Main responsible partner	The Institute of Urban Environment, Chinese Academy of Sciences (IUE-CAS)
ProGIreg partners involved	Forestry Bureau of Ningbo City (FBNC)
Other stakeholders involved	Tianhe Aquatic Ecosystem Engineering Co., Ltd. Haishu District Government Ningbo University
Total Budget	Total cost is 50,000 €
2. Pre-implementation activities	

Planning and preparatory activities	In order to enhance the city's image and promote the development of tourism, Haishu District has gone through long-term investigations and brewing work to do a good job of water quality, sludge, pollutant and other surveys and surveys, and formulate preliminary technical treatment plans. After listening to the opinions of experts in water control, representatives of the National People's Congress and citizens, and optimizing the technical plan for many times, it was decided to start the Moon Lake Water Ecological Comprehensive Improvement Project.
Administrative procedures	The Ministry of Science and Technology of China will support the funds for water quality monitoring, and the Ningbo government will compensate for the cost of the engineering measures.
Technical and social analysis	The selection of water environment monitoring samples, as well as the collection and testing of water samples, require professional operation.
Other activities	Many well-known scientific research institutions and universities such as Wuhan Institute of Aquatic Biology and Ningbo University will carry out scientific research on the management of Moon Lake's ecological environment and provide scientific theory and technical support for other similar types of lake management in China.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	The Institute of Urban Environment, Chinese Academy of Sciences (IUE-CAS). Organization and coordination of activities, as well as testing of collected water samples.
2nd Partner and role/function	Tianhe Aquatic Ecosystem Engineering Co., Ltd. Water samples collection.
3 rd Partner and role/function	Haishu District Government Provide advice and financial support.
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	**Co-design in planning and preparatory activities** The environmental compensation procedure requires advance payment by social capital. After the results are accepted, the government will compensate the social capital. This process requires the joint participation of enterprises, governments, and third-party supervision agencies. **Co-implementation and maintenance:**

	IUE-CAS will monitor the water environment of Moon Lake. Nearby residents will be affected by the project during the water environment treatment, but will then enjoy the high-quality green space after the water environment treatment.
Notes on major achievements/success factors/critical issues/barriers **(to be updated)** **(link to WP5)**	**Major achievements:** Introduced a new type of business model-PPP (Public-Private Partnership), which can make full use of social resources for effective project actions. **Success factors:** Before the implementation of the project, experts, officials and scholars from various parties conducted detailed discussions. This activity includes the professionalism of experts, the political considerations of officials and the wishes of residents.
Current situation and next steps **(to be updated)**	Discussions on ecological compensation issues have been conducted with relevant experts and scholars, Municipal departments, Streets, Moon Lake Management Center, and stakeholders.
5. Other activities	
Synergies with other proGIreg activities	The environmental compensation of Mook Lake is closely related to NBS3 of Ningbo, because dredging and green lake shore can better affect the water environment of Mook Lake.
Links with other external project or activity	The ecological compensation of NBS7 in Ningbo can be calculated based on the monitoring of long-term water quality data by referring to the upstream and downstream horizontal ecological implementation rules issued by Ningbo Municipal Bureau of Ecology and Environment.
Business model (link to WP5)	The implementation of the ecological compensation case of Moon Lake can provide reference for the water quality management and amount compensation of other scenic lakes, so that the compensation rules can be traced.
Technology Readiness Level (TRL) **(link to WP5)**	The previous practice of ecological compensation for scenic spots is often sporadic, and TRL is 6. TRL: 9 will be achieved through the implementation of proGIreg, which can bring the NBS idea and financing into the current and future infrastructure decision-making and investment formulation guide.
Communication activity (link to WP6)	Based on the establishment of the ecological compensation guide of Moon Lake scenic spot, the guide will be promoted and applied to the management of other scenic spots through the network and publicity.
6. State of Play and Monitoring	

Current situation (to be updated)	From January 2021 until now, we have sampled 15 times, 3 points each time, and 15 aerial shots. The planned sampling will continue until the end of 2021.
Next steps (to be updated)	At the end of the year, there will be 2.5 years of weekly water quality data and aerial photography results at each sampling time, which can also be used as the basis for park maintenance and management and used for the calculation of ecological environmental compensation results.
Notes/critical issues/barriers (to be updated) (link to WP5)	At present, the water quality of the Moon Lake has been basically stable, but it still needs time to be proved that it can be maintained for a long time.
7. NBS maintenance and outlook	
Maintenance	For the ecological compensation of NBS7 in Ningbo, automatic water quality monitoring station can be built to observe the change of water quality in real time.
Sustainability after project conclusion	After the construction of the project, the ecological compensation guide of the scenic spot, as an incentive mechanism, can effectively promote the management of the water quality of the Moon Lake, and then promote the construction of the whole scenic spot.
Additional resources	Water quality automatic monitoring station

4. Living Lab results and perspectives

4.1 Conclusions of the Implementation phase

We introduce Ningbo from the aspects of its geographical location, population, GDP (including growth rate) and climate characteristics, and introduce the GI project of Ningbo as well as some problems that need to be paid attention to at this phase.

As a relatively developed city in eastern China, Ningbo takes the lead in urban construction and greening, especially in certain policies, such as "Five Water Treatment" in Zhejiang province and the construction of urban green infrastructure.

Because of the rapid urban development, many years ago, it was at the expense of the environment. Now the government, society, urban residents and stakeholders will pay more attention to the construction of urban green infrastructure, which requires us to use scientific methods to carry out a series of urban monitoring and management. Compared with other FRCS, Ningbo has fewer NBS and only two official partners. Briefly introduce the main roles played by the two organizations in LL and the tasks.

The working group is divided into three modules, **Engineering Construction**, **Quality Monitoring** and **Cross-sectional activity**. The first module is about the extraction of lake bottom sediments and the aquatic vegetation; The second module is about soil quality monitoring, lake water Quality and Plankton monitoring in Living Lab. The third module is mainly submission of materials. Unofficial Enterprises was also introduced to the project cooperation.

- **NBS 2: Transforming lake sediment into soil fertilizer;**
- **NBS 3: Planting aquatic plants along the shore of the lake;**
- **NBS 7: Procedures for environmental compensation.**

4.2 Results obtained and criticism

As a city promoting proGIreg project, it is necessary to monitor and manage the urban greening with the joint government, residents and stakeholders. The purpose of the project is to obtain certain environmental effects through long-term supervision of the pilot area. In this implementation plan, we monitor the Ningbo pilot area – Moon Lake, and draw the following conclusions:

- Basic information about the pilot area

The location of the Living Lab and the introduction of communities, green area, population and density.

- Weaknesses and challenges in this area

Crowded streets around the Moon Lake. Many old residential quarters, old buildings, old streets, and old markets behind the high-rise buildings, with aging equipment and facilities and many remaining problems. With aging infrastructure, insufficient modern facilities, and difficulties in coordinating group interests. Some polluted water bodies with seasonal stench have appeared (see D.2.2)

- Main obstacle in this area

In terms of ecological and Environmental Restoration, since Moon Lake is located In the city center, it is difficult and costly to construct some green foundations around it. It is the main reason that restricts the further development of moon Lake green infrastructure.

Given that Ningbo has already implemented the NBS measures for improving the water quality of the man-made Moon Lake, they are currently only being monitored. Further LL implementation will need to be contextualized within the already-performed implementation (aquatic filtering plants, fry fish, pumps for oxygenizing the water, water filter, new bamboo plantings) and to support the past and ongoing initiatives with complementary NBS 2, 3 and 7 of proGIreg.

4.3 Further developments

The Zhejiang Provincial Party Committee Proposed the Introduction of the "Five Water Treatment" to transform and upgrade the Water Management by friendly interest, preventing flood, draining flooded fields, guaranteeing water supply and emphasizing water conservation. The move will have important effect to moon lake water quality in the future, to improve the moon lake water quality, improve the comfortable degree of residents and life experience.

Water quality: On the lake ecological comprehensive control project within one year after the completion of the main water quality indicators will reach IV class, will reach III class for two years. Water quality purification and ecological restoration projects will continue to remove pollutants in water bodies through moderate human intervention; improve self-purification ability of water bodies through ecological technology.

Overall environment: Through renovation, the underwater forest and water garden of the moon lake will reflect the cultural landscape on the shore, which will beautify the environment of the Tianyi pavilion and the moon lake, and strive to become a model of the park landscape and lake management, so that citizens and tourists can enjoy the scenery.

4. Annex 1: Ningbo Living Lab Map

proGIreg

Turin Living Lab Implementation Plan

Deliverable 3.4 – ANNEX 3

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Author: Riccardo Saraco – Turin

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Partner organizations

No.	Name	Short name	Country
3	City of Turin	COTO	Italy
23	Politecnico di Torino	POLITO	Italy
31	Orti Alti	OA	Italy
11	Fondazione della comunità di Mirafiori Onlus	MIRAFIORI	Italy
15	Dual SRL	DUAL	Italy
18	Parco scientifico e tecnologico per l'ambiente - Environment Park SpA	ENVIPARK	Italy
22	Università degli Studi di Torino	UNITO	Italy

Abbreviations

EC: European Commission

ERDF: European Regional Development Fund

D. No: Deliverable Number

FC: Follower Cities

FRC: Front Runner Cities

GA: Grant Agreement

GI: Green Infrastructure

GIS: Geographic Information System

IP: Implementation Plan

LL: Living Lab

NBS: Nature-Based Solutions

NGO: Non-Governmental Organization

ProGIreg: Productive Green Infrastructure for post-industrial urban Regeneration

TRL: Technology Readiness Level

WP: Work Package

1. NBS implementation in Turin

This document is a living and working document that will produce, at the end of the implementation phase, a comprehensive description about the Living Lab and NBS implemented in our City. The first release of the IP is June 2020. Attached to this document a Living Lab Map will graphically display a summary of the information of each NBS.

1.1 Project Framework

ProGIreg is funded by the European Commission under the Horizon 2020 programme and its name stands for “Productive Green Infrastructure for post-industrial urban Regeneration”. It aims to demonstrate the benefits of nature based solutions (NBS) applied into business models in post-industrial cities. In fact, post-industrial sites present several weaknesses and deficiencies from the social, economic and environmental point of view that must be addressed in order to guarantee better and more sustainable life conditions for the inhabitants. Lack of social bounds, poverty, forms of social exclusion and social deprivation, polluted and/or abandoned buildings and lands, uncertainty, unemployment and economic stagnation are some of the main features. These patterns can be observed in many cities that have undergone serious changes over the past years due to the de-industrialization process, and that have found themselves with huge gaps and inequalities among their own districts.

Through the implementation of green infrastructures (GI), proGIreg intends to promote self-sustaining business models that can boost and regenerate these areas. The cooperation of public actors, civil societies, academies and industry/SMEs (the so-called “quadruple helix approach”) is fundamental to build shared practices and ensure continuity over time. Innovation will take place of three levels: on a technical level through the deployment and improvement of the NBS; on the social level through co-designing, co-creating and co-implementing GI in partnership with local communities; on the economic level, as NBS can highlight new market opportunities for the green economy development that can be used in the private sector, social entrepreneurship and public actions.

1.2 ProGIreg in Turin

Located in the North-West Italy, Turin is the Piedmont's capital and is one of the biggest and most economically attractive Italian cities. It has an average elevation of 250 m upon the sea level and can benefit from a mild temperate climate (Köppen and Geiger classification). It has a GDP of 55 billion euros (which is 4,5% of the national GDP), 130 km^2 extension and about 884.733 inhabitants (2018).

Turin is characterized by the typical features of a post-industrial city which have turned from an (almost) exclusively industrial centre to an innovative city based on culture and services. Because of this shift some areas, which were the core plants of the local industrial manufacturing, have been emptied and they are now disused or abandoned.

The City began working specifically on these areas from the 1990s through regeneration plans and programmes. These efforts, financed also by European programmes and funds, have

mitigated the negative impacts of severe deindustrialization processes but the aftermath of the industrial heritage seems to have left a gap which has not yet been filled by the growth of other sectors (Belligni and Ravazzi 2012) and the attempt to focus on tourism and research has cut out of development plans many of Turin's suburbs.

Moreover, Turin is not immune to structural weaknesses. For instance, both the progressive ageing of the population (the percentage of people over 65 years old is constantly rising since 2007: from 23,7% in 2007 to 25,6% in 2017)[1] and the downward population trend are accompanied by an increased urban poverty rate and a weak economic development perspective (which is, as already mentioned, particularly severe in neighborhood with socio-economic difficulties).
In addition, due to its own orographic features, the high level of private mobility and the spread of old heating systems, Turin is one of the most air polluted cities in Italy. This led the City to exceed the limit of 50 µg/m3 more of the legal constraint established in 40 times a year (Forni et al. 2019)[2].
This dynamic is accompanied by the dysfunctions of public transport as well as the unequal distribution of urban green spaces, which generally penalizes the suburbs compared to central areas.
This lack of connection between the LL and the city centre is a main topic that has to be addressed in order to reduce the isolation perceived by residents living in post-industrial areas.

ProGireg represents an opportunity for tackling these problems in a way that ensures environmental sustainability, improves living conditions and provides economic benefits both to citizens and entrepreneurs. Although its focus is on a specific district, the entire city will benefit from it.

Finally proGIreg should be able to represent a worth model which could be replicated by professionals and administrators interested in applying NBS in regeneration projects. This aspect requires **a recognized and agile management structure to ensure effective communication, optimal collaboration among actors and a common and shared narrative of the process and of the results to be effectively disseminated.**

1.3 Living lab management activities

One of the main proGIreg's pillars is cooperation between all of the involved partners throughout the project. In Turin, this principle has been applied from the beginning of the planning activities. This subchapter retraces the process of management that has lead to the co-design and co-implementation of the NBS will be displayed. This collaborative process has evolved to adapt to the necessities emerged during the ongoing works and all the partners have been involved into the definition of a common strategy. All the stakeholders have had a central role in the definition of each activity, its placement and the definition of its beneficiaries

[1] Data is taken from the Annual Observatory of the Municipality of Turin (2017). link
[2] https://rsa.tandfonline.com/doi/abs/10.1080/23748834.2019.1596045?scroll=top&needAccess=true&journalCode=rcah20#.XoRYamQzY6U

and, most importantly, for highlighting the real possibilities given by the Living Lab, acting as real co-creators. The result is a interconnected system that defines each partner's role and responsibilities and provides guidance for each NBS implementation.

Working groups and clusters

The most distinctive feature of our Living Lab (also comparing with the other FRC) is the high number of projects (or actions) to be implemented under the frame of the 7 proGIreg NBS in which Turin is committed (see chapter 3). This variety of interventions has led to the involvement of a large number of local stakeholders, beyond the official partners of proGIreg. Some of them, such us the Municipality, University and Politecnico have been based on huge and articulated. For example, in the only Municipality of Turin have been directly involved in the activities almost 30 colleagues of 12 departments (mostly technical) as well as 100 of public and private partners enrolled in the local mailing list. Thus, there was a strong need of coordination and operative management of this big group of people.

After a plenary meeting which involved all the stakeholders, **three main groups** (also called "tables") have been created with the purpose of managing all the planning activities within proGIreg properly. For each group, a specific partner had been put in charge of the table activities:

- the first table was named **"new soil"**, as NBS2 (*New regenerated soil thanks to biotic compounds for urban forestry and urban farming*) is the core project in Turin (Envipark was responsible for it);
- the second is the "**widespread green"** table (tavolo "verde diffuso"), in which all the activities related to all the other NBS have been included (Orti Alti was the supervisor);
- the last one is the "**cross-sectional activities**" table (tavolo "attività trasversali"), in which various activities related to different fields of work and research have been included (Fondazione Mirafiori is the supervisor).

The participants of these three tables have met separately, according to the division mentioned, to carry on the co-design phases and to define each own's area of competence.

Consequently, a "**core team**" ("cabina di regia") had been created to guarantee a shared planning process among local partners. City of Turin (European Funds and Innovation Services) acted as coordinator and leading subject. The core team was used as coordination and exchange board to manage Turin Living Lab along all the implementation phases: according to a "variable geometry" principle local partners are invited to each meeting on the basis of the needs and of the issues to be discussed.

In addition to this, other meetings and events have been organized to boost cooperation among parts and manage all the different activities carried out: for example, inspections of the places in which NBS were meant to be implemented (on summer, 2018); workshops that lead to the SWOT analysis drafting (autumn, 2018); ICLEI workshops about co-design processes.

Partners and functions

After this first period and considering what has been done within the core team, a clear division of roles and tasks emerged, as shown in the following table:

Table 1 - Partners and activities

Partner	Specific activities	Cross-sectional activities
Comune di Torino (COTO)	Green walls/ Aquaponics ICT tools Green Corridors	WP3 coordination activities
Politecnico di Torino (POLITO)	Systemic design External communication with ICLEI (WP6) Co-design supporting activities with UNITO (WP2)	Synergies between NBS (fil rouge) Engagement of marginalized groups Green walls co-design activities Analysis of urban and suburban features of productive NBS Spatial analysis
Università degli Studi di Torino (UNITO)	Monitoring activities with CRN (WP4) Socio-economic analysis ricerca azione (WP2) Scientific contributions on specific NBS (new soil)	Codesign activities (with POLITO) Policy, project executive board
Fondazione Mirafiori (MIRAFIORI)	Gardens in boxes implemented in schools and social housing buildings Educational activities concerning sustainable agriculture	Communication activities addressed to local citizens Synergies between proGIreg and other local actions
Orti Alti (OA)	Pollinator garden Green roofs	Spatial analysis Co-design activities
Parco scientifico e tecnologico per l'ambiente - Environment Park SPA (ENVIPARK)	New soil Training courses on: -new soil -innovative agriculture systems	Role in WP5 drafting for reducing market barriers
Dual s.r.l. (DUAL)	New soil	

Partners have been involved according to their field of expertise. For instance, both University of Turin and the Politecnico carried on research activities such as monitoring, sampling, testing solutions and/or other important stages of the process. On the other side, NGOs' presence was necessary in order to involve citizens and foster proGIreg's issues thanks to the trust given to them by residents. As shown in the table, all the four main parts described by the quadruple helix approach theory have been included: local institutions (COTO), academies (UNITO and POLITO), industries (DUAL and EVIPARK), and the civil society (OrtiAlti, Fondazione Mirafiori).

As it emerges from table 1, cooperation principles have been applied to integrate and create synergies among Work Packages (WP) and NBS, as proGIreg requires. Links among different activities are extremely tight and a lack of coordination and collaboration could possibly damage different actions at the same time. Hence, the goal is to work on the Living Lab in an harmonious way taking into the account all the needs of each activity without losing sight of the greater picture

From the first ICLEI workshop emerged the necessity of splitting NBS in a different way. In Turin, 7 out of 8 nature based solutions have been planned to be tested, and different activities have been planned within almost each NBS. In order to manage appropriately all these activities, and given that some solutions are tightly linked together because of their nature or because of same actors are involved, six clusters have been created [table 2]. This further division is expected to facilitate problem solving and the implementation process.

Table 2 - Cluster/NBS Activity

Name of the cluster	NBS Activities
New Soil	2.1 New Soil production by Sangone Park
Social Gardening	3.1 Mirafiori Castle's ruins recovery and new planting
	3.2 Gardens in Cascina Piemonte (Orti Generali)
	3.3 Pollinator friendly garden at WOW
	3.7Gardens around the houses
	8.1 Butterfly gardens in school and for disadvantaged people
Green in building	4.1 Aquaponic test system
	5.1 New green roof at Casa nel Parco
	5.2 Green wall in a school
	5.3 Green wall on a homeless dormitory
	5.4 New green roof at WOW
Education community	3.4 School garden in box
	3.5 Micro vegetable garden in schools
	3.6 Community school garden
Green Corridors	6.1 Green corridor
	6.2 Local natural heritage enhancement in green corridor
ICT Tools	7.1 Tools for nvironmental compensation processes

In order to guarantee a good management of all these activities, three figures have been identified for each cluster:

- a spokesperson (a external representative of the City of Turin responsible for monitoring the timeline and for calling table meetings),
- an internal facilitator (an employee of the City of Turin that has the task of facilitating administrative procedures)
- and a delegate of the Turin Smart City Office (responsible for the coordination of the cluster with regards to other groups and with the project in its entirety)

1.4 Communication strategy and plan

Turin planned to realize various activities, in the perspective to foster diffused benefits along the area of intervention: Mirafiori Sud District. Thus, our LL will be co-design and co-implemented by multiple actors, each of them with different skills, experiences and backgrounds. So there was a need since the beginning to find a common narrative of the proGIreg activities based in Mirafiori Sud. This shared picture has to be built together with all local actors. So, Turin decided to have a dedicated and experienced human resource that helps us in defining a communication plan and strategy and then coordinate the communication and dissemination activities for the LL.
The general objective of our communication plan is to effectively disseminate the results of the project to maximize their impact. Starting from the 7 specific objectives (Update; Communicate; Create global awareness on nature-based solutions (NBS); Promote networking; Exploit recommendations and learnings; Disseminate; Monitor and coordinate dissemination events) identified by ICLEI (WP6 activities) a set of coordinated communication objectives and modalities were structured with this scheme:
1. Make the project known > produce news
2. Show partner network, > share news
3. Promote Living Lab participation > before the event
4. Measuring participation in Living Labs > after event

Specific attention was devoted to the social media. A Digital Editorial Plan (PED) has been created and shared with partners in order to:

- create replicable documentation of the communication process
- to find out when a partner edits news and be able to share it

Moreover a press office was established and a first screen of traditional and new media (social) channels was done. The communication plan set general rules and specific modalities to communicate proGIreg activities and schedule periodic news.

A second contribution aimed at communicate proGIreg activities and results extensively and by using the information technology tool is a digital map produced by Links Foundation (third party of POLITO). This map will show graphically and dynamically the progress of the intervention by summarizing and localizing each NBS implemented. The map can be found here: *http://www.urbantoolbox.it/project/progireg.*

2. Our Living Lab

2.1 Our Living Lab

The implementation area which hosts the NBS is Mirafiori Sud District. This neighborhood of 1.149 inhabitants is placed in the southern edge of the City's borders, traced by the Sangone river.

Mirafiori Sud is a post-industrial district that has had a remarkable growth during the 50s-60s thanks to the car industry (especially FCA). As Mirafiori Sud is a peripheral urban area (a suburb), it is characterized by a poor quality of the urban environment (green and grey infrastructures) and social issues such as social segregation, poverty and security problems. The District/LL area has a population of 34.659 inhabitants and a surface of 11.491 km², with a density of 3.016 *inh./* km².However, Mirafiori can rely on direct accesses to green area, which are more extensive and widespread than the City average (as shown in the following table).

Table 3 - Turin and Mirafiori Sud District data

	City of Turin	**Mirafiori Sud district (LL)**
Inhabitants (2017)	884.733	34.659
Surface area	12.999 km²	11.491 km²
Density	6.805,690 inh./ km²	3.016 inh./ km²
Average green area density	55 inh./ m²	91 inh./ m²

This district presents several weaknesses as well as great opportunities and important assets that could play a pivotal role for the successful implementation of several NBS. According to the SWOT Analysis previously drafted (see D.2.2), the main features of our LL have been divided into:

- socio-cultural inclusion
- human health and wellbeing
- ecological and environmental situation
- economy and labour market

For what concerns the first dimension of analysis (the “socio-cultural inclusion”), Mirafiori Sud district is characterized both by strong community bounds and worrisome dynamics that threats this social cohesion. On the one hand, the presence of community foundations and citizens' associations have helped to avoid a further degradation of the social fabric at local level. On the other hand, the low population density and the huge amount of empty spaces left by the industrial downturn affects interactions, communications and connections among citizens, companies and associations. At the meantime, decrease of generalized participation to social, religious and otherwise community events and gatherings have been noticed, as

well as forms of relational isolation and loneliness, especially among elderly people[3]. The growing presence of monoparental families, which may necessitate of greater attention.

Regarding "human health and wellness" dimension, despite the large presence of green areas, a higher incidence of different diseases has been detected (compared to the city level): in particular a higher incidence of cardio and respiratory diseases, chronic and mental stress. Additionally, there is a relevant presence of alone elderly with psychic discomfort. Also, even though this area benefits from great green spaces, these aren't homogeneously distributed: a shortage of parks has been highlighted in the Western part of this district.
Lastly Sangone river itself is perceived as a no-go-area and is currently underused by Mirafiori's dwellers.

With regards to the "ecological and environmental situation", this area presents good pathways connecting green areas and houses which has a positive impact on reducing both air pollution (walking spaces help to avoid traffic congestions) and overheating phenomena during hot seasons. However, many problems have to be tackled during the implementation phase: for instance, the chemical soil composition turns out to be polluted due to industrial waste and fuels used in the whole XX century. Air quality has proven to be still dramatically poor (see the "human health and wellbeing section") and the presence of several abusive gardens in the district increases the sense of degradation and pollution (i.e. garbage).

From the economic point of view, this area has been affected by the crisis of 2008 which has had a deep impact in the construction and industry sectors. Today, Mirafiori Sud district is experiencing a severe youth unemployment rate (over 50%) and is also characterized by a generally low education level and a low number of local businesses. Also, labor force is mainly employed in the service sector, and both the low real estate values and the large availability of empty accommodations could become a pull factor for new citizens.

Among the strategic assets that have been considered to propose proGIreg in Mirafiori, there is the presence of meaningful research and industrial hubs such as Politecnico Design Office and FCA's headquarter. Innovative companies in the Ex-Iveco area represent a great chance to address sustainability issues. Industrial brownfields, flat roofs and residual urban spaces are pivotal elements to enhance sustainability. At the city level, some projects oriented towards green spaces recovery and economic plans have been already put into practice: for example, TNE (Torino Nuova Economia - Turin New Economy) and the "Corona Verde" program, which aims to connect the peripheral parks, and developing the shores of the Sangone River. Finally, thanks to european and local projects (Cocity / Regulation of common goods) some innovative processes of citizen involvement in the management of commons took place in recent years, producing relevant social benefits and improving the care and the quality of public green spaces (flowerbed, green traffic island).

Starting from this context, proGIreg will represent an effective opportunity to regenerate and recover the district. In order to have meaningful and long-term impact, the vast majority of NBS

[3] In 2017 the average age among residents of Mirafiori Sud district is 48 years old, it represents the higher score among all district and, consequently, is slightly higher that the average age of all citizens of Turin (46 years old). Source: Annual Observatory of the Municipality of Turin (2017). link

(7 out of 8) will be tested in our Living Lab according with the features and needs of each selected site.
From this point of view those parks extended in the southern part of the district present a good ecological potential that can be a good asset for testing NBS2 (new soil regeneration) in Sangone Park. Moreover, the current network of cycle paths could represent the starting point for NBS6 (green corridors): thanks to the implementation of this specific NBS (NBS 6.1), the lack of path connecting different areas of the district can be tackled, promoting a healthier lifestyle among inhabitants at the same time. Within NBS6, an enhancement of natural heritage sites (NBS 6.2) has been planned in order to achieve a better biodiversity development, which is strongly linked to pollinator activities (NBS8) and may promote a greater use of outdoor spaces.

The presence of a strong third sector which is already oriented toward increasing socialization, social cohesion and environmental issues is pivotal for the success of this project as well. Some of the association and networks that are providing us support are OrtiAlti, Mirafiori Chlorophyll Project and Mirafiori Social Green Project. Thanks to their contribution proGIreg can have a real and useful impact at the local level, since each NBS can be better integrated and adapted to the real conditions and needs of the residents. Specifically, these associations have collaborated especially for the implementation of NBS3 (Community-based urban farms and gardening on post-industrial sites) and NBS8 (pollinator biodiversity). These NBSs will be implemented by considering and directly involving the gardening community built by OrtiAlti to enhance the local knowledge.
More specifically, seven activities have been planned within NBS3: the first activity (NBS 3.1) aims to recover Mirafiori Castle's ruins, an old castle symbol of the district that has endured great degradation over time; the second one wants to test new social garden activities, especially vegetable gardens (NBS 3.2); some of them are linked with the education system, promoting social gardening in schools (NBS3.4/ NBS3.5/ NBS3.6); one activity is linked to the creation of pollinator friendly gardens (NBS 3.3) which is tied directly to NBS 8; and the last one (NBS 3.7) promotes social gardening among buildings.

If empty industrial spaces usually cause further degradation, they can also potentially become social spaces that provide services to the community, especially throughout NBS4 (Aquaponics as soil-less agriculture for polluted sites**)** and NBS5 (Capillary GI on walls and roofs). Aquaponic represent a great resource for the labor market (green jobs) and may provide supplies for the most vulnerable part of the population (Casa nel Parco is a "borough house" that helps those citizens who are more in needs also through a free canteen), as well as promoting more sustainable ways of fish farming and planting. More specifically, with NBS5 there is the chance to convert abandoned spaces into community gardens, as well as testing green walls solutions. This NBS has been divided into four different activities that concern a green roof in Casa nel Parco (NBS 5.1), an indoor green wall in a school (NBS 5.2), an outdoor wall in a dormitory for homeless people (NBS 5.3) and an empty public building (NBS 5.4).

Eventually, NBS7 aims to promote local environmental compensation processes. This aim will be implemented through awareness-raising activities related to environmental issues at school level, especially with regards to the realization of a planting intervention of trees in a school yard.

By adopting these activities, proGIreg aims to enhance the quality of life of all residents with regard to different dimensions. The main (and direct) beneficiaries of this project are pupils that attend school in Mirafiori Sud, local urban farmers and some marginalized group (homeless, people who are living in disadvantaged situation and people with disabilities), .

2.2 Our Living Lab challenges and goals

The purpose of proGIreg implementation in Turin is to address the social, economic and urban problems mentioned above by testing specific NBS by adopting the LL methodology. Through specific measures, activities and tools, this district will be regenerated, and abandoned or underused areas will be accessible again. Furthermore, the safety of these places will be improved and green economy will be supported and boosted. More specifically, the activities carried out in the LL are supposed to have a positive outcome in terms of education (in local schools), inclusion of disadvantaged social groups (social housing inhabitants; people with disabilities), reinforcement of social links, support of new entrepreneurship and new green jobs, and establishment of a common good regulations to apply on NBS. Likewise, residents' mental and physical health are supposed to improve as well.

This district has faced significant changes and presents weaknesses linked to its status of post-industrial area: air and - possibly - soil pollution that has a negative impact on residents' health, progressive displacement of services, weakening of social bonds, unemployment, the presence of abandoned buildings and a sense of insecurity largely perceived among the inhabitants are some of the major problems emerged during the analysis of Mirafiori Sud district.

Some of the weaknesses and necessities which came up in the SWOT analysis could be turned into opportunities and strategic starting points for the implementation of several NBS: already-existing cycle paths can be enlarged, empty buildings can be turned into green infrastructures, brownfields can be turned into community gardens, etc.

At the same time, many points of criticism must be addressed. Our Living Lab presents many tough challenges which might affect the effectiveness of the whole project. During the co-design process, round tables and meeting have been organized with local partners in order to have a deeper understanding of those risks that may occur at different stages of the process. Above all, the most likely risks mentioned during these meetings were: delays due to administrative procedures or construction problems, insufficient budget for the realization of the project, lack of interest by residents, weak recognition of benefits produced by the NBS by the direct beneficiaries, and lack of perspective beyond the end of the project (2023).

More specifically, delays might be because many activities are carried out on public land or in public buildings and properties (schools, the Mirafiori Castle, the public building generally called "WOW") by private groups or associations: in these cases, administrative procedures can take more time than expected. Funds provided by Horizon 2020 happened to be insufficient for the realization of all activities planned in our LL, but other sources for financing the project have been found elsewhere (see the official Proposal). Nevertheless, additional financing problems can emerge at any time due to the extent and complexity of the project itself.

Although a large number of partners involved could cause further complications, as cooperation is more demanding and complex, it can increase reliability by involving experts from different scientific fields. Each partner provides sound knowledge according to its abilities and area of competence, considering that none of them could own a comprehensive knowledge of all the aspects faced by proGIreg. Then, building a common knowledge around NBS and their implementation is a major goal too.

Finally, the relationship between institutions and citizens needs to be strengthened and processes of ownership should be activated to make residents and direct beneficiaries more concerned about the success of proGIreg and its possible further development after 2023. In order to achieve this goal, the construction of a common identity in the neighborhood is a fundamental step. Through the realization of a “Mirafiori Sud brand” that includes the activities and values carried out by proGIreg, citizens will perceive themselves as part of a community and easily identify themselves with proGIreg. Promotion and communication activities are pivotal elements for what concerns this purpose.

From the City's perspective, our team is working to build a strong connection between partners, residents and institutions that might last in time in order to guarantee the continuity of the project and give birth to good practices that can be repeated in other parts of Turin and in other cities as well: in fact, a second Living Lab in the northern part of Turin is currently under study.

3. The NBS in Turin

The following table displays all the NBS implemented or to be implemented in Turin. As mentioned, due to the nature of living and working document, some information are missing because not available yet.

Table 4 - NBS summary table

NBS type	NBS Title (CTRL+ click to jump to each action)
NBS 2: Regenerating soil	2.1: New soil production in Sangone Park
NBS 3: Community-based urban farms and gardening on	3.1: Mirafiori Castle's ruins recovery and new planting
	Errore. L'origine riferimento non è stata trovata.
	3.3: Pollinator friendly gardens (WOW)
	3. 4: Didactic gardens in schools
	3.5: Micro vegetable gardens (OrtoMobile)
	3.6: Community school gardens
	3.7: Gardens around the houses
NBS 4: Aquaponics	4.1: Aquaponics test system
NBS 5: Green on walls and roofs	**Errore. L'origine riferimento non è stata trovata.**
	Errore. L'origine riferimento non è stata trovata.
	Errore. L'origine riferimento non è stata trovata.
	Errore. L'origine riferimento non è stata trovata.
NBS 6: Accessible green corridors	6.1: Green corridor
	6.2: Local natural heritage enhancement in green corridor

NBS 7: Local environmental compensation processes	**Errore. L'origine riferimento non è stata trovata.**
NBS 8.1: Pollinator biodiversity	8.1 Butterfly gardens for disadvantaged people

2.1: New soil production in Sangone Park

1. General information	
NBS type	New regenerated soil thanks to biotic compounds for urban forestry and urban farming
NBS title	New soil production by Sangone Park
Brief project synthesis	The experimentation consists in the creation of an area of "urban forest" along the banks of the Sangone river through the use of regenerated soil (New Soil), based on excavated material with the addition of compost from FORSU, zeolites and innovative biostimulants. The composition of the New Soil has been defined with the main scope of minimize maintenance needs. The composition is: - soil from deep excavation from works in the city as the main ingredient - compost from OFMSW for organic matter and nutrients addition (10%) - zeolites in the surface layer for the purpose of decreasing the density of the material and with an adsorbent function to retain water - *Mycorrizae* as bio-stimulants to improve nutrient uptake and resilience of plants. Plants of different species were planted in the New Soil area and in the adjacent area as a control. UNITO will perform plant growth analysis in order to monitor the effect of new soil on vegetation. Chemical characterizations of the soil from excavation before and after the mixing with the other ingredients have been done in order to verify the compliance with law prescriptions and to proceed with the authorization procedures.
Area of implementation	2000 m^2 in Sangone Park. GPS coordinates (of a central point): 45.009040 N, 7.641200 E
Target groups (beneficiaries)	Green department technicians of the City of Turin

	Citizens Quarry managers Compost producers Legislators
Timing (start and end date)	December 2019 - February 2020
Main responsible partner	Envipark (coordination)
ProGIreg partners involved	Dual Srl UNITO ACEA (TLP of Envipark) CCS (subcontracting of Envipark) City of Turin Arpa Piemonte (TLP of City of Turin) Città Metropolitana di Torino (TLP of City of Turin)
Other stakeholders involved	Private gardeners of adjacent municipal gardens Representatives of groups of citizens
Total Budget	Dual Srl (major part of funds): 124.000 € Arpa: 17.000 € Città Metropolitana di Torino: 9.000 € UNITO: 37.300 € Envipark: 55.00 0€ Acea: 54.500 € CCS Aosta: 20.000 € Total budget: 278.000 €
2. Pre-implementation activities	

Planning and preparatory activities	The planning activity started in 2016 with the first proposal step. The City of Turin (green department) had the problem to find soil to build new parks in Turin, without taking the soil from agricultural areas. Dual srl had the problem to reuse soil from deep excavation in Turin. They had experimented, in some construction sites of the city, the mix with compost. Envipark proposed to use ACEA compost and also the biotic compound produced by CCS Aosta, to improve this solution, and to add zeolites for capacity to retain water and for lower the material weight (as superficial layer on ground application and in the whole mixing for roofs applications). Arpa and Città Metropolitana were involved to overcome some administrative limitations about the use of soil from deep excavation. UNITO was involved to monitor the soil by the chemical and botanical points of view.
Administrative procedures	● Experimentation Agreement (between City and Dual to do works on public land) ● Safety documentation: - Single Document for the Assessment of Interference Risks (DUVRI) - Security and coordination report
Technical and social analysis	Analysis of the basic components of the new soil: - Preliminary evaluation of main physico-chemical parameters and characterization of microbial consortia of soil already present on site. - Compost: chemical and microbiological composition, contribution to organic load and to fertilization - Inert carrier sieved (provided by the Dual srl); Analysis of the characterization provided by the company and contribution to the definition of the composition to be used for the implementation of the area to be planted - Micorrizae: provided by CCS Aosta. Definition of the best consortia to be applied in the soil depending on the basic composition of soil, the selected plants and the autochthonous microbial composition of the soil. Contribution to the definition and the formulation and production of the best consortia to be applied in the test site of the project. Evaluation of the effects on plants growing, environmental strength and chemical composition in relation to the Mycorrhizae consortia application. - Implementation of a test site monitoring of the new soil effects on green site and environmental development Several epidemiological studies show that fruits, vegetables and cereals can play a nutraceutical role for their content of many antioxidant phytochemicals such as carotenoids, ascorbic acid and polyphenols or phenolics derivatives. A commercial inoculant (MICOSAT F®) containing arbuscular mycorrhizal fungi (AMF) could improve the

	nutritional value in crops. The goal of this work was to evaluate the effect of AMF on the level of carotenoids production, phenols, anthocyanins and saponins, proteins, total antioxidant activity and nitrates content in fruits, vegetables, legumes and durum wheat var. grecale, whose consumption is largely recommended according to Mediterranean diet. The treatment increased the antioxidant activity in strawberries (37.50%), in giant lentils (29.17%) and in durum wheat (63.63%) but decreased it in kiwi (31.81%) and in grape (19.81%). Nitrate levels decreased significantly in strawberries (39.78%) and in tomato intended for transformation (37.79%). The application of MICOSAT F® enhanced the levels of several secondary metabolites. However, the number of phytochemicals and respective by-products were reduced in some cases. Environmental conditions and modality of AMF inoculation could module both primary and secondary metabolites. AMF symbiosis is an efficient strategy to improve nutritional value of crops. In this study we evaluated the potential of MICOSAT F®. The application of this new commercial product enhanced the levels of several secondary metabolites analyzed in foodstuffs. However, the number of phytochemicals and respective by-products were reduced in some cases.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Envipark (coordination)
2nd Partner and role/function	Dual Srl (major part of funds: realization of the construction site)
3 rd Partner and role/function	UNITO (monitoring activity)
4 th Partner and role/function	ACEA (TLP of Envipark, they provide compost)
5 th Partner and role/function	CCS (subcontracting of Envipark, they provide micosat: the biotic compound)
6 th Partner and role/function	City of Turin (coordination of administrative procedure)

7 th Partner and role/function	Arpa Piemonte (TLP of City of Turin, help in administrative barriers)
8 th Partner and role/function	Città Metropolitana di Torino (TLP of City of Turin, help in administrative barriers)
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation	A social involvement of local population has been done in order to increase awareness about the experimental site developments and aims. This involvement was done through the organization of opportunities to meet with the neighborhood committees and with the owners of the urban gardens located in the Mirafiori area. During these meetings, dialogue was created with the representatives of local citizenship and a brief training was carried out on the actions envisaged in the project and on the new soil. Local government and research center are already actively involved in the project as partners (POLITO, UNITO, City of Turin, Arpa Piemonte (TLP of City of Turin), Città Metropolitana di Torino (TLP of City of Turin). The Mirafiori district of Turin involved in the implementation of the experimental area of the new soil has partially complex social characteristics. The active involvement of the citizen in the project activities is essential to make the installations 'alive and useful' and to avoid acts of vandalism. In the case of the NEW SOIL experimental park, citizenship was informed and involved through the involvement of the neighbourhood committees and their representatives. Moreover, proposing a dedicated meeting with explanations on the function of the new soil with insights on the theme of *Mycorrizae* was organized for the tenants of the urban gardens adjacent to the experimental planting area. In addition, a permanent information panel in Italian and English is present on the area (public park). Processes behind the design and implementation of NEW SOIL has provided for the organization of a technical table dedicated to the realization which met on a periodic basis to decide how to formulate the new soil recipe, analyses the regulations related to the formulation of the request to the authorization bodies and carry out all the chemical analysis to decision support. These meetings involved representatives from both companies and research centres and from authorization bodies depending on the topics covered.

Notes on major achievements/success factors/critical issues/barriers related to the engagement process ***(to be updated)***	*As for stakeholders' involvements please see the description above.* The major success factor of this implementation was the overcoming of the authorization barriers linked to the use of a by-product
Current situation and next steps ***(to be updated)***	*Currently the new soil has been placed in the area of interest, the plants and the grass have been planted in the new soil area and in the neighboring control area. The University of Turin has started monitoring the effects of new soil on plants and will proceed in the coming months.*
5. Other activities	
Synergies with other ProGIreg activities	NBS8: the lawn has been sown with wildflowers that can attract pollinating insects NBS3: pollinator garden: the new soil will be used for pollinator garden NBS3: orti generali: a flowerbed with new soil has been created in Orti Generali and further experiments have been carried out, financed by the Axto circular economy project
Links with other external project or activity	AxTO circular economy project SATURNO project: production of bio-fertilizers from wastes
Business model (link to WP5)	Still to be done
Technology Readiness Level (TRL) **(link to WP5)**	Current TRL: 5 Among natural resources, the soil is often overlooked despite its paramount ecological role and its non-renewable nature. The scarcity of the soil resource is particularly felt in urban areas where the competition of land uses endangers its environmental quality. Previous and ongoing projects have typified urban soils, their fertility and their environmental quality. Contamination, poor chemical, physical and biological fertility and high heterogeneity are common traits of soils in urban settings. However, e.g. for the construction of new green areas within a city, a soil of good agronomical and environmental quality is required. Soil is also needed for the restoration of derelict industrial areas. Future TRL through proGIreg implementation: 8

	The new soil concept will be investigated at its very base, in consideration of the wide variability of the materials that may compose the mixtures used as cultivation substrate. A sampling strategy will be established and laboratory and field tests will lead to the preparation of a methodology for the preparation of new soil. The methodology will be centred on the chemical, physical and agronomic quality of the materials and mixtures and will be fine-tuned and validated with the project partners using the soil. Guidelines to be produced will indicate the best strategy in the preparation and utilisation of a new growing medium, in view of the starting mineral and organic materials that can be employed, on the quality of the site to be restored, and on the type of plants that will grow in the area. At the end of the process, different types of new soil will be placed on the market and inserted into the public works pricelist.
Communication activity	At the opening of the construction site a specific press release was written for this action and some articles were published in the local press. Envipark is editing specific Facebook posts on the new soil issue. Videos and images of the construction site have been collected in order to make an overall film that can describe the action. Moreover ProGIreg activities as a whole and also new soil has been disseminated during the Event Climathon 2020 Turin, the global hackathon on climate change, fully digital on 13 and 14 November. This year's challenge was generated by the meeting of two projects with the City of Turin and the Administration involved: the proGIreg project focused on NBS (Nature Based Solutions) and the requalification of the Combi area, located behind the School of Economics and Management of the University of Turin. Nature Based Solutions were the tool to rethink the city. The event organized by Envipark and the Municipality of Turin, was completely dedicated to nature based solutions and involved the participation of 72 competitors divided into 16 teams. Some working groups have used the new soil for the development of their project work. A dedicated Facebook group was created with about 450 members (https://www.facebook.com/groups/744008156185287).

6. Monitoring activities

Current situation (to be updated)

Before the definition of the final mixture of materials to be used as 'New Soil', a lot of chemical characterizations have been done in order to comply with legislation standards for land application.
In addition, several meetings with the participation of the technical team and the policy makers were dedicated to overcome the authorization procedure limitations in order to define a model for the implementation of these application in urban areas. These activities are still in progress in order to create not only a first in kind application of New Soil but also a standard procedure for exploitation of results at National and international level.
The setup of the site was finished in February 2020.
The most important data about the experimentation are:

- soil composition (90% deep excavated soil with grain diameter between 0-20 mm and 10% compost ACEA)
- quantity of zeolites scattered and integrated in the first 20 cm: 100g at m2
- materials inserted at the base of the tree clumps before planting:
  - 500 g of a mix of coconut fibre and hydrating polymers saturated with water.
  - 30 g per hole of hydroretention compound.

- 50 g of Micosat (mycorricizi consortia from CCS company)

- the sown lawn is composed of:
  - 90% dwarf clover
  - 10% from a mix for flowering lawn with low water demand
  - before sowing the seeds were mixed with zeolite and "micosat semi" from CCS company.

- essences used for sowing the flowering lawn:
  - achillea millefolium wild form
  - plantago lanceolata
  - hypericum perforatum
  - anthemis sancti johannis
  - bellis perennis
  - centaurea cyanus
  - anthyllis vulneraria
  - salvia pratense
  - leucanthemum vulgare
  - hieracium pilosella
  - papaver rhoeas
  - potentilla neumanniana
  - lotus corniculatus
  - solidago virgaurea ssp minuta
  - thymus serpyllum
  - allium schoenoprasumsatureja hortensis
  - calamintha nepeta
  - cichorium intybus
  - sanguisorba minor
  - satureja hortensis

University of Turin has carried out the soil sampling for chemical analyses (February 2020). CNR, with the help of UNITO, started the monitoring of PM10 (from June 2019) and temperature (from February 2020).

Regarding previously collected samples, the soil samples (5) namely "blanks" taken in the site chosen as control, and the new soil samples, (27) taken on 24th February 2020 in the experimental site, were air-dried, gently crushed, sieved (< 2mm), ground in a centrifugal ball mill and stored in suitable jars.

The samples were subsequently subjected to analysis for the determination of some chemical and physical parameters: particle-size distribution, pH, Organic Carbon, Inorganic carbon, Cation-Exchange Capacity, exchangeable Potassium, Calcium and Magnesium, Extractable Phosphorus - Olsen method, Total Nitrogen. Analysis were

performed according to the Ministerial Decree 13/09/99 “Metodi Ufficiali di Analisi Chimica del Suolo”.

The content of 16 PAHs, designated as high priority pollutants by the Environmental Protection Agency (EPA), were determined in all samples by gas chromatography-mass spectrometry technique. Preliminary, the samples were extracted using microwaves and the extracts were purified and concentrated before analysis.

Suitable quantities of some samples have been subjected to acid treatment with the aim to quantify the concentration of major, minor, and potentially toxic elements by inductively coupled plasma–optical emission spectrometer (ICP-OES) or graphite furnace atomic absorption spectrometer (GF-AAS).

On October 22nd, 2020, control samples after 6 months from the starting of the monitoring action, were taken in five points of the new soil, at three depths (0-5 cm, 5-10 cm, 10-20 cm), totalizing 15 samples. Additionally, 5 samples of the cover crop (*Trifolium repens*) were sampled in the same sites. On October 24th, 2020, we sampled 5 topsoils, at a depth 0-10 cm in the same sites of 22nd with the aim to perform the microbiological analysis of soil quality.

All the samples were analysed according to the protocol adopted for the previous sampling campaigns.

With the aim of a continuous monitoring of the site, a further sampling was made on May 19th, 2021, using the same sampling devised in October 2020: 15 soil samples were collected at three different depths throughout the site.

Plants monitoring

Several die-offs occurred in the new soil area also due to the Covid diesase restrictions (reduced accessibility to the area for maintenance and irrigation).

The plants were replaced in December by DUALgreen, The monitoring of plant growth, in charge of DISAFA, have not yet been made

On other side Disafa collected the leaves, for foliar analysis, and sent them to the CNR in July 2020.

Sampling has been made on the plants that were requested (3 Malus, 3 Quercium Ilex, 3 Celtis). The results of the foliar analyzes are still in progress.

In the meantime CNR together with UNITO- DISAFA have developed the following activities

	- from February 2020 positioning of sensors to measure the temperature, whose data are downloaded and sent to CNR approximately every 3 months. - From 28 May to 28 June 2021 (one month), air quality monitoring was also carried out with passive sensors. - In the meantime we have supported DUAL and the Municipality in replacing plants where necessary and in site maintenance works (grass cutting). - In July 2020, measurements were also taken on the plants and the leaves were collected for CNR according to their protocol for the evaluation of dust.
Next steps **(to be updated)**	Soil monitoring The determination of agricultural and chemical-physical parameters of soil, the quantification of the elements and PAHs content were performed in the samples collected in the period January- October 2020. Some of these parameters will be detected on samples collected during May sampling campaign. Additionally, on these samples, we will start the monitoring of the soil quality through the determination of the microbial biomass C and of the soil respiration indices. Plants monitoring Plants growth analytical monitoring will begin in spring 2021. Moreover, some surveys are planned for summer 2021 on plants and soon the fence will be removed and SOPARC will be done again in October.

Notes/critical issues/barriers (to be updated) (link to WP5)	The sign of administrative and authorization documents; several meetings with the participation of the technical team and the policy makers were dedicated to overcome the authorization procedure limitations in order to define a model for the implementation of these application in urban areas. These activities are still in progress in order to create not only a first in kind application of New soil but also a standard procedure for exploitation of results at National and international level. A discussion and coordination table was set up with the authorities with the aim of promoting the new soil also through legislative support that provides for the recognition of the background values of the pollutants in the destined locations of regenerated soil. By the end of the year 2020, Arpa has delivered the definitive technical report on the values of natural funds to the Piedmont Region, and discussions on the document will begin at the beginning of year 2021. By the first six months of 2021, the Region could approve the basic values with a resolution. City of Turin will give wide publicity of the approved values and the simplification of the procedure for the new soil application.
7. NBS maintenance and outlook	
Maintenance	During proGIreg the maintenance will be done by Dual srl, after maybe the city will carry on the maintenance.
Sustainability after project conclusion	Following the successful outcome of the trials, it is planned to produce a brand for the new soil and to include it in the public specifications for the construction of the new urban areas.
Additional resources	

3.1: Mirafiori Castle's ruins recovery and new planting

1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	Mirafiori Castle's ruins recovery and new planting
Brief project synthesis	Landscape transformation, through new plants and signposting, to enhance the area of historical-environmental interest (green area adjacent to the ruins of the Castle of Mirafiori and the altar inside the area of the Bela Rosin Mausoleum). At the end of the 16th century Carlo Emanuele I of Savoy started the construction of the Castle of Mirafiori, a residence with wonderful gardens which took part in the "crown of delights" of the Savoy dynasty. Unfortunately, it was demolished in the 19th century but some ruins continue to keep track of the palace. Comitato Mirafiori Borgata, a committee from the Mirafiori Sud neighborhood born in 1978, has worked over the years to recover the historical memory of this place and with this NBS it will be possible to carry out their work by enhancing the ruins of the castle and spreading the historical and artistic heritage.
Area of implementation	The area of implementation is the Sangone Park next to Bela Rosin Mausoleum GPS coordinates: 45.009504, 7.636714
Target groups (beneficiaries)	Citizens who can discover this historical part of the Sangone Park

Timing (start and end date)	Start of physical transformation: May 2020 End of physical transformation: July 2021
Main responsible partner	Orti Generali APS (previously named, Coefficiente Clorofillla the Association has changed the legal name in November 2020)
ProGIreg partners involved	City of Turin (Green Department)
Other stakeholders involved	Comitato Borgata Mirafiori The Mirafiori Borgata District Committee, established in 1970, is not exactly an association but a group of citizens who are passionate about our district and who dedicate time, skills and creativity to the promotion of the area and the transmission of local culture. It does so by organizing meetings and conferences, publishing articles, promoting authors and literature and maintaining a self-managed library of 3000 volumes, with free access.
Total Budget	16.000 €
2. Pre-implementation activities	
Planning and preparatory activities	Recovery of the ruins of the Castle of Mirafiori with the improvements of the green area of the Bela Rosin Mausoleum, was a request coming from Borgata Mirafiori Committee. Inspections were carried out for the interventions in the green area of the Bela Rosin Mausoleum and reformulate the expenses on the Castle area based on new engineering needs. A continuous work group of cleaning and maintenance of the Castle area was started (together with the Borgata Mirafiori Committee and the Torino Spazio Pubblico) formed by volunteers. The works in the area of the gardens, the Castle and the Mausoleum of Bela Rosin can be realized upon arrival of the December co-financing.
Administrative procedures	The final plan for tree plantation will be proposed to the green department but is not necessary a formal act.
Technical and social analysis	
Other activities	
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Orti Generali APS - Coordination

2nd Partner and role/function	City of Turin - Project Approval
3 rd Partner and role/function	Comitato Borgata Mirafiori - Citizen engagement
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	The ordinary and extraordinary maintenance works preparatory for the new set-up were defined in collaboration with Comitato Borgata.
Notes on major achievements/success factors/critical issues/barriers related to engagement process	The engagement of Comitato Borgata allowed a deep historical knowledge of the area and ensured an important contribution for the cleaning of the ruins. A possible critical issue for the future is the high average age of people of Comitato di Borgata, with the possible risk of losing the cultural heritage brought by them.
Current situation and next steps **(to be updated)**	- Comitato Borgata was engaged to share with Orti Generali the contents and the shape of the information panel and the bulletin board. - Comitato Borgata periodically provides for light maintenance.
5. Other activities	
Synergies with other proGIreg activities	The NBS 2 with the experimental flowerbed of regenerated soil takes place in the same green area of the Bela Rosin Mausoleum. In this way, the whole area is redeveloped through two actions of the NBS 2 and the NBS 3.
Links with other external project or activity	The City has started the redevelopment of the banks of the Sangone river and at the end of this intervention a cycle path will connect the area of the Bela Rosin Mausoleum with Piemonte Park and the neighboring parks of Stupinigi and Beinasco.
Business model (link to WP5)	
Technology Readiness Level (TRL) **(link to WP5)**	
Communication activity (link to WP6)	The communication of this NBS will take place through the social media channels of Orti Generali, Mirafiori Social Green and Fondazione Mirafiori.
6. State of Play and Monitoring	

Current situation (to be updated)	At the moment the following interventions have been carried out in the area: - First ordinary maintenance work near the ruins of the Castle of Mirafiori - Felling of 3 Robiniae pseudoacacia - Construction of a Narrow Road - Realization of the wooden guard rail - Two more grass cuts were made in july and october 2020 - In spring 2021 new planting of roses has been located near the area of Bela Rosin Mausoleum and a landscape arrangement will be created at the foot of the ruins
Next steps **(to be updated)**	- In July 2021 the information panel and the bulletin board will be installed
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	It was hard to find a craftsman who could build a panel on the model chosen and used by the Municipality of Turin.
7. NBS maintenance and outlook	
Maintenance	The maintenance of the area is carried out by the volunteers of Borgata Mirafiori committee together with the City of Turin.
Sustainability after project conclusion	In the case of Mirafiori Castle's ruins, the sustainability over time is intended as the maintenance and enhancement of the area. It will be carried out by the volunteers of Borgata Mirafiori.
Additional resources	

Errore. L'origine riferimento non è stata trovata.

	
1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	Gardens in Cascina Piemonte (Orti Generali)
Brief project synthesis	*Orti Generali* was born with the aim of building a model of enterprise model for the transformation and management of post-industrial and metropolitan residual agricultural areas based on ecological sustainability and social equity. The aim is to regenerate Cascina Piemonte area, which is mostly reduced to ruins because of occupations and acts of vandalism, creating new community gardens that will pursuit different goals: education, social inclusion, technological innovation, job training and integration into the labor market. 160 gardens of different charges and sizes will be realized and 330 trees will be planted. Gardens will be assigned to private citizens, families or collectives, with lower charges for people under 35 and for economically disadvantaged people. The design of these gardens goes beyond the classic model of urban gardens. In fact, it includes an area (30% of the entire site) that is meant to become a shared green space in which people can meet and socialize. Gardeners have the opportunity to partially contribute to the maintenance activities of these common spaces (i.e. trimming fruit trees, the trees of the roads, cutting the hedges and the lawns, managing the recycling bins, taking care of ordinary maintenance). The goal is to create an educational center that uses the garden as a multidisciplinary tool that promotes the spread of urban, social and civic agriculture by building networks of relationships with public and private bodies, associations, cooperatives, groups, individual people. The setting up of an educational area with an urban farm, an apiary, a greenhouse-classroom and didactic gardens will guarantee a continuous educational and training offer over time and addressed to multiple types of users. Thanks to its innovative and technological characteristics, Orti Generali won a tender published by MIUR, called Smart cities and Communities and Social Innovation.

Area of implementation	This NBS is going to be implemented in an area of 12.000 m^2 surrounding Cascina Piemonte. GPS coordinates: 45.011266, 7.627034
Target groups (beneficiaries)	The main beneficiaries of this activity are: families (also one-person households), collectives, schools of the district and disadvantaged people. However, the whole neighborhood will benefit from this project thanks to the re-enhancement of the land, the courses provided by the centre and the reinforcement of social bonds.
Timing (start and end date)	Implementation phase Start: February 2019 End: November 2019
Main responsible partner	~~Associazione "Coefficiente Clorofilla"~~ Orti Generali APS (The Association has changed the legal name in November 2020) e-mail address: ortigenerali@gmail.com
ProGIreg partners involved	• Fondazione Mirafiori • University of Turin (Department of Life Sciences and Systems Biology, DBios and Department of Agricultural, Forest and Food Sciences, DISAFA)
Other stakeholders involved	• Miur (Ministry of Education, University and Research). It supported the start-up phase. • Compagnia di San Paolo. It supports physical transformations of the area. • IREN SpA. It supported the energy requalification of Cascina Piemonte and the implementation of the activities in the collective garden. • PON Metro (City of Turin). It supported the social inclusion and voluntary activities. • Fondazione CRT. It supported the physical construction of the pollinator garden and the activities of citizen science.
Total Budget	ProGIreg Partners funds: 61.500 € Other funds: - 45.000 € MIUR - 155.000 € Compagnia di San Paolo - 18.000 € IREN AmbientAzioni - 11.600 € Comitato Territoriale Iren - 8.000 € PON Metro (City of Turin) - 10.000 € Fondazione CRT - 15.000 € Segnali d'italia Total budget of the implementation: 324.100 €
2. Pre-implementation activities	

Planning and preparatory activities	The design of Orti Generali comes from a project of research-action called MiraOrti. This project of 4 years worked in the district of Mirafiori Sud for a social survey and a local entertainment for accompanying urban-environmental transformation of the areas along the banks of the Sangone river that have an agricultural vocation. Inclusive decisional programs have been activated for planning the territory by involving institutions, gardeners, students from neighborhood schools and their parents in plenary discussions and educational activities especially focused in vegetable gardens. This research showed the interest of a significant and diversified citizenship towards urban vegetable gardens and also the desire to support them with common areas that involve leisure, cultural and educational activities.
Administrative procedures	As the funds used for the implementation of this NBS come from European projects (Horizon 2020), these funds have been transferred at first to the City of Turin and, then, to the partners involved according to their necessities. All these phases have been accounted.
Technical and social analysis	Planning and preparatory activities: in addition to the social analysis made during the project MiraOrti, some physical-chemical analysis of the soil was made to ensure the absence of high metals or other pollutants in the area.
Other activities	• Fundraising to get the economic resources for physical transformations • Involvement of citizens in the work of cleaning and requalification of the area
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Orti Generali APS The association has designed the whole activity in its entirety, taking charge of the pre-implementation and implementation phases. They are the main partner involved, as they currently manage the social gardens area and the courses and workshops linked to them. they will guarantee the continuity of this NBS over time.
2nd Partner and role/function	Fondazione Mirafiori It supports the project sharing with the association its office and acting as facilitator in relations with institutions.
3 rd Partner and role/function	UNITO (DBios e DISAFA). The Department DISAFA is the responsible of the environmental monitoring in the area and collaborate with the association for the experimentation and divulgation of the new soil concept; The Department DBios monitored the pollinators in the area and has supported the association in the choice and planting of trees and shrub species.

4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	Co-design in planning and preparatory activities *Orti Generali* is the result of a four-year period of participatory planning that has involved schools, associations, gardeners and citizens of Mirafiori (Mira Orti) and discussion in focus groups with Borgata Mirafiori and the Environment Department of the Municipality. Co-implementation and maintenance: Having the possibility to grow their own vegetables and fruits, gardeners will benefit from their own food production and, possibly, they will cooperate to maintain Orti Generali, thus strengthening their civic engagement. Interestingly, gardeners do not come exclusively from Mirafiori Sud district but from other parts of Turin as well. The differentiated charges system is meant to ensure the possibility of access to those who are economically disadvantaged. More specifically, 15 gardens are exclusively given in solidarity to people who live in severe poor conditions and can devolve some of their time in volunteering in return. Other 25 gardens are reserved to citizens under the age of 35, thus promoting farming activities among younger generations. Gardeners, and also all the citizens interested in, can benefit from training courses about organic agriculture, permaculture, pruning, composting and also about collateral activities linked to the environmental theme such as apiculture, painting with dyeing plants, food preservation. Associations and cooperatives find in Orti Generali a place where they can benefit from the positive feedback from disadvantaged people to do horticultural activities and in relating with farmyard animals. University students find in Orti Generali a place where they can develop their research on urban agriculture and trainees from gardening courses can apply the notions learned during the training course. All the stakeholders are engaged in different ways: - volunteers and solidarity gardeners are engaged in the maintenance of the common spaces and the management and cultivation of the collective gardens, and are also involved in plenary meetings to facilitate team building and plan activities together; - the staff of the association provides constant support to cultivation for those who need it; - events are periodically organized to gather all the gardeners and encourage relations and community making; - communication in social networks, the publication of videos and photos, the drafting of articles concerning Orti Generali create a sense of belonging among gardeners.
Notes on major achievements/success factors/	**Stakeholders involved:** • Gardeners of 160 allotments. They are the major contribution to the economical sustainability of the project and the first responsible for the development of the community. • Disadvantaged people from SERD and Consorzio Abele Lavoro, immigrants from Casa del Mondo and people with physical disabilities of

critical issues/barriers **(to be updated)** **(link to WP5)**	"Il Punto scs". They allow the pursuit of social inclusion as one of the objectives of Orti Generali. • UNITO (DBios and DISAFA). It allows the pursuit of technological innovation and research as one of the objectives of Orti Generali. • Fondazione Mirafiori. It helps the association in establishing relationships with associations, cooperatives and institutions. • Compagnia di San Paolo. It provides economic support to the association before achieving the economic sustainability of the project. • Volunteers and social gardeners. They widely contribute to the management of the common spaces. **Major achievements:** • Creation of a community in a former abandoned area that has been regenerated. • Gardeners involved in the project come from different districts of Turin, thus bringing attention to an area that is usually underrated. • 160 allotments assigned in 4 months and a waiting list of 170 people. **Critical issues/barriers:** • Long timeline and high costs of the Italian bureaucracy to obtain authorizations and permissions. • Small theft prolonged over time (work tools, gas cylinder, coffee, dishes…)
Current situation and next steps related to engagement process **(to be updated)**	• In 4 months (March-June 2019) all the 160 allotments were assigned. • 330 trees of ancient local species of apple and pear, mulberry, and salix purpurea planted with gardeners and volunteers. • 1600 kg of vegetables produced by volunteers and social gardeners in the collective garden and donated to the project "Mirafiori Zero waste" for people in economical difficulty. • 18 classrooms from schools of the district involved in educational activities. • Activation of 7 courses. • ~~6~~ 20 classrooms involved in distance learning activities in collaboration with Microsoft Italia and the platform Agorà del Sapere. • Organization of "Gran Galà", a territorial animation event on the theme of food within the Mirafood/Terra Madre calendar. • 7 educational happy hours on the theme of healthy food and environmental sustainability proposed to the general public. • New collaboration with Il Punto SCS involving people with motor disabilities in the preparation of seedlings of transplant plants. • Start a collective management of the chicken coop. **Next steps:** • Increase in the educational offer. • Organization of artistic and cultural activities related to food themes within the FUSILLI project (See section 5).
5. Other activities	

Synergies with other proGIreg activities	• Links with the activities of “Citizen science and social inclusion of the mentally disabled (NBS8) with UNITO • Links with the activity “Methodologies and variables for NBS monitoring and evaluation” (WP4) with UNITO • Link with the activity "Spatial analysis and analysis WP2.1 framework"
Links with other external project or activity	• Collaboration with SERD and Consorzio Abele. • “Biodiversity Turin for pollinators” project for monitoring and conservation of pollinators in Piemonte Park in collaboration with DBios with CRT funding. • “Un chiosco per Orti Generali” project of energy upgrading of Cascina Piemonte with IREN funding. • “L'orto collettivo. Manuale tangibile di economia della reciprocità su scala di quartiere” project for the implementation of the activities in the collective garden with IREN funding. • “FUSILLI” (Fostering the Urban food System Transformation through Innovative Living Labs Implementation) for the implementation of a circular management of the kiosk and for the organization of artistic and cultural activities related to food themes in collaboration with the Municipality of Turin.
Business model (link to WP5)	Gardens’ costs: • 120 Standard gardens: 50m^2 - 25€/month; 75m^2 - 35€/month; 100m^2 - 45€/month. • 25 Gardens Under 35: 50m^2 - 15€/month; 75m^2 - 20€/month; 100m^2 - 30€/month. • 15 Social Gardens: 50m^2 - 5€/month; 100m^2 - 10€/month.
Technology Readiness Level (TRL) **(link to WP5)**	The NBS 3 is supposed to reach the TRL nr. 9, starting from the level 7. The association contributes to achieve this goal playing the role of mediator between citizens and the Municipality. It takes care of the involvement in the project of a large public of around ~~400~~ 1200 people,it draws up documentation to ensure the legality and environmental safety of the horticultural activity and manage the business plan which is supposed to reach the economic sustainability in 3 years.
Communication activity (link to WP6)	From February 2019 the communication activities focused in the creation of a community into social networks and the diffusion of information through DEM and press office. Facebook channel has reached 2919 followers and Instagram channel with the hashtag #ortigenerali has reached 1706 followers ~~and 270 posts~~. 33 post have been published with the hashtag #proGIreg. In 2019 the press release had 90 articles and the website www.ortigenerali.it had 600 monthly visitors. At the moment there are over 1600 people subscribed to the newsletter.
6. State of Play and Monitoring	
Current situation (to be updated)	• The widening of the areas destined to the gardens has been monitored since June 2018. • Monitoring of lepidoptera by Dbios.

	• Construction of the water well, the irrigation system and three greenhouses (classroom-greenhouse, seedbed and tropical greenhouse). • Road access to the farm had been improved, working activities were concluded in March 2019. • Installation in the area of sensors for environmental monitoring by CNR (PM10, PM2.5, Ozone, NOx, Temperature, Humidity, Pressure). • By the 23th of June 2019, all gardens have been assigned. • Disadvantaged people and students have been involved in the care and implementation of gardens from July 2019 • By the end of November/beginning of December 2019, the hedges and all the 330 trees have been planted. • In June 2020 the renovation of Cascina Piemonte ended, and the building was restored as a kiosk opened to the public from the 4th of July. • In October 2020 the experimental plot for the cultivation of ancient grains was set up in collaboration with ASCI Piemonte. • In December 2020 the preparation of a pollinators garden has been completed as a final step of a series of citizen science activities in collaboration with Farfalle in Tour.
Next steps **(to be updated)**	• Increase in the number of animals housed in the city farm. • Increase of the covered and heated areas to encourage educational activities and convivial moments even in the coldest periods of the year and in the bad weather days. • Discuss with the municipality to expand the area under concession in order to meet the high demand for gardens and to achieve economic sustainability. • Implementation of a circular management of the kiosk within the FUSILLI project (See section 5).
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	• Cascina Piemonte building is severely damaged because of vandalism and occupations. There is the necessity to adopt measures for securing the site, external proGireg funds will be use if necessary. • Ministerial restrictions due to the containment of the infection from Covid-19 have forbidden the access of gardeners at Orti Generali. This obstacle has been overcome activating the “telecoltivazione”, a remote cultivation activity made by the workers of the association that let the gardeners to not lose the annual harvest. • Ministerial restrictions due to the containment of the infection from Covid-19 have also forbidden educational trips for school. “Telegite” (trips made within an online platform) have been organized, in collaboration with Microsoft Italia and the municipality, to give students the opportunity to continue their educational activities. • 1 planned course of organic horticulture has been interrupted because of COVID restrictions. • 3 lessons of the course of Permaculture have been done using online platforms because of COVID restrictions.
7. NBS maintenance and outlook	

Maintenance	~~Clorofilla~~ Orti Generali APS will continue to maintain and manage the area even after the end of proGIreg. The goal of Orti Generali APS is to reach as soon as possible the economic sustainability of the project offering a wide range of services to citizens by diversifying activities and thus managing to cover management and personnel costs.
Sustainability after project conclusion	The goal of Orti Generali APS is to make the reality of the gardens self-sufficient thanks to the revenues deriving from the monthly rents and all the other collateral activities (kiosk, educational activities, courses). The association is in continuous dialogue with the environment department of the City of Turin discussing together possible future scenarios for the implementation of Orti Generali that would be useful for its economic sustainability.
Additional resources	https://www.ortigenerali.it/ https://www.instagram.com/ortigenerali/ https://www.facebook.com/ortigenerali/ Orti Generali (Youtube channel)

3.3: Pollinator friendly gardens (WOW)

	
1. General information	
Compilation date and update	June. 2021 - third draft version

NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	ORTO WOW - A pollinator friendly garden
Brief project synthesis	As NBS3 Orto WOW is designed to address to topic of ecological corridors in Mirafiori South, as being the living lab area for proGIreg. The main needs are: - to recover an abandoned and underutilized former industrial lot and to return it for public use; - to favor the transition of pollinating insects, following the directions of the ecological corridors identified by proGIreg; - to activate local inhabitants in taking care of the new green installations, by stimulating them through citizens-science activities; - to favor a collaborative setting of different stakeholders, in order to guarantee the sustainability of the intervention in the future. Orto wow will be made in the courtyard of the VOV102, abandoned space that periodically hosts a Coldiretti market. Orto wow is composed of a number of 15/18 of garden boxes with aromatic plants and other melliferous plants. The distribution of the boxes in the courtyard will be defined in accordance with Coldiretti, in order to do not hinder the operations of the market. Moreover, the idea is to create a sort of “green square”, by displacing the boxes so as to facilitate the organization in the courtyard of public activities open to all (such as educational activities, public talks, convivial activities, etc). The idea is to collaborate with a number of local NGOs in order to make Orto WOW a lively and vibrant green area open to the public and managed by inhabitants of the surroundings. Main partners of the project are: Fondazione di Comunità Mirafiori, as the main local actor able to involve citizens in local development projects and Coldiretti, which will also participate in organizing educational activities for the people and will support the daily management of the garden boxes.
Area of implementation	At the address of via Onorato Vigliani 102, there is a public building currently unused inside and waiting for a future destination. The building has been the seat of the National Agricultural Mechanical Centre since 1951. Later it was instead the seat of a social housing and for some years now it has been in a state of abandonment. Nowadays the courtyard is instead periodically used by Coldiretti, for markets of local producers. The area borders to the south with the Colonnetti Park, identifying itself as a suitable place for the placement of hives. While the garden boxes will be placed in the area in front of the entrance, closer to the public part of the courtyard. GPS coordinates: 45.017254, 7.644881
Target groups (beneficiaries)	The main beneficiaries of this intervention are local inhabitants, and in particular people who live in the surroundings, which have been historically interested in having access to the open area of VOV 102. Our beneficiaries will thus be probably families and elderly people.

Timing (start and end date)	The construction site was started in February 2020 but was blocked by Covid-19 lockdown. The construction was finished in may 2020. Activities with citizens are been carried out in spring 2021.
Main responsible partner	Orti Alti: Elena Carmagnani - elena.carmagnani@ortialti.com and Emanuela Saporito - emanuela.saporito@ortialti.com
ProGIreg partners involved	• Heritage Management Department, City of Turin • Fondazione di Comunità Mirafiori • University of Turin (Department of Life Sciences and Systems Biology, DBios and Department of Agricultural, Forest and Food Sciences, DISAFA)
Other stakeholders involved	• Coldiretti (the national association of farmers) to support the management of the garden boxes and keep the area open to the public in the future • Associazione Parco del Nobile (Beekeepers - operative partner)
Total Budget	Construction costs: 7.500 €
2. Pre-implementation activities	
Planning and preparatory activities	The identification of the area was due to the Spatial Analysis phase, which indicate the VOV 102 site as an interesting area where to test such NBS, both for its environmental and social meanings. In fact, the site is located at the entrance of Colonnetti Park, on the border with the residential area of the neighbourhood: a perfect spot where to implement solutions aimed at reconnecting ecological corridors (detected and planned after the analysis) and bring nature inside the urban area. From a social point of view, this site was also identified by the local community as an urban common, as a demonstration that there was the citizens interest in recovering the green area and reusing, at least part, of the building for community purposes. In the planning phase, OrtiAlti, as responsible of the realization of NBS 3, in collaboration with the City of Turin, have identified Fondazione di Comunità Mirafiori, as the main stakeholder and main allied in co-designing activities for community engagement. Furthermore, among other stakeholders, there were involved since the planning activity Coldiretti and Parco del Nobile, to the preparatory activity about the apiary installation (e.g. cleaning the green area where to locate the beehives). The planning phase was impacted by the change of design of the green roof (the budget is the same for both actions) and it changed the number of wood boxes and also the shape. At the end, the wood box project was proposed by OrtiAlti collaborators in order to spend less money and to reuse wood axes from other construction site. In that way also, the circular economy issue was insert like planning element. As preparatory activity, we have also implemented some infrastructural interventions (as the water access on the courtyard) in order to prepare the site for the garden boxes.

Administrative procedures	In order to use the open area of the VOV 102 it was necessary to involve many public sectors of the local Municipality, especially the Public Building sector, in order to obtain a pre-assessment and the final resolution of the city council. Afterwards, an agreement has been signed between the Municipality and OrtiAlti, to have permission for initiate the worksites, and a report for the key's delivery to the property. On october 2020 was signed a Patc of Collaboration as the main management tool, signed between Associazione Parco del Nobile, Fondazione Mirafiori, Coldiretti, Rete degli Impollinatori metropolitani, and the City of Turin.
Technical and social analysis	As technical analysis, as OrtiAlti we have verified the possibility to use the new soil for growing the plants identified for the pollinator garden. We have finally decided to use it in the boxes where melliferous plants will be planted, and not the edible ones. Moreover, in collaboration with UNITO we have selected which plants will be grown in the boxes, in order to attract pollinators. As preparatory activity, we have also implemented some infrastructural interventions (as the water access on the courtyard) in order to prepare the site for the garden boxes. In terms of social analysis, we, as OrtiAlti, has carried out a preliminary stakeholder assessment, together with Fondazione di Comunità MIrafiori, in order to understand the needs of the local communities (are there citizens interested in taking care of the garden boxes? are these citizens interested in using the green areas of VOV 102? For which purpose?)
Other activities	In order to keep the construction costs low, we used some recycled materials (e.g. the wooden boards used to build the garden boxes are taken from the green roof construction site [NBS5], and part of the soil used will be new soil [NBS2])
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	OrtiAlti - coordination - design - construction - community engagement - pact of collaboration coordinator
2nd Partner and role/function	City of Turin (administrative partner) - owner of the building - administrative permissions - mediator

3rd Partner and role/function	Fondazione di Comunità Mirafiori (operative partner) - community engagement activity - site management activity
4rd Partner and role/function	Associazione Parco del Nobile (operative partner) - plant growing consulting - educational activity for citizens
5rd Partner and role/function	Coldiretti (operative partner) - collaboration in the taking care of the boxes - educational activities for citizens
6rd Partner and role/function	University of Turin (technical and communication partner) - citizens and science activities - selection of the plants
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	The stakeholder engagement process was blocked by Covid-19. The plan is to organise an activation plan for citizens, a number of meetings for animating the space of VOV 102 and make citizens interested in the event taking place there. These public meetings will be about communication, animation and education activities on the main topics of the proGIreg project and will be organized every Friday afternoons, for at least 6 weeks (each friday will involve a different stakeholder, involved in the NBS) and will take place during the farmer market of Coldiretti. This process of community engagement will be organized together with Fondazione Mirafiori, Coldiretti, UNITO, Associazione Parco del Nobile and other informal groups (such as the "metropolitan pollinators network) and will be anticipated by a communication plan. Moreover, some co-design activities were organized in order to decide the layout of the garden boxes, especially by involving Coldiretti, as the main actor using the space for the local produce market. Another co-design activity coincides with the collaboration in writing the collaboration pact for the management of the NBS.

Notes on major achievements/success factors/critical issues/barriers related to engagement process	The most critical aspect is due to the Covid-19 emergency situation. However, as a main result, we managed to gather a number of local stakeholders, which will be involved at different stages of the implementation and management phases of the NBS 3, Among the others, already listed in this fiche, we had also included the informal network of "metropolitan pollinators", a group of experts in urban beekeeping and biodiversity, that will be part of the management group, concerned with the functioning of the all VOV 102 external area, comprising the NBS3, but also 8 and 5. In order to do not lose the time waiting for better conditions related to the sanitary emergency, we decided to anticipate some co-design activities, which need more time to be fully developed, such as the drafting of the Pact of Collaboration.
Current situation and next steps **(to be updated)**	Results: - stakeholder engagement, in particular of Fondazione di Comunità Mirafiori (as main local actor able to facilitate citizens participation in future); Coldiretti, as main guardian of the space - community engagement methodological definition (from communication plan, to an animation plan of the space, organization of training activities for the management group, and the initiation of a Pact fo collaboration) - on august 2020 some laboratories with children together with Centro Scienze were held
5. Other activities	
Synergies with other proGIreg activities	This NBS3 is related with many other NBS most of all NBS5 and NBS8. The species selected to the planted in the boxes are, in fact, related to the apiary, located in the same complex, which will produce the urban garden honey wow. The selection of the plants has been made in collaboration with UNITO and the Agriculture Department and the Life Sciences and Systems Biology Department. This operation allows to activate city ecological corridors, in connection with the Colonnetti Park, which is exactly bordering with the VOV 102 area. The new soil from NBS 2 will be used to fill wood boxes. Plants into wood boxes will be pollinator friendly in connection with NBS8 and NBS5.
Links with other external project or activity	Since the VOV102 area hosts different proGIreg NBS, the idea is, moreover, to create a connection in the management and valorization of all the interventions, creating a collaborative group, which will accompany the involvement of local inhabitants, and will support the re-use of the open area and, luckly, also the future re-use of the abandoned building. Together with Fondazione Mirafiori, Coldiretti and OrtiAlti (as coordinator), the group also involves Associazione Parco del Nobile (for the management of the apiary) and la Rete degli Impollinatori Metropolitani (the Network of the Metropolitan Pollinators), an informal group of experts in beekeeping, pollinating insects and urban biodiversity.

Communication activity (link to WP6)	A communication and animation plan for inviting local people to take part to the use of this space, has been drafted (even if because of Covid-19 most of the activities will take place in Spring 2021). OrtiAlti posts on Facebook different phases of the construction site, the local press wrote a lot in March (before Covid-19 lockdown) about the green roof and the pollinator friendly garden.
6. State of Play and Monitoring	
Current situation (to be updated)	May 2020: realization of the garden boxes, placing of the gardens on site and planning
Next steps **(to be updated)**	May - December 2020: drafting of the collaboration pact and bureaucratic steps Spring 2021: community engagement process Spring 2021: training activities to the management group
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	*See Section 4 "Co-design activities and stakeholder engagement"*
7. NBS maintenance and outlook	
Maintenance	It will be important to identify the citizen group who can carry out the maintenance of the pollinator friendly garden. Another co-design activity coincides with the collaboration in writing the collaboration pact for the management of the NBS.
Sustainability after project conclusion	The sign of the collaboration pact for the management of the NBS will ensure the sustainability of the NBS after the project.
Additional resources	*www.ortialti.com* *http://www.ortialti.com/2017/04/20/or-to-il-nuovo-orto-di-eataly-lingotto/* *http://www.ortialti.com/2018/07/06/giardino-incredibile-lorto-dei-viali-2/* *http://www.ortialti.com/2011/04/14/orto-fai-da-noi-2*

3. 4: Didactic gardens in schools

	
1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	Didactic gardens in schools
Brief project synthesis	The schools in South Mirafiori district are suffering a decrease in the number of students; the families with more opportunities tend to enroll their children in schools more near to the city centre. A consequence is that in Mirafiori school there is a higher percentage of children coming from families that struggle economically and socially. Fondazione della Comunità di Mirafiori, since its establishment, has cooperated with the schools in order to tackle this challenge. By establishing vegetable gardens in all the primary schools of Mirafiori, plus two kindergarten and one vocational school, and providing educational activities focusing on the themes of sustainable agriculture, biodiversity and the NBS of proGIreg, we aim at improving the science curriculum of the schools, increase their attractiveness and raise awareness of environmental sustainability, NBS and how they can improve life quality in the cities. The educational activities involve pupils and teachers, while the pupils' families will be involved in events and in the maintenance of the NBS. The benefits of school gardens are many and well assessed in scientific literature: improvement in achievements scores in science, increase in focus, patience, teamwork and social skills, tendency to make healthier food choices, increase of environmental awareness. Our boxes have been placed on concrete pavements, thus increasing the green spaces in schoolyards, with benefits in terms of reduction of the heat island effect and water runoff.
Area of implementation	In South Mirafiori neighborhood there are two "*Istituti Comprensivi*", state educational institutes that include primary and intermediate schools, I.C. Cairoli and I.C. Salvemini. The schools of the two institutes are spread across the whole neighborhood; the proGIreg container gardens are placed in the five primary schools of the two institutes, in one kindergarten of Cairoli Institute, in a municipal kindergarten and in a vocational school.
Target groups (beneficiaries)	Pupils, teachers and families of the pupils of the aforementioned schools. In ENGIM vocational school, the garden is dedicated to students with special education needs.

Timing (start and end date)	Educational activities: November 2018 - June 2022 Implementation of the container gardens: April 2019 - September 2020
Main responsible partner	Fondazione della Comunità di Mirafiori, contact person: Vittorio Bianco - v.bianco@fondazionemirafiori.it
ProGIreg partners involved	Linked Third Party Miravolante for the implementation and maintenance of the gardens UNITO (DBios) and "Farfalle in TOur" group for the integration in the educational program of activities regarding butterflies.
Other stakeholders involved	I.C. Salvemini, I.C. Cairoli, ENGIM San Luca, Polo dell'Infanzia - Municipal kindergarten
Total Budget	81.000 € (proGIreg)

2. Pre-implementation activities	
Planning and preparatory activities	We began our planning by meeting the schools' principals and the teachers, then we organized co-design workshops involving teachers, non-teacher staff, pupils and their families. During the co-design workshop both the practical set-up of the gardens and issues related with the maintenance of the gardens and the activities to be organized in them have been addressed. The plans have been discussed with the school's managers and the teacher concerned. On-site inspections have been conducted in all schools, in order to identify the sites suitable for the implementation of the school gardens. Further planning and preparatory activities have been conducted through the co-design workshops (see below).
Administrative procedures	Being implemented in the schools' premises, this NBS implementation has required the approval by the school managers and by the school's board, to which the preliminary project has been proposed.
Technical and social analysis	The choice of the NBS and of the approach and methodology for its implementation, has been based upon the in-depth knowledge of the schools and their context, and has been discussed during the meetings of the "Osservatorio d'Area", a monthly meeting that involves the schools of the neighborhood, the district's administration and non-for-profit organisations cooperating with the schools, among which Fondazione Mirafiori. The technology (i.e. container gardening) has been chosen in order to avoid possible risks related to the soil contamination. Different kinds of boxes available on the market have been taken in consideration, and the most suitable and cost-effective have been proposed to the stakeholders during the codesign activities.

Other activities	All other pre-implementation activities have been conducted through co-design workshops.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Fondazione della Comunità di Mirafiori, overall coordination, implementation and maintenance together with Associazione Miravolante.
2nd Partner and role/function	Associazione Miravolante (Linked Third Party): support in the implementation and maintenance of the container gardens.
3 rd Partner and role/function	City of Turin: coordination of this NBS with other proGIreg NBS involving the schools.
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	Main stakeholders engaged: - teachers; - pupils and their families (parents, grand-parents); - non teaching staff. For each school garden, it was held first a meeting with the teachers concerned, and then, with the help of the teachers, a co-design workshop has been organised, in which the different aspects of the NBS implementation and maintenance have been discussed: number and dimensions of the containers, positioning of the boxes in the school premises, types of vegetables to be cultivated, involvement of families in the management of the gardens. Accordingly to the outcomes of the co-design workshops, the school container gardens have been installed together with the pupils, their families, or both. The educational activities have been planned together with the teachers at the beginning of each school year and tailored to the needs of each class. For ENGIM vocational school the process has been slightly different, as the garden is part of the activities aimed at the students with special needs: the garden has been designed together with the school manager and the support teachers, and has been implemented together with students with mental disabilities.
Notes on major achievements/success factors/critical issues/barriers related to engagement process	Teachers reacted positively to the proposal of school container gardens, their response in terms of engagement has been very good, and for the second school year the number of classes asking to participate in the project was too high to satisfy all requests. Non-teaching staff also was keen to be engaged and cooperates in the maintenance of the gardens. Parents and grand-parents participating in co-design workshops also expressed positive comments on the project and gave their availability to participate in the maintenance of the gardens. Their involvement was planned for the spring-summer of 2020 but the Covid-19 pandemics forced the interruption of the activities. The real engagement of families in the maintenance of the NBS will have to be assessed in the next school year.

Current situation and next steps **(to be updated)**	The co-design workshops have been held in all the schools. All the school container gardens have been installed, the last one in February-March 2021 (it was scheduled for March 2020 but had to be postponed due to the Covid-19 pandemic) A crucial step will be the involvement of stakeholders in the gardens' maintenance during the summer months, which was scheduled for the summer 2020 but has been rescheduled for summer 2022 due to the Covid-19 pandemic.
5. Other activities	
Synergies with other proGIreg activities	School gardens and the educational activities that are organized in the frame of this NBS have many potential links with other NBS, as they are designed to introduce to pupils' basic concepts of the proGIreg project (biodiversity, the importance of soil, biogeochemical cycles…). At the moment, the main link is with NBS 8, with activities designed together with the University of Turin in order to help pupils learn concepts related to butterflies, their life cycle, their ecological importance.
Links with other external project or activity	School gardens activities are coordinated with those of *Batti il 5,* a national project of which Fondazione Mirafiori is partner, and which offers to the schools among others, a program aimed at improving their curriculum in STEM subjects.
Business model (link to WP5)	A proper business model has not yet been designed, also because this NBS is not very market-oriented. However, during the co-design workshops ways to raise funds for the school's gardens have been discussed, which include small fund-raising events for collecting offers in exchange of the vegetable gardens products.
Technology Readiness Level (TRL) **(link to WP5)**	*Starting TRL 7 - TRL to be achieved at the end of the project: 9*
Communication activity (link to WP6)	Part of the communication activity for this NBS involved direct contact with the teachers. The families of the pupils directly involved in the NBS have been reached through the teachers and with the co-design workshops. A wider public has been reached through the participation in local events hosted by the schools, namely the "PrimaVera Festa" (May 18th, 2019), an yearly event during which the schools of the neighborhood and the organisations that cooperate with them present their activities to families and citizens, and the "Feste della Partecipazione", a series of events held between the end of September and the first half of October 2019 by the primary and intermediate schools of the neighborhood to promote the participation of families to the schools' life. In each of these event Fondazione della Comunità di Mirafiori have organized gardening workshops for the kids. The educational activities have been promoted through the publication of a leaflet with the different activities organized by Fondazione Mirafiori and partners for the schools of the neighborhood, with dedicated pages to proGIreg activities and *Batti il 5* activities respectively. All these events and the activities of the school gardens have also been communicated through the Facebook page of Fondazione Mirafiori, https://www.facebook.com/fondazionemirafiori/

6. State of Play and Monitoring	
Current situation (to be updated)	As stated above (section 4), all co-design workshops have been held and all but one school container gardens have been installed. The educational activities started in school year 2018/2019 and the second year activities were being conducted when the schools were shut down at the end of February 2020. Activities resumed at the end of February 2021. Eight school gardens have been installed. Three types of wooden boxes have been used, two on the floor (the smaller ones 60x80x40 cm, the larger 120x80x40 cm) and one raised, that allows people on wheelchair to access them. The educational activities will cover 3 full schoolyears (originally planned: 2018/19, 2019/20, 2020/21, extended to part of the 2021/2022 year due to the Covid-19 lockdown).
Next steps **(to be updated)**	The activities for school year 2020/2021, as well as the implementation of the school garden of "Polo dell'Infanzia" kindergarden have been planned together with the teachers as soon as it was made clear by the authorities how the school activities would take place to comply with the Covid-19 measures.
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	The most critical issue at the moment is the Covid-19 epidemic and the related shut down of schools. Given the specific nature of the educational activities related with the school gardens, it has been decided not to convert the activities into online courses, as it would seriously reduce their impact. Instead, it has been decided to postpone them, adding a new school year. In case of a new, prolonged shut down, it will be necessary to adapt the activities to distance learning. Another issue is the maintenance of the school gardens during the summer, when the schools are closed. During the first summer the maintenance has been conducted by Fondazione Mirafiori staff with the cooperation of non-teaching staff; the plan is to involve more the families of the pupils in the next years, but the right balance between the desire to engage more people and the necessity of clearly identify a limited number of persons authorized to access the school premises has to be achieved. Update June 2021: activities in schools with pupils resumed, while it is still not possible to involve families as access to schools is limited and social distancing is in force.
7. NBS maintenance and outlook	
Maintenance	During the progress of proGIreg, Fondazione Mirafiori staff will gradually hand over the maintenance of the gardens to teachers, non-teaching staff and families. We plan to form a group of volunteers and accompany them towards a sustainable management of the gardens.
Sustainability after project conclusion	The school container gardens and the educational activities linked to them are part of Fondazione Mirafiori strategy and continuous effort to support the schools of the neighborhood. The goal is to give to the schools the instruments to autonomously manage the project, but Fondazione Mirafiori will support them after the conclusion of proGIreg if needed.

Additional resources	https://www.facebook.com/fondazionemirafiori/ Further documentation has not been published but is available upon request.

3.5: Micro vegetable gardens (OrtoMobile)

	
1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	“OrtoMobile” - Micro vegetable gardens in box
Brief project synthesis	The urban laboratory “OrtoMobile” promote by ITER - City of Turin that has as its common thread " micro garden in box" interpreted as a unit minimum of "Natural Based Solution" easy to implement for all ages, with high degrees of socialization, both in the classroom and at home, with considerable potential for composition that enables the realization of simple and effective installations of indoor and outdoor areas in the schools. The action provides: • The realization of a practical course for teachers to learn how to make a "vegetable garden in a box" • The supply to the classes by the ITER LabCS of a kit composed of: suitable cassettes to the realization of the individual modules of "micro gardens", seeds (with particular attention to those suitable for pollination), potting soil, small tools, garden care manual. • The organization by ITER's LabCS of events for the composition of the set-ups inside schoolyards and/or on public space of formed "collective gardens" by assembling the different modules of "micro vegetable garden", designing formal compositions and different colors depending on the creativity expressed and the places adopted. One of the objectives is to create small ecological corridors to facilitate the processes of pollination. • At the end of the events and the setup period will be organized on space the "OrtoMobile Marketplace", which will also collect schools that have developed the experience of caisson gardens with the aim of promoting the activity realized in proGIreg and to raise small funds to support the "OrtoMobile" project.

Area of implementation	Scuole dell'Infanzia: • Circolo Didattico 33, Mirafiori Nord, • Circolo Didattico 33, Elvira Pajetta, • Circolo Didattico 33, Cento fiori, • I.C. "A. Cairoli", La Giostra, • I.C. "G. Salvemini", Mariele Ventre • I.C. "G. Salvemini", Str. Castello Di Mirafiori • Privata Paritaria, Margherita Mirafiori, • Scuole Primarie: • C.D. "Carlo Collodi • Scuola Engim
Target groups (beneficiaries)	The first beneficiaries are: teachers and students from primary and secondary schools. Moreover, it involves students with disabilities from a vocational school. Indirect beneficiaries are: households involved by students in activities both in schools and at home, dwellers who will take part in outdoor public markets set up by schools and cultural and educative stakeholders from the local community.
Timing (start and end date)	Start: October 2019 Stopped by Covid-19: March 2020 End: June 2021 (planned)
Main responsible partner	ITER - Institution for a Reliable Education (City of Turin)
ProGIreg partners involved	Fondazione Mirafiori
Other stakeholders involved	• Circolo Didattico 33 • I.C. "A. Cairoli • I.C. "G. Salvemini" • Privata Paritaria, Margherita Mirafiori • C.D. "Carlo Collodi • Scuola Engim • Osservatorio d'Area di Mirafiori Sud • POLITO - Denerg
Total Budget	25.000 € (proGIreg)
2. Pre-implementation activities	

Planning and preparatory activities	The strategy identified to plan educational activities in proGIreg is oriented with a "Learning Cities" approach, which foresees the active involvement of the whole local educational system: starting from the school communities and then extending to groups of citizens (organized or not) engaged in information, training and co-designing paths in a logic of lifelong learning and peer education. The objectives of the educational activities coordinated by ITER of the City of Turin can be summarized as follows: • To promote the active role of the local educational system for the entire duration of the project by consolidating, through co-planning processes, the protagonism of the school communities in order to give continuity to the experience and make schools a point of reference on environmental, cultural and socio-economic issues related to the concept of Green Cities. • To contribute to the development of the co-design process and the definition of the management models of the Natural Basic Solutions (NBS) foreseen in the project, evaluating the possible activation of Collaboration Pacts as foreseen by the Regulation of Common Goods adopted by the City of Turin. • Modelling in the Mirafiori area a school acting as a Civic Centre: a public structure open to the territory, recognized as one of the territorial centralities where to develop dissemination/training activities foreseen in the project, also as one of the hubs of a possible living lab spread throughout the territory on Green City issues. • Enhance the educational projects already active in the area and support the creation of initiatives that can be born as a spontaneous expression of the territory. • Identify and establish ways of connection and forms of collaboration with local partners starting from the activation of a continuous relationship for the entire duration of the project with the Area Observatory table. The "OrtoMobile" project is part of this general strategy and is born from the "Educational co-designing table" set up for proGIreg and bringing together the stakeholders active in the educational sector present in the Mirafiori Sud Area Observatory.
Administrative procedures	ITER is a task body of the Educative Service of the City. Its regulation relies on public administrative law.
Technical and social analysis	'Orto Mobile' activity was born from the ITER experience in community garden projects inside schools of the City of Turin. This involvement methodology of school communities on green issues has been shaped in the framework of proGIreg and shared by local stakeholders in 'Co-designing educational table'.
Other activities	• Link with the project “Didactic box gardens” (3.06) • Participation in the 'Spring party of Mirafiori Sud'

3. Management structure and responsibilities	
Main partner (coordinator) and role/function	ITER - Institution for a Reliable Education (City of Turin) Coordination
2nd Partner and role/function	Mirafiori Foundation for the management of educational and co-design activities which have been involving the educational system of the neighborhood. Fondazione Mirafiori per il coordinamento delle attività educational e di co-design che vedono coinvolto il sistema educativo locale
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	ITER proposes an initial training experience for teachers to train them in the creation of "micro gardens in boxes". With the guidance of a technician with great experience in the field, the groups of teachers are involved in very practical activities in order to be able to transfer the experience also to the class groups that will realize the NBS micro modules. The second phase of co-design provides for the accompaniment of the experience at the individual schools, from the educational point of view, involving the whole school community and composition for the realization of "mobile gardens" built with the micro modules of NBS, to obtain green installations inside school yards or in public spaces. The third phase of co-design offers support to the school communities to organize, communicate and set up the "OrtoMobile Marketplace" which, in addition to publicly conveying the initiative, is also an opportunity to meet other partners and stakeholders of proGIreg and fund raising with the sale (free offer) of the products made. Monitoring phase of the experience carried out involving all parts of the community involved: teachers, students, families. The co-implementation phase is foreseen through the support to the replicability of the experience by publishing a "manual" that collects all the information necessary to replicate the actions in an autonomous way.
Notes on major achievements/success factors/critical issues/barriers	**Major achievements:** • Creation of a network of schools working simultaneously on the same objective. or identified in proGIreg • Active involvement of 30 pre-school and primary school teachers • Active involvement of 568 students, of whom 462 from nursery schools, 94 from primary school,

related to engagement process	• Involvement of a community of disabled people in the vocational training school. • Collaboration with the Mirafiori Foundation for the coordination of all educational activities proposed in proGIreg • Establishment of the "Educational Table" within the Mirafiori Sud Area Observatory, to govern the actions of the proGIreg project. **Critical issues/barriers:** • How to get involved and organizational timing to activate such a large community. • Establishing effective forms of communication • Fluidity over time of the composition of school communities • Complex public procurement procedures for the purchase of supplies • Effective experience monitoring system
Current situation and next steps **(to be updated)**	**Current situation:** • Awareness and information activities were carried out to identify all the stakeholders affected by the actions. • Preliminary meetings with the teacher-reference groups for each school plexus were carried out • Start public purchasing procedures for the equipment made available to school groups • Start teacher training activities • Training stopped in February 2020 due to the Covid-19 emergency **Next step:** ● Resumption and conclusion of training activities ● Purchase and distribution of material to all school groups involved ● Realization by the school groups of the micro-gardens in boxes ● Co-design meetings for the composition of mobile gardens ● Organisation of the OrtoMobile Marketplace ● Social monitoring activities with stakeholders involved and environmental monitoring with the POLITO - Denerg
5. Other activities	
Synergies with other proGIreg activities	
Links with other external project or activity	● Project of School-Job with the 'Primo Levi' Institute ● Research grant with the Politecnico of Turin - Denerg for the environmental monitoring

	• Progetto Too(l)Smart, environmental monitoring by sensors in Mirafiori Sud area
Business model	
Technology Readiness Level (TRL)	
Communication activity	
6. State of Play and Monitoring	
Current situation (to be updated)	• Awareness and information activities were carried out to identify all the stakeholders affected by the actions • Preliminary meetings with the teacher-reference groups for each school plexus were carried out • Start public purchasing procedures for the equipment made available to school groups • Start teacher training activities • Training stopped in February 2020 due to the Covid-19 emergency
Next steps (to be updated)	• Resumption and conclusion of training activities • Purchase and distribution of material to all school groups involved. • Realization by the school groups of the micro-gardens in boxes • Co-design meetings for the composition of mobile gardens • Organisation of the OrtoMobile Marketplace • Social monitoring activities with stakeholders involved and environmental monitoring with POLITO - Denerg
Notes/critical issues/barriers (to be updated) (link to WP5)	• How to get involved and organizational time to activate such a large community • Establishing effective forms of communication • Fluidity over time of the composition of school communities • Complex public procurement procedures for the purchase of supplies • Effective experience monitoring system
7. NBS maintenance and outlook	
Maintenance	The simplicity of the cassette gardens does not pose any maintenance problems. The NBS micro modules can be reused several times by recovering containers and culture soil.

	The compositions of "mobile gardens" are easily maintainable and can be quickly disassembled and reused in other situations.
Sustainability after project conclusion	At the end of the project the adaptability of the system will guarantee the sustainability from economic, social and environmental viewpoints.
Additional resources	

3.6: Community school gardens

1. General information

Compilation date and update	June. 2021 - third draft version
NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	Community school gardens
Brief project synthesis	Within the framework of proGIreg, a School-Work Alternance Agreement has been activated between ITER - City of Turin and the Istituto Superiore Primo Levi to realize a project dedicated to the themes and purposes of proGIreg. The objective of “Community school gardens” project is the development of the following activities: ● knowledge of soil composition ● creation of an educational garden inside the school ● support for the creation of collective urban gardens with a social ethical function which need to specific forms of maintenance and management, as a form of adoption of public space ● experimenting with the role-playing game "Green Surge City" provided by the proGIreg project ● peer to peer" experiences of tutoring students of the same age or from primary or secondary schools Participants and programme: The course will involve 4 classes and will provide training modules and practical experience on: ● training course for the creation and care of an educational vegetable garden in a box implanted in the schoolyard for which ITER will provide all the necessary equipment (chests, soil, seeds, equipment) ● initial event and laboratories dedicated to a network of sensors for monitoring environmental variables such as relative humidity, temperature and air quality that have been installed in school plexuses of Mirafiori area. The students will measure themselves with a "Sensor self-construction kit", with the data collection platform and with the implementation of the sensor network ● participation in 3 thematic workshops, "Environmental monitoring" and "The new soil flowerbed" conducted by the Chlorophyll Coefficient Association, "Green Solutions" conducted by the DIATI del Polytechnic Turin ● visit to OPEN 11 "Youth Mobility and Interculture House" conducted by the Environment Service of the City of Turin

	● public return of the experience on the occasion of the "Spring Festival" of Mirafiori ● participation in the edition of "Torino Porte Aperte" with the special project "Adopt a Neighbourhood".
Area of implementation	Istituto Superiore Primo Levi GPS coordinates: 45.019397, 7.629588.
Target groups (beneficiaries)	High school teachers and students
Timing (start and end date)	Start: October 2019 Stopped by Covid-19: March 2020 End: June 2021 (planned)
Main responsible partner	ITER, Institution for a Reliable Education (City of Turin)
ProGIreg partners involved	- Orti Generali - Associazione Coefficiente Clorofilla - Fondazione Mirafiori - POLITO - DIATI
Other stakeholders involved	Osservatorio d'Area di Mirafiori Sud POLITO - DENERG
Total Budget	ProGIreg funds: 15.000 €
2. Pre-implementation activities	
Planning and preparatory activities	The strategy identified to plan educational activities in proGIreg is based on a "Learning Cities" approach, which foresees the active involvement of the whole local educational system: starting from the school communities and then extending to groups of citizens (organized or not) engaged in information, training and co-designing paths in a logic of lifelong learning and peer education. The educational goals defined by ITER and the City of Turin are:

	• Promoting the active role of the local educational system for the entire duration of the project by consolidating, through co-design processes, the protagonism of the school communities in order to give continuity to the experience and make schools a point of reference on environmental, cultural and socio-economic issues related to the concept of Green Cities • Developing co-design process to define the management models of the Natural Basic Solutions (NBS) foreseen in the project. This might be achieved by setting Collaboration Pacts as foreseen by the Regulation of Common Goods of the City of Turin • Modelling in the Mirafiori area a school that acts as a Civic Centre: a public structure open to the territory, recognized as one of the territorial hubs. It has to host dissemination/training activities foreseen in the project, to create the conditions for a possible living lab spread throughout the territory on Green City issues • Enhancing the educational projects already active in the area and supporting the creation of initiatives that can arise as a spontaneous expression of the territory • Identifying and establishing ways of connection and forms of collaboration among local partners starting from the activation of a continuous relationship for the entire duration of the project with the Area Observatory table. The project 'School gardens' is part of the wider proGIreg strategy and has its roots in a co-production project designed by Istituto Superiore Primo Levi.
Administrative procedures	ITER is part of the Educational Service of the City of Turin, hence its rules and management are based on public administrative regulation.
Technical and social analysis	The "Community school gardens" activity is the result of ITER's experience gained over the years with schools in Turin and developed for three years with the "Slow Food" association, which has allowed the consolidation of intervention methodologies and techniques. This methodology of involving school communities on green issues has been redesigned by proGIReg and shared with the Istituto Superiore Primo Levi.
Other activities	Link with the "Micro vegetable gardens" project (NBS 3.05) Participation in the Spring Festival of Mirafiori Sud Participation in the edition of "Torino Porte Aperte" with the special project "Adopt a Neighbourhood"
3. Management structure and responsibilities	

Main partner (coordinator) and role/function	ITER - Institution for a Reliable Education (City of Turin) Coordination
2nd Partner and role/function	Istituto Superiore Primo Levi
3rd Partner and role/function	POLITO
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	ITER proposes a training course dedicated to high school students aimed at the creation and care of a community school garden in the schoolyard. The co-designing phase entails the definition of the activities with the school representatives followed by a workshop with the students involved in the projects. The second phase of student involvement includes a series of workshops focused on some of the issues addressed in proGIreg: environmental monitoring, the "new soil", green solutions (NBS). The workshops are conducted by experts from partners of the proGIreg project, in addition, it has organized a visit to OPEN 11 "Youth Mobility and Interculture House" conducted by the Environment Service of the City of Turin to learn about a "green" experience dedicated to young people. The third phase of co-design foresees a practical training of the group of students on two different actions: ● learning laboratory aimed at realizing and monitoring a community school garden ● laboratory focused on the management of sensors of environmental data collection provided by proGIreg. These sensors will enhance the ongoing network placed on some of the schools of Mirafiori Sud by the project 'Too(l)Smart' The monitoring phase is carried out by involving all parts of the community involved: teachers, students, experts, stakeholders, through direct observation, questionnaires and interviews. The co-implementation phase is foreseen through the signing with the school community of a "pact of collaboration" that defines the management and development of the experience, guaranteeing the protagonism of children.

Notes on major achievements/success factors/critical issues/barriers related to engagement process	Major achievements: ● Creation of environmental awareness in a community of young people active in proGIreg ● 8 high school teachers actively involved ● More than 100 students from the three years of high school actively involved ● Collaboration with the Mirafiori Foundation for the coordination of all educational activities proposed in proGIreg ● Collaboration with the experts of the proGIreg partners of the Chlorophyll Association and DIATI of POLITO ● Collaboration with "Casa della mobilità giovanile e della intercultura" and with the Environment Service of the City of Turin ● Establishment of the "Educational Table" within the Mirafiori Sud Area Observatory, to govern the actions of the proGIreg project Critical issues/barriers: ● Effective strategies for involving a youth community (15/18 years old) and organizational timing consistent with the school organization. ● Establishing effective forms of communication ● Definition of the "cooperation pact" for the co-management phase ● Fluidity over time of the composition of the school community, especially in the co-management phase ● Complex public procurement procedures ● Effective experience monitoring system
Current situation and next steps **(to be updated)**	Current situation: The cognitive and informative activity has been carried out to identify all the stakeholders affected by the actions Preliminary meetings with the referring teacher groups were carried ou Start-up workshop with groups of students carried out Start public purchasing procedures for the equipment made available to school groups Training and workshops were discontinued in February 2020 due to the Covid-19 emergency Next step: ● Resumption and conclusion of training activities and workshops ● Purchase and distribution of the material to all school groups involved. ● Realization by the school groups of the community school garden ● Create "peer to peer" moments to disseminate the experience in other school communities ● Co-design meetings to define the "pact of collaboration" and the management and opening to the territory of the plant ● Organisation of public events designed by youth groups ● Social monitoring activities with the stakeholders involved and environmental monitoring with POLITO - Denerg
5. Other activities	
Synergies with other proGIreg activities	

Links with other external project or activity	Research grant with POLITO - Denerg for environmental monitoring activities Too(l)Smart project, activation of an environmental monitoring network in the Mirafiori Sud area "House of youth mobility and interculture - OPEN 011" of the City of Turin
Business model	
Technology Readiness Level (TRL)	
Communication activity	
6. State of Play and Monitoring	
Current situation (to be updated)	The cognitive and informative activity has been carried out to identify all the stakeholders affected by the actions Preliminary meetings with the referring teacher groups have been carried out Start-up workshop with groups of students has been carried out Start public purchasing procedures for the equipment have been made available to school groups Training and workshops were discontinued in February 2020 due to the Covid-19
Next steps (to be updated)	Resumption and conclusion of training activities and workshops Purchase and distribution of material to all school groups involved. Realization by the school groups of the community school garden Peer to peer moments to disseminate the experience to other school communities. Co-design meetings to define the "pact of collaboration" and the management and opening to the territory of the plant Organisation of public events designed by youth groups Social monitoring activities with the stakeholders involved and environmental monitoring with the POLITO - Denerg
Notes/critical issues/barriers (to be updated) (link to WP5)	• Effective strategies for involving a youth community (15/18 years old) and organizational timing consistent with the school organization. • Establishing effective forms of communication • Definition of the "cooperation pact" for the co-management phase • Fluidity over time of the composition of the school community, especially in the co-management phase • Complex public procurement procedures • Effective experience monitoring system

7. NBS maintenance and outlook	
Maintenance	Signing of a 'collaboration deal' with the school community and other stakeholders to define the conditions of use
Sustainability after project conclusion	The suitability of 'community school gardens' avoids potential threats in terms of environmental/social economic sustainability in the long period
Additional resources	

3.7: Gardens around the houses

1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Community-based urban farming and gardening on post-industrial sites
NBS title	Gardens around the houses
Brief project synthesis	The action consist in the installation of wooden boxes for urban horticulture on public space in the South Mirafiori district, with the aim of improving the urban quality and quality of life in the areas, stimulating the active participation of citizens in the processes of urban transformation, creating opportunities for aggregation and cooperation among citizens on the issue of environmental sustainability and urban horticulture, technological and social innovation, care and sharing of common goods. The number of the planned boxes to be installed has been increased thanks to the contribution of the Turin City District 2 administration, within the project *"L'orto tra le case"* (The garden among the houses). A total of 20 wooden boxes for vegetable gardens are planned to be positioned (three types of wooden boxes will be used, two on the floor - the smaller ones 60x80x40 cm, the larger 120x80x40 cm - and one raised, that allows people on wheelchair to access them), in two public spaces of the South Mirafiori district, plus smaller installations in the yards of public buildings managed by non-for-profit organisation (one center for refugees, one center for kids and teenagers, one center for disadvantaged families), that have been added, as preparatory, support and engagement actions, during the months of delays caused by the administrative procedures for the installation of the boxes in the two public spaces mentioned. Update June 2021:budget management has allowed to install a few more wooden boxes in non-for-profit managed spaces, and also to create some areas in the ground and in small containers.

Area of implementation	- **Centro Mirafleming**, a community centre for children and teenagers managed by a group of non-for-profit organisations (Cooperativa Mirafiori, Cooperativa l'Arcobaleno and Associazione Arcobaleno) that offers a wide array of activities. It is located in via Fleming 19/c - Turin. GPS coordinates: 45.016525, 7.635449 Two wooden boxes 60x80x40 cm have been installed. - **Casa del Mondo**, a community centre that hosts refugees (males, adults), managed by Progetto Tenda.Two raised boxes, 120x80x20 cm, raised to an height of 70 cm, have been installed. - **Crescere Insieme,** a community centre managed by Associazione Crescere Insieme, hosts disadvantaged families, offers activities for families and children and also distributes food to people in need. A minimum of two wooden boxes 60x80x40 cm will be installed and a vegetable garden in open ground will be reactivated in the centre garden (the number of boxes could be increased if Covid-19 emergency issues will make more feasible to install here also part of the boxes planned for via Roveda public garden). - public space of via **Morandi 6** (back of Villa Scintilla) - Turin. GPS coordinates 45.013953, 7.633208 It is a small pedestrian space on the back of a 19th century mansion surrounded by social housing buildings, in the vicinity of a centre for elderly people. Ten wooden boxes 120x80x40 cm will be installed. - **public garden** of via Roveda 35/1 (elevated area) - Turin. GPS coordinates 45.020615, 7.606504 This container garden has been placed on a small hill with a concrete pavement inside a public garden. The garden is next to a social housing building and it is perceived as neglected and unsafe.).Ten wooden boxes, of which two raised, have been installed in May 2021 together with volunteers and inhabitants.
Target groups (beneficiaries)	- Mirafleming: kids age 6-14 and their educators and families - Casa del Mondo: male adult refugees and their educators - Crescere insieme: disadvantaged families hosted in the centre and people of the neighbouring area - via Roveda and via Morandi public areas: all the citizens of the neighbourhood willing to participate.
Timing (start and end date)	First co-design workshop has been held on the 19/2/2019. End date of the accompanying activities is foreseen in May 2022 (provisional date, depending on Covid-19 evolution).
Main responsible partner	Fondazione della Comunità di Mirafiori

ProGIreg partners involved	(Linked Third Party) Associazione Miravolante - involved in the co-design and co-implementation of the gardens. City of Turin - administrative procedures and authorisations
Other stakeholders involved	ATC - Agenzia Territoriale per la Casa: it is the institution responsible of public social housing - involved in the preliminary activities for identifying the areas - owner of the area of the public garden in via Roveda. Cooperativa Mirafiori, Cooperativa l'Arcobaleno and Associazione Arcobaleno - non-for-profit organizations managing Mirafleming centre Progetto Tenda - non-for-profit organization managing Casa del Mondo Associazione Crescere insieme - non-for-profit organization managing Crescere insieme centre near via Roveda public garden
Total Budget	ProGIreg funds: 32.000 € District 2 of the City of Turin - L'orto tra le case project: 2.800 €
2. Pre-implementation activities	
Planning and preparatory activities	The preliminary phase of identifying the areas where the container gardens could be created started in June 2018, with meetings between Fondazione Mirafiori and ATC and between Fondazione Mirafiori and City of Turin District 2. The meetings with District 2 led to the submission, in October 2018, of the project "L'orto tra le case" which has been funded with 2.800 € in order to increase the number of wooden boxes. On-site inspections have been conducted around the South Mirafiori district in the months of August, September, November and December 2018, also with officers of the District administration, in order to identify suitable areas. At the end of the process, the two areas of via Morandi and via Roveda have been identified. The first meeting with citizens was held on February 19th, 2019 at the elderly centre in via Morandi (one of the candidate areas is located in the immediate vicinity). The project was presented and co-planning was started through activities (cognitive mapping, collages) that allowed to detect the expectations and predispositions of the participants regarding the urban horticulture activity, to visualize the different proposals regarding the cultivations to be realized, to discuss ideas regarding the problems and possible solutions related to the management of the garden. During the rest of the year 2019 Fondazione Mirafiori, the City of Turin, the District 2 and ATC have been working to the administrative procedures (see below). In the months of June and July 2019, in order to start spreading the concept of container gardening and activate groups of citizens that could participate in the future activities, small container gardens have been installed in Mirafleming (near via Morandi) and in Casa del Mondo (near via Roveda). Gardening workshops have been held in Mirafleming in June, July, October

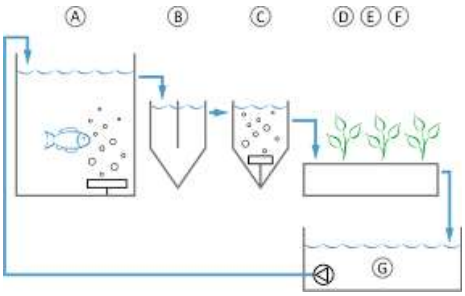
	and November. A series of biweekly workshops was scheduled to take place in Crescere Insieme and via Roveda public garden from the end of January to the end March, to be concluded with the installation and inauguration of the container garden. Unfortunately, the series of workshops has been interrupted after the third meeting by the outbreak of Covid-19. The installation of the wooden boxes eventually took place in May 2021.
Administrative procedures	• First of all it was sent to the Municipality an application for authorization to install wooden boxes for urban horticulture on the two areas identified. • The answer from green department was that was needed a "pact of collaboration" in compliance with the "commons" ("*beni comuni")* regulation of the City. • Fondazione presented the pact of collaboration, but it was blocked in "circoscrizione 2" offices (district 2 offices of Municipality) • The innovation department tried to help the installation of boxes asking another authorization from "public soil" office, but the procedure never finished. • It was discovered that the area of via Roveda public garden is not owned by the city but by ATC (social housing company): they gave authorisation after a request of Fondazione Mirafiori • Currently the pact of collaboration for is blocked by Covid-19 lockdown but it is quite ready in "Circoscrizione 2 "offices
Technical and social analysis	The choice of the areas has been made by considering the following criteria: - availability of water in the vicinity; - exposure to the sun; - concrete or asphalt pavingin order to increase the green availability by installing the container gardens, instead of covering an existing green area; - vicinity to social housing complexes; - presence of active group of citizens in the vicinity; - preference to neglected areas in need of maintenance and care, in order to maximize social benefits. The technology (i.e. container gardening) has been chosen in order to avoid possible risks related to the soil contamination. Different kinds of boxes available on the market have been taken in consideration, and the most suitable and cost-effective have been proposed to the stakeholders during the codesign activities.
Other activities	
3. Management structure and responsibilities	

Main partner (coordinator) and role/function	Fondazione Mirafiori / Linked Third Party Associazione Miravolante: co-design, co-implementation, co-maintenance and accompanying activities
2nd Partner and role/function	City of Turin (authorisations)
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	- meetings with ATC and Circoscrizione 2 - joint on-site inspections with Circoscrizione 2 - co-design workshop with members of via Morandi centre for elderly people (19/2/2019) - co-implementation of Casa del Mondo container garden (July 23th, 2019) together with refugees hosted in the centre - co-implementation of Mirafleming container garden and workshops (11-18-25/6, 2-9-16/7, 11/10, 8-23/11/2019 - via Roveda / Crescere Insieme co-design workshops (25/1, 8-22/2/2020)
Notes on major achievements/success factors/critical issues/barriers related to engagement process	- Refugees in Casa del Mondo are interested in gardening, the two boxes are well maintained several months after the installation; they are also interested in sharing their products with their neighbors - activities in Mirafleming have been successful too - the workshops in Crescere Insieme have had a good number of participants (29), although it is not certain that all of them will take part in the gardening activities - the main critical issues have been the lockdown and the uncertainties related to the Covid-19 epidemic, on one side, and the delays in the administrative procedures, on the other
Current situation and next steps **(to be updated)**	All activities were blocked by Covid-19 lockdown; engagement activities, co-design, co-implementation, will restart when the Covid-19 measures will allow meetings and gatherings. Update: the vegetable garden of Crescere Insieme has been managed during the summer 2020 by Miravolante's staff in order to produce food for the activities of food distribution to people in need managed by Fondazione Mirafiori. Since October a small group of volunteers has been involved in the management of Crescere Insieme vegetable garden.
5. Other activities	
Synergies with other proGIreg activities	Via Morandi area is on the green corridor (NBS 6.1) and the paving of the area will be made permeable in the frame of NBS 6.1 implementation. The activities are similar to those of school container gardens and pollinator friendly garden, and an exchange of practices and experiences among the different groups of active citizens involved will be facilitated.
Links with other external project or activity	The gardens implementation has been integrated with the project “L’orto tra le case”. Possible links are currently taken into consideration with two other projects in

	Mirafiori: • "Tele-Coltura" a project carried out by OrMe, the network of urban gardens of Turin Metropolitan Area, will distribute to people in need toolkits for container gardening at home; we are planning to involve beneficiaries of proGIreg in this project and increase the number of toolkits; • Fondazione Mirafiori is active in several projects for the collection and distribution of food to people in need, and we are considering using part of the "gardens among the houses" to produce food to distribute; some of the beneficiaries of the food distribution could be involved in the maintenance of the gardens as well, enabling them to produce their own food.
Business model (link to WP5)	This NBS is not very business oriented, and the costs of maintenance of the gardens are quite low; the model will rely mainly on volunteer work and small fund-raising events organised together with the groups of active citizens involved.
Technology Readiness Level (TRL) **(link to WP5)**	*Starting TRL 7 - TRL to be achieved at the end of the project: 9*
Communication activity (link to WP6)	- 19/02/2019 the workshop "L'orto sotto casa" has been organised in via Morandi centre for the elderly people; - 1/06/2019 participation at the event ValletT'incontra, open day of the public health centre near via Morandi area, to present the project; - 15/06/2019, participation at "Eataly & OrMe", stand at the entrance of Eataly mall to present the project to customers interested in urban gardening activities; - Mirafleming workshops (see above): leaflets have been printed to communicate the project and the workshops to kids and their families; - 23/07/2019: "Coltiviamo l'arte" event in Casa del Mondo, presentation of the project and co-implementation of the container garden; leaflets have been printed and distributed in the area; - Crescere insieme workshops in January and February 2020 (see above): leaflets have been printed and distributed in the area; - all the events have also been communicated on the Facebook page of Fondazione Mirafiori, https://www.facebook.com/fondazionemirafiori/ and on the pages of local organisations involved.
6. State of Play and Monitoring	
Current situation (to be updated)	All the actions have then been delayed due to the procedure to obtain permits to place the boxes on public space; co preparation has been rescheduled, for via Roveda public garden. Co-design workshops have been interrupted again due to the Covid-19 pandemics. Wooden boxes in Via Roveda have eventually been installed in May 2021. As far as Via Morandi is concerned, we are currently waiting for the works of the Green Corridor task to be completed.

	- The wooden boxes in Mirafleming have been installed in June 2019; the wooden boxes in Casa del Mondo have been installed in July 2019 - wooden boxes for gardening have been installed in Mirafleming and Casa del Mondo, together with the relevant groups of citizens (kids and families and refugees respectively), and are co-maintened by them; – co-design and co-implementation activities for via Roveda garden are suspended due to Covid-19 The vegetable garden of Crescere Insieme has been managed during the summer 2020 by Miravolante's staff in order to produce food for the activities of food distribution to people in need managed by Fondazione Mirafiori. Since October a small group of volunteers has been involved in the management of Crescere Insieme vegetable garden. Update June 2021: engagement activities restarted during the spring 2021, with small groups of citizens in order to respect social distancing.
Next steps **(to be updated)**	- co-design and co-implementation activities for via Roveda garden have restarted in May; wooden boxes will be installed in Crescere Insieme in July; the exact number of boxes to be installed in via Roveda garden is ten. – co-design and co-implementation activities for via Morandi planned for Spring 2021, in parallel with green corridor NBS. Update 2020: if the pandemic evolution allows it, in the spring 2021 we will continue to engage citizens in Crescere Insieme garden activities, and in the installation of via Roveda container garden, always in small groups in order to avoid gatherings prohibited by Covid 19 restrictions. co-design and co-implementation activities for via Morandi, planned for Spring 2021, in parallel with green corridor NBS, have been delayed due to delays in the implementation of the Green Corridor actions.
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	The main critical issues have been the lockdown and the uncertainties related to the Covid-19 epidemic, on one side, and the delays in the administrative procedures, on the other. Update: the main factor of uncertainty is still the Covid-19 pandemic. For via Morandi, another factor is the completion of the works for the green corridors
7. NBS maintenance and outlook	
Maintenance	After the end of proGIreg the NBS will be mantained by the group of volunteers formed during proGIreg.
Sustainability after project conclusion	This NBS is connected with Fondazioni Mirafiori strategy on food and agriculture, with the Slow Food “Comunità del cibo di Mirafiori”, and with OrMe, the network of urban gardens of Turin Metropolitan Area
Additional resources	https://www.facebook.com/fondazionemirafiori/ Further documentation has not been published but is available upon request

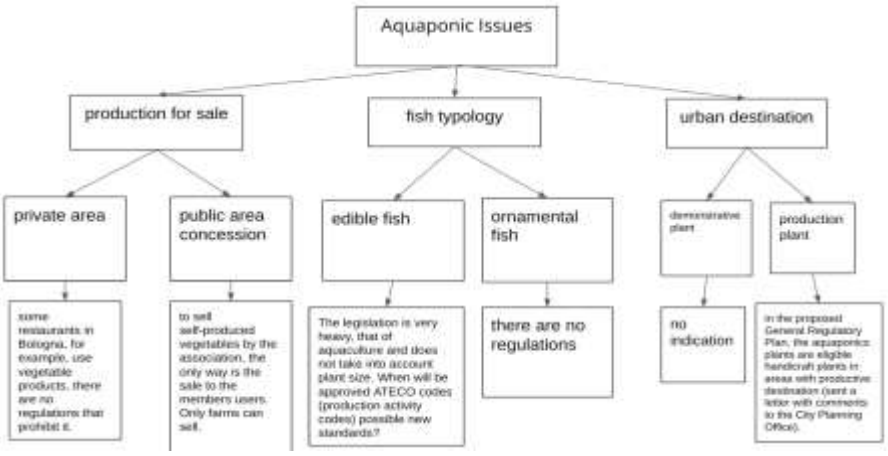
4.1: Aquaponics test system



1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Aquaponics as soil-less agricolture for polluted sites
NBS title	Aquaponics test system
Brief project synthesis	The City of Turin, within the project proGIreg and through the European Funds and Innovation Service intends to select subjects interested in co-developing and testing in real conditions innovative solutions in the field of technology called aquaponics, in order to assess the potential access and market sustainability as well as the related positive effects on the communities of reference. In particular, we are looking for solutions that can allow an economic sustainability as well as promote the dissemination of new technologies related to urban agriculture and at the same time be able to respond to social challenges and quality of life in the target areas and promote the enhancement of social exchanges and the inclusion of vulnerable population groups.
Area of implementation	The city decided not to identify a priori the location of the aquaponics plant but to provide a call for tenders with incentives for private companies or associations to carry out two demonstrative tests of aquaponics. The announcement will be published at the end of May 2021. A demonstration plant will be placed in Mirafiori, another plant in a central place in the city for dissemination and replication purposes.
Target groups (beneficiaries)	The beneficiaries of the contribution will be private companies or associations. The final target of the dissemination and dissemination actions will be the citizens.

Timing (start and end date)	Start: May 2021- End: December 2021
Main responsible partner	City of Torino
ProGIreg partners involved	
Other stakeholders involved	
Total Budget	20.000 euro proGIreg funds

2. Pre-implementation activities

Planning and preparatory activities	Initially the city had thought to place an aquaponics plant in a public area. Following the consultation of partners and stakeholders, however, was not identified a community 'able to maintain the plant. Therefore, the city decided to make a call for tenders with incentives for private individuals who identify an area for the construction of the plant and who are responsible for the management and maintenance of the plant over time. The plant will therefore be privately owned. After a discussion with the environmental department of the city of Turin, it was decided to realize two small demonstration plants: one in the Mirafiori district and one in the city center to facilitate communication and project replication. The city has deepened the issues related to the regulations for aquaponics plants in Italy in order to identify economic and administrative barriers: 

Administrative procedures	The administrative procedure will be that of a call for incentives to private companies and associations. This administrative model has already been applied in Torino City Lab.
Technical and social analysis	
Other activities	
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Torino
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	The city conducted a dialogue with partners and stakeholders already involved on proGIreg in order to identify a location and entity that could build an aquaponics facility. No one was willing to take on and follow the management and maintenance of the plant, so the city has chosen not to identify a priori the place and the subject but to open a call for private participation.
Notes on major achievements/success factors/critical issues/barriers related to engagement process	
Current situation and next steps (to be updated)	
5. Other activities	

Synergies with other proGIreg activities	*)*
Links with other external project or activity	*https://akuaduulza.wordpress.com/* *https://www.torinocitylab.it/it/urbanaquafarm*
Business model (link to WP5)	
Technology Readiness Level (TRL) **(link to WP5)**	
Communication activity (link to WP6)	
6. State of Play and Monitoring	
Current situation (to be updated)	The public tender was been launched by June 2021, and it will be open until July 2021
Next steps **(to be updated)**	After the proposal evaluation, the plan is to assign the works by September 2021
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	
7. NBS maintenance and outlook	
Maintenance	
Sustainability after project conclusion	
Additional resources	

5.1: Green roof at Casa nel Parco

1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Capillary GI on walls and roofs
NBS title	Green roof on Casa nel Parco
Brief project synthesis	New Access to Green Roof on top of “Casa del Parco”: realization of the physical access and the improvement of the already existing green roof at Casa del Parco, with the aim to improve its use by citizens, even disabled and aged people. The new access to the green roof at Casa del Parco will allow to use this NBS by all for recreational activities.
Area of implementation	GPS coordinates: 45.013616, 7.648410
Target groups (beneficiaries)	The users of Casa del Parco and the neighbors
Timing (start and end date)	September - November 2018
Main responsible partner	City of Turin

ProGIreg partners involved	Fondazione Mirafiori
Other stakeholders involved	
Total Budget	29.316,97 euro
2. Pre-implementation activities	
Planning and preparatory activities	
Administrative procedures	Project and tender conducted by the City of Turin
Technical and social analysis	
Other activities	
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Turin
2nd Partner and role/function	Fondazione Mirafiori
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	Intervention is the outcome of the co-design phase and stakeholder engagement carried out within WP2. These minor changes will affect positively the work in Turin Living Lab management: indeed, these new interventions respond to new needs/challenges detected within the co-design phase. This will then improve the sense of ownership/community of our NBS living lab, which is one of the objectives of the project (co-design and inclusion of local stakeholder). Also, they are perfectly in line with the overall project and living lab objectives, with a specific focus to inclusivity of vulnerable categories through NBS.
Notes on major achievements/success factors/critical	

issues/barriers related to engagement process	
Current situation and next steps	
5. Other activities	
Synergies with other proGIreg activities	
Links with other external project or activity	
Business model (link to WP5)	
Technology Readiness Level (TRL) (link to WP5)	
Communication activity (link to WP6)	
6. State of Play and Monitoring	
Current situation (to be updated)	
Next steps (to be updated)	
Notes/critical issues/barriers (to be updated) (link to WP5)	
7. NBS maintenance and outlook	
Maintenance	
Sustainability after project conclusion	
Additional resources	

5.2: Green wall indoor at school

1. General information	
Compilation date and update	June. 2021 – third draft version
NBS type	Capillary GI on walls and roofs
NBS title	Green indoor wall in a school
Brief project synthesis	The project foresees the preparation and construction of two green walls - intended as replicable examples in urban environments of Nature Based Solution (NBS) - to be placed in an atrium of the IC Cairoli School located in Via Torrazza Piemonte - Turin. Specifically, the project foresees the setting up of a green wall with dimensions of 20 square meters (school indoor) It will be positioned at a height between 0 and 3 m above the ground floor in a hallway corridor with a large roof-window. The botanical choice of the indoor wall will instead be agreed with the project group of POLITO, which is investigating in depth the issues related to the abatement of indoor contaminants due to the presence of vegetation. Moreover, on the occasion of specific didactic-disseminating circumstances, the presence of a technician may be required (for a maximum of 1 time per year) to illustrate the characteristics of the intervention, the structure set up and its possible applications.
Area of implementation	The area of implementation is a hallway corridor of the Cairoli primary school GPS coordinates: 45.019222, 7.608875

Target groups (beneficiaries)	Students, teachers, parents.
Timing (start and end date)	Start June 2019 then was blocked by Covid-19 End December 2021
Main responsible partner	City of Turin
ProGIreg partners involved	POLITO (DIATI)
Other stakeholders involved	
Total Budget	40.000€ (unique budget for NBS 5.2 and 5.3)
2. Pre-implementation activities	
Planning and preparatory activities	Several exploratory site visit has been conducted in order to analyze the features of indoor spaces, strengths and constrains. Preliminary meetings have been organized with the school administrator and teachers in order to explore their interest to the project and to establish a baseline to develop a place-based learning experience with students. Working inside a school is so important as we will start spreading knowledge about NBS with children, they will grow knowing the importance of plants in everyday life
Administrative procedures	As there are so many different technologies for green walls the City decided to do a pre-tender procedure (avviso esplorativo) to discover different way to do it as the amount was quite small (for the Italian market) the City had 4 answer with 2 different technologies. The City decided to do the tender for both technologies, and at the end, out of 4 only 1 applied and won.
Technical and social analysis	We did the pre-tender to have the chance to choose between different technologies and discover the most suitable for our project Several site visits have been conducted to assess the compliance of the selected space with mandatory technical and safety requirement.

Other activities	Place-based educational activities and experiential learning were organized and coordinated by POLITO (DIATI). The activities were designed based on regular curricula of the Ministry of Education in order to integrate and support the development of interdisciplinary skills. The collaboration with school's teachers was essential to schedule the activities that supported not only the learning of "science" disciplines, but also of the Italian language, civic education and social studies.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Turin (role/function) Administrative tasks and overall coordination
2nd Partner and role/function	POLITO for co-design and co-creation
3 rd Partner and role/function	UNITO (DBios and DISAFA) for plants choose
4. Co-design activities and stakeholder engagement	

Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	Co-design activities have been conducted in order to establish a set of guidelines and technical requirements essential to select the most appropriate technical solution. It must be easy to interact with and therefore to maintain the vegetation and the structure itself. The green wall's structure must be durable for several years and it should require minor interventions. A specific requirement concerns the opportunity for students to interact with plants installed into the green wall: the structure must avoid safety risk and should also invite students to change some plants keeping and improving the benefits of NBS itself. The implementation of specific lab activities involved students of different ages and classes to improve and develop knowledge concerning the benefits provided by plants and vegetation in the built environment. Several activities and meetings have been organized in order to spread basic knowledge about differences between varied plant species, plant physiology and plants care. Young students are invited to observe and recognize the plants' health status to be aware about how to take care of an indoor green wall and which environmental parameters can affect plants behavior and their growth. Direct observation and site exploration has been promoted and supported to understand technical features of the indoor living wall. While plants propagation techniques have been introduced to students.
Current situation and next steps **(to be updated)**	Site works ended in December 2020, everything was done in one week work, during Xmas holyday, when the school was closed to students and they coul find the green wall as a Xmas surprise. Educational and experiential labs with students are still active and coordinated by POLITO (DIATI) in collaboration with school administrator and teachers. The most of the activities have been conducted in face-to-face mode, while special contents were produced to support blended learning experience. Special materials for virtual consultation have been produced and distributed to teachers, students and their parents, in order to continue activities also during school lockdown due to restriction imposed by the Covid-19 pandemic issues. The activities will have a break during summer holyday and they will start again at the beginning of the new school year.
5. Other activities	
Synergies with other proGIreg activities	NBS 8.1 for plants choosing, and 3.4 School garden in box

Links with other external project or activity	Taking plants into indoor space means improving knowledge about plants that can lead to some new activities and teaching action about nature
Business model (link to WP5)	
Technology Readiness Level (TRL) **(link to WP5)**	
Communication activity (link to WP6)	The chosen firm would use this project to communicate the achievement of the NBS as a way of improving green quality in the city and green knowledge among citizen
6. State of Play and Monitoring	
Current situation (to be updated)	Maintenance is done by construction team, with 2 monitoring visits/month. Educational students labs are still active. Before the school's summer break, a closing activity has been organized into the school garden involving students and teachers of varied classes together thank to the relaxing of Covid-19 restrictions. Specific summer "homework" have been designed and realized by POLITO (DIATI) and distributed to students during the final activity.
Next steps **(to be updated)**	Questionnaires will be done by teachers and students for the WP4 and to assess users' satisfaction and to collect feedbacks concerning the user experience, positive aspects and main constraints. Works started by June 2020 in order to prepare questionnaires. ARPA analysis on air quality should start before and after planting
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	Covid-19 will change the way children could interact with experts, teachers. Social distance will chance the perspective of any human action inside a school building
7. NBS maintenance and outlook	
Maintenance	For 3 years it will be maintained by the company who won the tender.
Sustainability after project conclusion	Not yet, but NBS good practice should move and open up new attitudes about plants maintenance and respect

Additional resources	Plants were chosen to be easy to grow inside, not poisoning (for children), safe and beautiful. Marantha leuconera, Chamaedorea elegans, Pilea peperomioides, Chlorophytum comosus, Calathea amabilis, Calathea ornate, Calathea orbifolia

5.3: Green wall outdoor on a homeless dormitory

	
1. General information	
Compilation date and update	June. 2021 – third draft version
NBS type	Capillary GI on walls and roofs
NBS title	Green wall outdoor on a homeless dormitory

Brief project synthesis	Green wall mq 80 (outdoor made with self-supporting structure compared to the anchor wall). It will be positioned at a height between 0 and 3 m above the ground floor according to the instructions given at the time of setting up. In particular, as far as the outdoor equipment is concerned, a clear space between the green wall and the building is guaranteed to allow any future maintenance work on the facade. The outdoor walls outside the Corso Tazzoli building must be mounted on an independent structure and not resting on the building. As far as the outdoor installation is concerned, the botanical characteristics of these small seedlings can be chosen by the successful bidder according to the nursery experience gained, considering the aesthetic and chromatic elements to be obtained with the green wall, on the one hand, and on the other hand identifying nursery material able to attract pollinating insects (bees, bumblebees and butterflies). For the latter purpose, the following species are proposed as examples that can be defined with the scientific coordinators of the University of Turin who will follow the project directly during the preparation of the vertical panels: marjoram, scabiosa, thyme, yarrow, lavender, sedum, oregano, wild thistle, minnow, verbena, clover, aubrezia, violacacia, etc. The positioning of the green wall described in this way, is understood to include the irrigation system deemed most suitable by the manufacturer, in this regard it is specified that the Administration will prepare a water intake at a distance not exceeding 10 m from the point of preparation of the vertical wall. The contracting party is responsible for the final hydraulic connection as well as the preparation of a possible collection system for leaching water from the panels. The installation, as described above, must be prepared, built, set up and maintained - for the entire contractual period of three years from construction - by the contractor in accordance with the rules of the art and in compliance with the defined technical specifications. Moreover, on the occasion of specific didactic-disseminating circumstances, the presence of a technician may be required (for a maximum of 1 time per year) to illustrate the characteristics of the intervention, the structure set up and its possible applications.
Area of implementation	The dormitory for homeless people in Corso Tazzoli - Turin is a precast building, owned by the city and managed by a social cooperative GPS coordinates: 45.032972, 7.633774
Target groups (beneficiaries)	Homeless people
Timing (start and end date)	Sitework started and ended in November 2021
Main responsible partner	City of Turin
ProGIreg partners involved	POLITO

Other stakeholders involved	UNITO (DBios and DISAFA)
Total Budget	40,000€ (unique NBS 5.2 and 5.3)
2. Pre-implementation activities	
Planning and preparatory activities	A homeless dormitory with a concrete courtyard without green or trees, was the perfect place to give the people sleeping there at least a chance for a better environment.
Administrative procedures	As there are so many different technologies for green walls the City decided to do a pre-tender (avviso esplorativo) to discover different way to do it as the amount was quite small (for the Italian market) the City had 4 answer with 2 different technologies. The city decided to do the tender for both technologies, and at the end, out of 4 only 1 applied and won.
Technical and social analysis	We did the pre-tender to have the chance to choose between different technologies and discover the most suitable for our project
Other activities	
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Turin (role/function) Administrative tasks and overall coordination
2nd Partner and role/function	POLITO for co-design and co-creation
3 rd Partner and role/function	UNITO (DBios and DISAFA) for plants choose
4. Co-design activities and stakeholder engagement	

Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	Searching for a technology easy to maintain, so that can be an easy to cure wall, that can last for many years and is adapting in the years to come, where you can also change some plants keeping and improving the benefits of NBS.
Notes on major achievements/success factors/critical issues/barriers related to engagement process	As homeless were forced by covid restrictions to stay in the dormitory all day long, some of them choose to take care of plants, planting other vegetables plant in the courtyard and making the former grey place greener!
Current situation and next steps (to be updated)	Sitework started and ended in November 2021, as it was outside we did not bother people living inside (being in a covid strict rules period).
5. Other activities	
Synergies with other proGIreg activities	NBS8.1 for the plant choose
Links with other external project or activity	This NBS could inspire to upgrade the grey courtyard, adding some trees and green area to have a better place for outdoor living
Business model (link to WP5)	
Technology Readiness Level (TRL) (link to WP5)	
Communication activity (link to WP6)	The chosen firm would use this project to communicate the achievement of the NBS as a way of improving green quality in the city and green knowledge among citizen
6. State of Play and Monitoring	

Current situation (to be updated)	Maintenance is done by construction team, with 2 monitoring visits/month
Next steps (to be updated)	Regarding the homeless and caregivers participation in daily maintenance, the aim is to introduce the people, living and working in the shelter, to the care for the green wall; this involvement could be performed according to the inclusion and secondary homelessness prevention policy the cooperative carries out, and in the framework of occupational internships offered to homeless people.
Notes/critical issues/barriers (to be updated) (link to WP5)	Covid-19 will change the way people could interact with experts and gardeners and between them. Social distance will change the perspective of any human action but plants and a more attractive place can give people some more chance of a better way of life, even in a homeless dormitory.
7. NBS maintenance and outlook	
Maintenance	For 3 years it will be maintained by the company who won the tender. After, the cooperative who manage the center will maintain it (the city inserted the issue in the future tender for cooperatives)
Sustainability after project conclusion	NBS good practice should move and open up new attitudes about plants maintenance and respect.
Additional resources	Plants were chosen to be easy to grow, flowery and coloured so to attract bees, scented and beautiful. Rosmarinus prostrates, carex, Deschampsia cespitosa, bergenia, Heuchera, Santolina chamaecyparissus, Teucrium chamaedrys

5.4: New green roof at WOW

1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Capillary GI on walls and roofs
NBS title	New green roof on public building (WOW)
Brief project synthesis	The project concerns the realization of an extensive green roof on a public building, currently abandoned. The green roof is realized using the green roof technology supplied by Harpo Group, composed by layered materials: antiroot waterproofing, water retention felt, drainage, storage and ventilation elements, filter sheet and 14 cm of substrate, produced by Harpo specifically for green roofs, mainly made by mineral-based material (volcanic lapillus, pumice). The green roof is intended to be a “natural lawn” obtained by sowing a mixture of seeds from stable meadows of northern Italy that can be calibrated to be used from the plain to the mountain areas up to 1000 - 1500 m of altitude. Many species extend their range also in the regions of central-southern Italy, allowing the use of this system to the most part of the Italian peninsula. The mixture, supplied by the seed company "Semenostrum", is composed of at least 20 species belonging to the association Chamaecytisus hirsutus -Chrysopogonetum grylli, typical species of natural lean meadow vegetation, with a balanced ratio of grasses, perennial dicotyledons and annual dicotyledons. This kind of vegetation has been conceived in order to be a pasture for the bees hosted in the hives located nearby the building. A sub-irrigation system has been installed on the roof, under the substrate, realized by a serpentine of pvc pipes ø16 mm with a pitch of 30 cm. The system is fed by a cistern placed in the nearby garden, with a capacity of 11.000 liters for the accumulation of rainwater, pumped to the roof and connected to the downpipes of the building.

Area of implementation	The area of implementation is a public building located in via Onorato Vigliani 102 – Turin. The building has been the seat of the National Agricultural Mechanical Centre since 1951. Afterwards it was managed by a social cooperative and since few years it's empty and abandoned, waiting for a future destination. In front of the building there is a large paved area, easily accessible by the road and partially covered by a canoby. This area is periodically used by Coldiretti for their market of local producers and it will host the NBS Pollinator friendly garden. In the backyard of the building, a green area bordering with the Colonnetti Park has been identified as the suitable place for the placement of hives. The green roof will cover an area of 140 sqm. GPS coordinates: 45.017254, 7.644881
Target groups (beneficiaries)	The green roof implementation is strictly connected with the other NBS expected in the same area: the Pollinator friendly garden and the apiary. The main beneficiaries of these implementations will be the inhabitants of the neighborhood (families, collectives, schools of the district and disadvantaged people), who are expected to spend their time in the new refurbished area, together with the Coldiretti farmers and their clients, who regularly go to the market.
Timing (start and end date)	Start: February 2020 - End: June 2020
Main responsible partner	Associazione "OrtiAlti" e-mail address: info@ortialti.com
ProGIreg partners involved	• Heritage Management Department, City of Turin (Owner of the building) • University of Turin (Department of Life Sciences and Systems Biology, DBios and Department of Agricultural, Forest and Food Sciences, DISAFA)
Other stakeholders involved	Associazione Parco del Nobile (beekepers)
Total Budget	ProGIreg funds: 53.500 €
2. Pre-implementation activities	

Planning and preparatory activities	The initial project concerned the creation of a roof top garden to be managed by a citizens' association. After evaluating and excluding the building located in via Negarville 8 and the Youth Centre in strada delle Cacce, the feasibility study led to identify the roof of a building owned by the Municipality, located in via Onorato Vigliani 102. Subsequently the structural verification confirmed the feasibility of the roof garden only in a specific portion of the flat roof of the building, an area of 140 sqm. The Heritage Management Department of the City of Turin has excluded the use by the citizens of internal stairs to reach the roof, as they will try to transfer the use of the building to a new entity and the mixed use of the stairs is not feasible. The cost of external stairs is considered excessive compared to the green roof cost and poses safety problems since the building is not supervised and would only be used occasionally. The choice therefore fell on the construction of an extensive green roof with flowering lawn, which can function as a pasture for the bees, with a very low maintenance (one annual grass mowing) that can be taken in care by the beekeepers who are involved in the installation and care of the apiary (Associazione Parco del Nobile). Alternatives choices of vegetation for the extensive green roof were considered: sedum (requires less maintenance but is less attractive for pollinating insects), lippia nodiflora (low maintenance, quite attractive for pollinating insects), meadow florin (higher maintenance but higher biodiversity and attraction of pollinating insects). Given the willingness of the beekeepers to mow the flowering meadow, it was decided to prefer the flowering meadow. The roof will be provided with a lifeline and access to the roof will therefore be allowed only to specialized personnel, through an aerial platform. Following the request of the City of Turin, irrigation will be carried out through the recovery of rainwater. In fact, the City with another European project (CWC interreg) is planning a green roof with rainwater reuse.
Administrative procedures	Resolution of the City Council, agreement between town and OrtiAlti, report of delivery of the keys of the property.
Technical and social analysis	Structural analysis and load test on the roof slab; analysis of the state of deterioration of the concrete and solutions; cost analysis in order to keep the budget provided by proGireg.
Other activities	

3. Management structure and responsibilities	
Main partner (coordinator) and role/function	OrtiAlti: - coordination - design - construction - maintenance coordination
2nd Partner and role/function	City of Turin (owner of the building): - owner of the building - administrative permissions - co-maintenance
3 rd Partner and role/function	University of Turin: - air quality monitoring
4 rd Partner and role/function	Associazione Parco del Nobile (beekepers): - maintenance of the green roof
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	During the co-design process the offices of the Heritage Management Department of the City of Turin have been included to manage the construction site. The co-implementation process, strictly connected with the implementation of the Pollinator friendly Garden (see NBS 3:03), has engaged Fondazione Mirafiori, Coldiretti and an informal network of beekeepers but the process was blocked by Covid-19.
Notes on major achievements/success factors/critical issues/barriers related to engagement process	Major achievement in the engagement process has been the resolution of the City Council for the intervention in the site and the collaboration with Fondazione Mirafiori in the co-design of the engagement process.

Current situation and next steps **(to be updated)**	Despite the Covid-19 lockdown, the construction process was completed quite early but co-design activities which are crucial for engaging communities and ensuring the long-term maintenance of the NBS, are in standby. In response to the impossibility by the City to bring in charge the maintenance of the NBS lawn, OrtiAlti decided to bear these costs (mowing of the lawn once a year), during the time needed to define the permanent maintenance of the NBS.
5. Other activities	
Synergies with other proGIreg activities	Strictly connected with NBS8 Pollinator Friendly Garden: this implementation is in the same area and it's also in charge to OrtiAlti. Interconnections are related to the co-design process which is the same for the two NBS and to the future use of the area as a showcase of NBS.
Links with other external project or activity	European project (CWC interreg): the same reuse of rainwater for a green roof.
Business model (link to WP5)	
Technology Readiness Level (TRL) **(link to WP5)**	
Communication activity (link to WP6)	Different phases of the construction site have been documented and diffused by OrtiAlti's social media. Local press interviewed OrtiAlti and several articles went out between February and March (before Covid-19 lockdown) about the green roof and the pollinator friendly garden.
6. State of Play and Monitoring	
Current situation (to be updated)	After Covid-19 lockdown, in May 2020 the construction site restarted and ended in June 2020. Maintenance and accompaniment activities with citizen are ongoing.
Next steps **(to be updated)**	

Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	The most critical aspects and barriers are connected to the difficulty by the City to find a new use for the building which fall back in the management of the green roof, related also to the impossibility by the City to bring in charge the maintenance of the NBS lawn that requires an annual mowing. Barriers are also emerged in the difficulty to engage the green maintenance offices of the City in taking care of the site during and after the realization.
7. NBS maintenance and outlook	
Maintenance	The maintenance will be done by Associazione Parco del Nobile (beekeepers) through OrtiAlti resources.
Sustainability after project conclusion	The sustainability after project conclusion is strictly linked to the future use of the building and the area. The strategy designed by the City supposes a strong new actor managing the building in order to define a new science center disseminating proGireg NBS and other green solutions towards citizen and scholars. In this hypothesis new collaborations could emerge between the Science Center and other stakeholder acting in the area through a collaboration pact (Fondazione Mirafiori, Parco del Nobile, informal beekeepers, etc.).
Additional resources	

6.1: Green corridor

	
1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Making post-industrial sites and renatured river corridors accessible for local residents
NBS title	Green corridor
Brief project synthesis	The Sangone torrent, the waterway that surrounds the city to the south, and the area of the Piedmont Park, with agricultural, horticultural and beekeeping activities, is an opportunity to create an ecosystem path capable of redeveloping areas that today are weakly characterized and at risk of "heat island". Pollinating insects will enter urban areas, producing a vital pollination action. It will foster processes of involvement, participation and awareness in the residents. By participating in the project, and at the events, they will find a sense of identification and affection for the territory that will stimulate further actions of care and community ownership. The green traffic divider and small gardens, are today without any characterization and poorly used by the inhabitants: the accommodation with grasses and shrubs and few trees will solve these deficiencies and at the same time will provide a welcoming environment for pollinating insects with appropriate plant species. The composition of the intervention is designed to have pre-defined and repeatable modules and will allow the operation to be carried out in relation to the economic availability of the moment and to be increased as soon as there will be further funding. A "mosaic" methodology of project actions in a wider master plan.
Area of implementation	The "Green Corridor" area is developed by incremental lot in the areas inside the Mirafiori district along via Rodolfo Morandi in the stretch between via Castello di Mirafiori and via Palmiro Togliatti: the first lot is between via Castello di Mirafiori and via Rodolfo Morandi n.17.

Target groups (beneficiaries)	The main benefits will be for citizens who live in the area: residents of social housing and smallholders, communities of people with economic and social difficulties, those who are hospitalized in facilities for physical and mental problems, those who work in the neighborhood, of different age groups and their economic differences. All the citizens are asked to become communities around the importance of actions on the environment in which they live or work, from simple information to active participation in construction and maintenance activities.
Timing (start and end date)	Start: 08/2020 End: 06/2021
Main responsible partner	City of Turin – Mobility and Infrastructure Department – Urban plan Service e-mail address: ferruccio.capitani@comune.torino.it
ProGIreg partners involved	• Fondazione Mirafiori • University of Turin (Department of Life Sciences and Systems Biology, DBios and Department of Agricultural, Forest and Food Sciences, DISAFA):
Other stakeholders involved	• ATC (Housing Agency): contacts with tenants • Casa Farinelli: activity with users • AIAPP – Italian Associazion of landscape architecture - Piemonte and Valle d'Aosta section: professional consultancy about project technical features
Total Budget	proGIreg funds: 60.000,00 €
2. Pre-implementation activities	
Planning and preparatory activities	The project started from the need to carry out actions to involve citizens in safeguarding, maintenance and design of the territory aimed at the redevelopment of green areas within urban areas and to promote the composition of embryonic ecosystem services with positive reverberations both on human beings and on other species, whether animal or plant. The area has been identified as part of a series of actions already in place by proGIreg: the development of community farming (NBS 3.2) and beekeeping activities (NBS 8.1), the organization of caisson crops with the involvement of citizens living in the neighborhood (NBS 3.7). The redevelopment of the riverbanks of the Sangone torrent is also a planned COTO project financed by others funds. The area is characterized by a varied set of green areas with little or no identity but great potential. The main stakeholders have been identified in relation to the project needs and the skills they can offer.

Administrative procedures	As the funds used for the implementation of this NBS come from European project (proGireg), these funds were initially transferred to the City of Turin and, subsequently, to the partners involved according to their needs. All these phases have been taken into consideration.
Technical and social analysis	Social and demographic analyses already carried out within WP2 activity have been used. Analyses carried out by the City of Turin about green heritage, population characteristics and dynamics, environmental conditions -such as the heat islands – and the infrastructure system of the district have been considered. Previous actions of citizens involvement by local NGOs have been considered in order to involved them in this action.
Other activities	Actions planned to involve the citizens and the District in order to: - prepare and eventually clean up the areas of intervention - to carry out information and training actions in order to know and recognize the tools and aims of the actions for the construction of the Green Corridor, also in relation to its maintenance - to organize groups of citizens, also coordinated by the District through the technical offices, for light maintenance works together with control actions and reporting any critical maintenance and management issues
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Turin – Mobility and Infrastructure Department – Urban plan Service; Project design and coordination Collaboration between several Departments within the Administration has enabled the Urban Plan Service to coordinate the design of the NBS green corridor through meetings with the various stakeholders, both in terms of communication and professional and design exchanges.
2nd Partner and role/function	University of Turin (Department of Life Sciences and Systems Biology, DBios and Department of Agricultural, Forest and Food Sciences, DISAFA): scientific support for the identification of flora and fauna species on the territory UNITO contributed for some fundamental scientific characteristics for the design of the NBS, in particular for the choice of botanical and faunal species and then for the pre and post implementation monitoring actions

3 rd Partner and role/function	Fondazione Mirafiori: stakeholders and citizen involvement and active participation Fondazione Mirafiori carries out actions of facilitation in the management and organization of the meetings with the various stakeholders both for organizational experience and for historical knowledge of the territory and will manage a group of vegetable gardens that will be involved in the creation of the green corridor.
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	*Co-design* The DBios University and the Mirafiori Foundation Association were involved in the design process, as well as, until the lockdown that imposed restrictive measures, Casa Farinelli and the ATC, especially in the phases of involvement of the resident population for the future maintenance of the NBS and in training experience on the re-introduction of pollinating insects, addressed to families with housing or economic difficult conditions. The aim is to achieve an affection for the places and consequent identification with them and the development of virtuous pathways to safeguard them, from a physical and social point of view, both in the pollinating insects' corridor and in the box gardens that will be managed through the Mirafiori Foundation. *Co-implementation* Having the opportunity to understand the sense of participation in the planting, construction and monitoring works, and the benefit of a small and little – symbolic - food production, the people involved will work together to maintain the areas, thus strengthening their civic commitment.

Notes on major achievements/success factors/critical issues/barriers related to engagement process	Stakeholders involved: - Resident citizens already involved by Fondazione Mirafiori in the cultivation of vegetable gardens in the caissons, with the provision of cultivation experiences with all participants - Residents of Casa Farinelli: horticultural activities of small size in the spaces of their own residence with the aim of sharing and production of plant material to be "exported" in the green corridor - Residents of ATC Houses, both in the condition of assignees and those who have redeemed the property units, in the activities of planting and maintenance of the green corridor, with the aim of being able to carry out small cultivation activities "on balconies" with the goal of reintegrating or increasing the presence of species along the corridor - District technicians and occasionally other City Department to help and guide in maintenance and management activities. - Members of AIAPP - Italian Association of Landscape Architecture, for the transfer of knowledge related to the cultivation and landscape composition techniques. Summary of the results achieved: - Creation of a community feeling among residents in different residential, housing and social conditions with the aim of sharing and understanding the preciousness of social contamination and at the same time with the extraordinarily positive effects of "biodiversity" in the natural world. - Development of the sense of belonging to the Community and consequently to the places, and consequent development of virtuous actions of maintenance by the community with an economic aid directed towards the wider community that is in the City as a whole. - Collaboration in actions to mitigate the effects of climate change and heat island risks highlighted in the analysis of locations Critical issues: - Action timing indefinable with certainty as it is very dependent on the condition of awareness of the community but also of the individuals, especially in relation to the events of restriction and change in social relations as a result of the pandemic. - Theft of plant species, especially aromatic or aesthetically attractive, notwithstanding the sensitization done with small training courses on the possibility of taking plant material without having to reach total removal.
Current situation and next steps **(to be updated)**	Current situation The DBios University is currently starting to monitor the presence of butterflies within the project areas in order to detect the current status at the "zero" point before any intervention on the site has already begun so that subsequent comparisons can be made as the work is carried out. Next steps - Executive project approval by the end of July 2021 - Start of the procurement procedure - Start of work month September 2021 - Contextual information activities with the various residents
5. Other activities	

Synergies with other proGIreg activities	• Links with "Citizens' science and social inclusion of the mentally disabled" (NBS 8) activities with UNITO • Links with the activity "Methodologies and variables for NBS monitoring and evaluation" (WP4) with UNITO • Possible interactions with the NBS 2.1 for the possible use of the new soil in the construction of the green corridor
Links with other external project or activity	“Biodiversity Turin for pollinators" project for the monitoring and conservation of pollinators in the Piedmont Park in collaboration with DBios with CRT funding.
Business model (link to WP5)	At this stage there are not yet sufficient elements to complete this request.
Technology Readiness Level (TRL) **(link to WP5)**	At this stage there are not yet sufficient elements to complete this request.
Communication activity (link to WP6)	Communication activities are essential, as stated also in the preliminary workshops, and can be carried out on several levels: - “Endogenous" workshops with the aim of involving the resident population in different situations to contribute to the formation of a community, although heterogeneous. - “Exogenous" workshops, with the aim of involving multimedia networks (radio, television, local but also national press…), social, political, productive world in order to valorize the existence and the role of such an NBS that can give life to trendy phenomena that increase the conscience and the possible participation. - Small training courses with the aim of making people understand the importance of the presence of vegetation, the fundamental role of pollinating insects, the crucial synergy between the different actions to enable a respectful behavior for the places and hopefully collaboration in maintenance and management activities. - Activities aimed at highlighting the value of the experience that many people have unexpectedly, if not in the agronomic field, certainly in that of cultivation, expression of a certain popular tradition.
6. State of Play and Monitoring	

Current situation (to be updated)	In collaboration with the Mirafiori Foundation, the first meetings were held with a significant number of stakeholders who were interrupted due to the pandemic. Within this interaction with DBios University, the most suitable plant species were selected for the design of the green corridor according to the propagation of butterflies and pollinating insects. The DBios University has also started monitoring the presence of butterflies in the area in order to define the situation before the project.
Next steps **(to be updated)**	- Executive project approval by the end of July 2020 - Start of the procurement procedure - Start of work month September 2021 - Contextual information activities with the various residents
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	The most critical element was the lockdown following the pandemic which led to the suspension of a series of meeting activities on the territory, monitoring and inspections with design function.
7. NBS maintenance and outlook	
Maintenance	Once ProGIreg will be completed, Citizens, organized in the forms of associations or bodies already present in the territory, those that will eventually be formed over, with the collaboration of the technicians of the City and the District, to carry out maintenance and development of the project carried out. At the same time will be verified the possibility to undertake subsequent participation in raising new funds or funding that will be useful for the development of more ambitious and wider project goals.
Sustainability after project conclusion	The NBS has characteristics compatible with the indications that the Administration of the City of Turin, therefore it is integral part of the new

Additional resources	• http://www.pollinatorpassasjen.no/intro#!/food_en • https://www.greenme.it/informarsi/animali/autostrada-api-oslo/#:~:text=L'autostrada%20per%20le%20api%20di%20Oslo%20%C3%A8%20il%20primo,altrove%2C%20non%20solo%20in%20Norvegia. • https://www.rainews.it/dl/rainews/media/autostrade-di-fiori-selvatici-per-le-api-15c09457-55db-47f6-ab29-9f3e83f7ccd7.html#foto-1 • https://www.greenme.it/informarsi/natura-a-biodiversita/corridoi-api-regno-unito/#:~:text=Corridoi%20per%20le%20api%3A%20Londra%20pianta%20una%20vera%20e%20propria,di%20fiori%20lunga%2011%20chilometri&text=Un%20autentico%20%E2%80%9Ccorridoio%20delle%20api,insetti%20impollinatori%20entro%20questa%20estate. • http://www.teveretv.it/news/2016/maggio/23/nasce-in-italia-l-autostrada-delle-api-in-umbria-sbarca-un-progetto-ideato-in-norvegia/ • https://www.corriere.it/pianeta2020/20_maggio_18/giornata-mondiale-api-milano-festeggia-l-installazione-sotto-cometa-14f84a6e-9784-11ea-a89d-213e261096e7.shtml • https://www.npr.org/sections/thesalt/2015/05/20/408017267/pollinator-politics-environmentalists-criticize-obama-plan-to-save-bees?t=1592841790264 • https://www.facebook.com/aiapp.piemonte.vda

6.2: Local natural heritage enhancement in green corridor

	
1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	Making post-industrial sites and renatured river corridors accessible for local residents
NBS title	Local natural heritage enhancement in green corridor
Brief project synthesis	The aim of this action is to facilitate access to the NBS implemented by proGIreg, by placing landmarks/signs, providing information both on site and online, and organizing activities and visits for the residents.
Area of implementation	This action wil be spread across the different NBS sites and in particular along the green corridor.
Target groups (beneficiaries)	All the inhabitants of Mirafiori and visitors alike.
Timing (start and end date)	March 2021 - July 2022
Main responsible partner	Fondazione della Comunità di Mirafiori
ProGIreg partners involved	Associazione Miravolante (proGIreg Linked Third Party) City of Turin
Other stakeholders involved	
Total Budget	22.000 €

2. Pre-implementation activities	
Planning and preparatory activities	- Meetings with City of Turin to plan the action and coordinate it with the green corridor action (NBS 6.1) - Request and collection of estimates for the landmarks/signs - Contact with the offices of the City of Turin in charge of urban furniture in order to identify the necessary administrative procedures to install landmarks/signs
Administrative procedures	- Estimates for landmarks/signs have been requested and collected from three possible suppliers - Once the co-design process will be completed, the final design will be submitted to the office responsible for the occupation of public land
Technical and social analysis	- Technical analysis is still ongoing, in order to identify the kind of landmarks/signs to be installed, with the necessary guarantees of durability and static conformity - The social analysis was performed in order to identify the stakeholders to engage in the co-design process
Other activities	
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	Fondazione della Comunità di Mirafiori - coordination of the activities, co-design, implementation
2nd Partner and role/function	City of Turin - coordination with NBS 6.1, authorizations
3 rd Partner and role/function	Miravolante - organisation of activities and visits for the citizens
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	A first group of stakeholders have been identified and invited to two workshops, on the 9th and 22nd of July 2019; it includes: - ATC - Agenzia Territoriale per la Casa, institution that manages public social housing and owns many plots of land in the district; - Mirafleming, centre for kids (age 6-14); - the local parish; - Presidio Sanitario Valletta, public health centre; - Casa Farinelli, a centre that provides temporary housing to families in

	need; - Associazione Clorofilla, that manages Orti Generali; - Circoscrizione 2 - Turin's District 2 administration; - Comitato Borgata Mirafiori, a group of active residents of Borgata Mirafiori neighbourhood. They will be involved again once the planning moves forward towards the final design and will be involved together with other group of active citizens in the co-implementation and co-management process.
Notes on major achievements/success factors/critical issues/barriers related to engagement process	The participation to the two first workshops has been good, all invited stakeholders where actually present. The level of engagement will be re-assessed when entering the co-maintenance phase.
Current situation and next steps **(to be updated)**	Currently the co-design process of landmarks/signs has just started, and will procede until summer 2021 in parallel with the green corridor implementation. Engagement activities and visits will be planned during the same period and are due to start when the green corridor will be completed.
5. Other activities	
Synergies with other proGIreg activities	The activity is strongly linked to NBS 6.1; the co-design of landmark/signs that are meant to signal and connect all NBS, will involve all partners responsible of the other NBS implementation in Turin
Links with other external project or activity	The activity is linked with Iperurbana project that organizes visits and events to promote South Mirafiori district
Business model (link to WP5)	The landmark/signs will be designed to be durable and require little maintenance. A group of volunteers will be formed for the maintenance. For the organisation of visits and events Iperurbana project will be involved, which is being incubated by Fondazione Mirafiori as a way to promote sustainable tourism in Mirafiori.
Technology Readiness Level (TRL) **(link to WP5)**	Current TRL: 8 TRL to be achieved by the end of the project: 9
Communication activity (link to WP6)	- June 1st, 2019: participation at the event ValletT'incontra, open day of the public health centre near via Morandi area, to present the project - October 6th, 2019: participation at the event "Giro di Blues" tour accompanied by music along the Sangone riverside.

6. State of Play and Monitoring	
Current situation (to be updated)	- Preliminary co-design worshops completed - First group of stakeholders engaged - Quotes for landmarks/signs requested and collected
Next steps (to be updated)	As stated above, the co-design process will continue until March 2021. Co-implementation will begin in March 2021
Notes/critical issues/barriers (to be updated) (link to WP5)	The timeline could be changed if the Covid-19 pandemic causes further disruption making meetings and on-site visits impossible. Possible delays may be caused also by the authorisation process, that can be started only once final design is available
7. NBS maintenance and outlook	
Maintenance	As stated before the landmark/signs will be designed to be durable and require little maintenance, and a group of volunteers will be formed for the maintenance, with the help of local stakeholders.
Sustainability after project conclusion	Iperurbana project will be involved for the organisation of events and visits and to promote sustainable tourism in the area and the access to proGIreg NBS and Sangone riverbanks.
Additional resources	*https://www.facebook.com/fondazionemirafiori/* Further documentation has not been published but is available upon request.

7: Strategic public-private partnership for greening the City

	
1. General information	
Compilation date and update	May. 2021 - third draft version
NBS type	Local environmental compensation processes
NBS title	Strategic public-private partnership for greening the City
Brief project synthesis	The aim of this NBS is to identify, collect and display tools and concrete opportunities in order to allow the Administration to improve the green assets of the City. The engagement of the private sector can boost the development of green areas by giving win-win solutions. Green areas should be considered as one of the main "urban commons" and, in contemporary cities, their shared management can become a link between different realities, helping to build a sense of community. The strategic plan of green infrastructure recently approved by the City of Turin has set up the basis for the descriptive contents of this NBS.
Target groups (beneficiaries)	Urban planners, city department interested in use these tools and solutions.
Timing (start and end date)	2019- 2023
Main responsible partner	City of Turin
ProGIreg partners involved	
Other stakeholders involved	Green department, Public and Private building and Urban planning Departments of the City

Total Budget	30.000 were used to acquire FME software, a geodata integration platform
2. Pre-implementation activities	
The existing regulatory framework	**The Municipal regulation n. 317** about public and private green spaces, approved in 2006, contains both normative prescriptions and indications about management of the green urban areas in the City. The aim of the document is to protect and discipline the design, development and maintenance of the green areas. The Regulation contains a first part dedicated to introductory notions such as the functions and types of urban green, the promotion and involvement of citizens, the entrusting and sponsorship of green areas, and principles and criteria both general and concerning the safeguard of the valuable green assets (for example monumental trees, historical gardens, etc.) are identified. With the approval of the **Strategic Green Infrastructure plan (2020)** more issues are raised: protection of trees and, tree compensation mechanism; improvement of ecological corridors; technical planning for the enhancement of ecosystem services provided by green areas; enhancement of the recreational and cultural value of parks and gardens.
The management of public green	The City has more than 18 million s.m of municipal public green (2019), which represent about 14% of the surface of the city. This patrimony has a very important heritage, whose preservation, maintenance and enhancement are tasks that require, in addition to the skills and professionalism of those who are dedicated to it, also adequate resources: hence the decision of the City, since 2007, to adopt initiatives that encourage greater collaboration, including financial support from the private sector.
The needs and the goals	In recent decades, the actions of the Public Administration have been considerably affected by the difficult overall economic situation. Local authorities, which have been increasingly called upon to carry out primary tasks in the administration and meet the growing expectations of citizens, have recorded a decrease in available resources due also to the reduction from government transfers. At a local level, therefore, alternative ways of managing certain activities are increasingly being tried out, also with the aim of achieving savings in expenditure. Private parties can be involved in the development of new infrastructures - such as new green areas, playgrounds, sports areas, urban gardens - as well as in the maintenance and care of existing green assets, such as green areas, trees and woods, playgrounds, dog areas, urban gardens, furniture and fountains. A privileged area of involvement of private entities is also the enrichment of the city's arboreal heritage, through interventions of urban forestation, which may involve new plantings or creation of urban forests,
3. Management structure and responsibilities	

Main partner (coordinator) and role/function	City of Turin
Other partners	
4.The tools/solutions	
Donation	The simplest mechanism to involve the private sector in the care of the public green is to obtain its contribution for the realization of the improvement or the growth of the city's green heritage. This can happen through financial support or through participation in an intervention, or in the implemenation phase, in a purely philanthropic way, without asking anything in return if not the possibility to contribute to the improvement of the public thing and the environment. In these cases we have the provision by the private (whether it is a subject acting for profit or not), of an asset. This is a method that is used not only by non-profit organizations or individual citizens, but also by some companies that, as part of their social responsibility actions, can implement interventions of this nature. Examples of this are the donation of thousands of tulip bulbs to embellish unprotected public green areas, or the purchase and supply of a vandalized seesaws that the administration did not have the immediate possibility to purchase and replace, or the purchase and supply of a new one.

Sponsorship	Sponsorship is a contract whereby one party (the sponsee) undertakes to allow another party (the sponsor) to use its public image and name to promote a brand or product in return for payment. This may consist of a sum of money (financial sponsorship), or goods or services (technical sponsorship), to be provided by the sponsor, either directly or by entrusting the provision of such goods and services to a third party.The sponsorship contract can be concluded with public or private entities, individual companies, associations, foundations, citizens and in general with any entity that does not carry out activities in conflict with the public interest.. The private subjects who, in response to public calls for proposals and following an evaluation procedure of their proposals, carry out the maintenance and enhancement of the city's green areas at their own care and expense**, obtain in exchange a return of image**, in the forms and ways established by the contract, in addition to the tax benefits provided for by current fiscal laws, which vary according to the legal nature and tax position of the sponsor. Throughout the duration of the contract, the sponsor will be allowed to publicize its collaboration through various means of communication (e.g.: installation of signs on the area, strictly concerning its own sponsorship and not advertising to third parties, indication of the sponsor's name/brand/logo in the relevant official communications, in illustrative material and on the Administration's web pages informing about the initiative, etc.). Sponsorship contracts can be of two types: the most widespread discipline is **technical sponsorship**, which occurs when the works, services or supplies are acquired or carried out not only "at the expense of the sponsor" but also "by the sponsor". However, the Administration may also accept sponsorship for purely **financial purposes**, in which case the public body is responsible for implementing the project, possibly even through the identification of third party contractors through the ordinary procedures for awarding public contracts.
Collaboration Agreement	The municipal Regulation n. 357, about municipal contracts, defines in artt 5 and 27 the collaboration agreement and the Regulation n. 375 about urban commons sets the collaboration agreement for the care, shared management and regeneration of green areas and other spaces and buildings within green areas.
Agreement Protocol	With this protocol the municipal administration, after deliberation, reaches agreements with specific private parties, generally at no cost for the administration, for the implementation of individual projects or broader initiatives, in order to benefit the entire community, to be carried out on green areas.
ICT tools	This activity aims to provide the project team and, in the future, the City and the territory, with IT tools and technologies able to allow the collection and systematization of all spatial and non-spatial data that will be considered of interest, on common cartographic databases. The City Acquired “FME software suite” a Geo ETL (Extract, Transform, Load), to build workflows that receive input from heterogeneous data sources, perform transformations on them (e.g. mapping, restructuring, manipulation, coordinate projections) and generate output in as many formats as possible, both proprietary and free.

Ecosystem Services and environmental compensations	The City of Turin has started the process of evaluating the ecosystem services produced by the green areas currently present in the city and the relative implementation methods to cope with the changing climatic conditions, also in support of planning choices. The study of ecosystem services will provide a better understanding of the value generated for the community by the city's natural capital, how to preserve or improve it in urban transformations and how to implement it to counter the impacts of climate change and improve the quality of the urban environment, increasing its ecological value. The assessment of ecosystem services will also provide adequate support to land transformation processes, in order to promote solutions to avoid or minimize impacts on the soil component and defining, for significant impacts, appropriate compensation methods to ensure an improvement in the environmental and ecological quality of the intervention. At the end of the assessment of ecosystem services, the Administration will adopt an act to formalize the identification of a tool to assess and guide urban transformations and able to estimate the compensation of possible changes in the value of ecosystem functionality as a result of the assumed changes in land use.
7. Case studies	
Give a tree to your city	Turin's municipal administration has applied the instrument of donation in particular to manage and encourage the planting of trees in the city's green spaces. With the initiative " Give a tree to your city", citizens can donate trees to the City of Turin by paying a minimum amount (in 2019 the amount was €250.00 for each tree), which is a contribution to the costs of supplying and planting a tree specimen of a size suitable to ensure greater chances of taking root and surviving in urban public space (min. 16-18 cm circumference). The donor can choose the location where the tree will be planted from any green area in the city. They can also choose the species from a list drawn up annually, which takes into account the availability in the municipal green nursery. The Public Green Department has the task of assessing, from a technical quality point of view, the proposal or project submitted by the applicant, avoiding situations that do not technically meet the City's standards (e.g. quality of plant material, impact on green maintenance activities, chosen species, etc.). Furthermore, the Department takes care of the purchase and planting of the donated trees, as well as their subsequent maintenance.

Municipal regulation on public-private partnership	In October 2019, the Municipality approved Municipal Regulation No. 389, "Discipline for combating urban decay and strengthening widespread forms of public-private partnership", which provides that the Municipal Administration may acquire sponsorships, aimed at combating urban decay and protecting urban safety, through the installation and maintenance of new elements of furniture, recovery of degraded elements, interventions on public lighting, signage and other actions of similar content. The objectives and methods defined by Municipal Regulation No 389 can be applied to particular initiatives concerning public green spaces, making it possible to launch a simplified procedure for finding a sponsor. Since 2007, the Municipality of Turin has adopted a multi-year programme to find sponsors for the care and enhancement of the city's public green areas. The City council's resolution of 5 June 2007 approved the guidelines to the search for sponsors for the maintenance and development of the city's green areas, as well as playgrounds and areas reserved for dogs, defining at the same time the launch of a public procedure consisting in the issuing of annual calls for tenders by the relevant managers.
Azzero CO2 and Mosaico Verde initiatives for urban forestry	In 2019, the City Council approved the signing of two memoranda of understanding, respectively with the company Azzero CO2 s.r.l., for the regulation related to the implementation and management of the Mosaico Verde project, and with the Rete Clima Association, for the regulation of the implementation of urban forestation actions co-financed by third party companies or citizens. Mosaico Verde is a national campaign for the redevelopment and protection of the territory and adaptation to climate change. It is a major national reforestation plan throughout Italy. The project will reward the commitments of public administrations and at the same time amplify the efforts made by the most committed companies with a strong green marketing campaign. CO2: offers a platform to match green areas with the need of companies to invest resources as a measure of corporate social responsibility. The public body benefits, at no cost, from the forestation, requalification and protection intervention carried out by Azzero CO2 and financed by the company involved, which in turn benefits from the communication of the campaign. In April 2020, the first urban forestation intervention was carried out under the protocol with the partner Mellin S.p.a. for about 3,000 trees planted in the Piedmont Park along the ecological corridor of the Sangone torrent in Mirafiori Sud district.
Calculation of ProGiReg indicators	The City has calculated some of the indicators provided for ProGiReg by WP2 (Methodology on spatial analysis in front-runner and follower cities), section 3.3.2., by leveraging FME technology.

Municipality of Turin estates	Heritage Department of the City collects estates data inside fragmented CAD files, one for each cadastral sheet, which are suitable for a graphic representation but not for data analysis. FME technology has helped the ICT department to translate CAD files to GIS format, whereby the City has got a full-view city map of estates and a dataset suitable for further processing and analysis.
Public flat roofs	As an example of use of the GIS estates dataset, the ICT department leveraged FME to get a map of public buildings with flat roofs, which is a valuable support in identifying potential sites for NBS.
Reporting from environmental control units	FME was used to produce automated weekly monitoring reports on working/not working control units, equipped with environmental sensors installed by the City within ICT projects.
7. Further developments of the tools/solutions	
ICT Tool	The development of a software tool able to assess and guide urban transformations, to support the Administration in the calculation of possible environmental compensations. The tool should allow the analysis of possible changes in the value of eco-systemic functions following the hypothetical transformations of land use.

Participatory planning	In the future it is necessary, to strengthen and promote the experimentation of new participatory planning paths, in order to create green areas that the needs of Turin's citizens. Participation must have as a priority aim the involvement of citizens, schools, area traders and spontaneous local committees, introducing, as a cornerstone of the decision-making process, the principle of active listening, based on the concept of widespread and equal information, founded on argumentation and aimed at the construction of shared long-term decisions. The techniques to be experimented may come from various design and deliberative processes, finding innovative application in the realization of public green areas on the basis of the specific needs of the local community, the characteristics of the place, the social context, the available project resources, the timeframe envisaged for the realisation of shared projects, specific targets to be reached, and so on.
Protocols for the generation of ecosystem services and environmental value	Considering the growing role and interest of the private sector in environmental and green issues, it will be opportune to promote and enhance protocols with third bodies for the involvement of private individuals and enterprises that have to draw up environmental sustainability reports in the requalification of the urban space and in the enhancement of the ecosystem services of the city green through urban forestation interventions. In this sense, the aim is to encourage the work of several third parties and networks in the area, capable of bringing together the demand of the private sector looking of opportunities for environmental compensation or the creation of social and environmental value to increase the quality of the environment and of public green spaces. A further opportunity for innovation in this area will be to attract even unusual investments in the environmental field. Due to an increasing attention to the state of the environment, climate change and its impacts on the territories, the value of the soil and biodiversity, as well as the need to compensate the environmental impacts of individual economic activities, some private investment funds are looking for opportunities to generate environmental value to complement the economic and financial value generated by traditional investments.
Notes/critical issues/barriers	*Describe here if issues or barriers are still to be solved in order to deploy or develop further your NBS. Add here all other relevant comments about your NBS.*
Link to other NBS	*Is this NBS linked to other proGIreg NBS? If yes, describe here the linkage.*

8.1 Butterfly gardens for disadvantaged people

1. General information	
Compilation date and update	June 2021 - third draft version
NBS type	NBS 8 - Pollinator biodiversity improvement activities and citizen science project
NBS title	Butterfly garden for disadvantaged people
Brief project synthesis	All the activities are part of “Farfalle in ToUr”, a project born in Turin (Italy) in 2014 from the collaboration between Local Health Company (LHC), Mental Health Centres and University of Turin (Department of Life Sciences and Systems Biology). The objective of the project is to promote the presence of butterflies in the city of Turin through the creation of a network of green areas which, with proper management and with the presence of suitable plants (food plants and nectar sources) for the life cycle, allows butterflies to cross the urban area, otherwise seen by these insects as a wall. The scientific aim of the project is accompanied by the social purpose, the involvement of fragile people with mental or physical disabilities, against isolation and social stigma. Supported by university researchers, people affected by mental or physical diseases, after a training course, become scientific disseminators and carry out all the project activities in some realities of the Mirafiori district: they create and take care of pollinator gardens, observe and record butterfly species, manage a website, breed caterpillars, taking part in public events and educational activities in schools, refugee centres, social housing, shelter facilities for the elderly.

Area of implementation	Butterfly garden in centro Aquilone: GPS coordinates 45.009894, 7.636412 Butterfly garden in scuola Torrazza: GPS coordinates 45.015945, 7.656806 Butterfly garden in Casa Farinelli: GPS coordinates 45.015232, 7.634801 Butterfly garden in Casa del Mondo Unito: GPS coordinates 45.018837, 7.609188 Butterfly garden in presidio Valletta: GPS coordinates 45.015602, 7.631016 Transects in Orti Generali: GPS coordinates 45.00916, 7.62559 They collaborate with other activities and events all around the district.
Target groups (beneficiaries)	The main beneficiaries of this project are psychically and mentally disabled people. Other categories of disadvantaged people will be involved: refugees, social housing guests, Alzheimer patients. Common citizens will benefit from this project and will ask them to take part in the project activities involving public green areas, public events, online challenges.
Timing (start and end date)	Start: April 2019 End: December 2021
Main responsible partner	UNITO (DBios) email address: zoolab.unito@gmail.com
ProGIreg partners involved	• City of Turin • Coefficiente Clorofilla (Orti Generali) • Fondazione Mirafiori
Other stakeholders involved	• Cooperativa La Rondine • Cooperativa Il Margine
Total Budget	Budget DBIOS (UNITO): • 31.106,75 € Staff costs • 2.000 € Other direct costs • 4.138 € Indirect costs

	ProGIreg funds from City of Turin to Cooperativa Rondine for activities from 2020 to 2021 (total 22.000 €): ● 540 € for the supply of plants from Orto che Cura (Il Margine) ● 18.000 € from self-financing activity made by Cooperative Rondine-Il Margine ● 3.360 € for University researcher teaching
2. Pre-implementation activities	
Planning and preparatory activities	Before proGIreg the project "Farfalle in TOur" was launched in the city of Turin (2014) thanks to the collaboration between DBios and the Mental Health centre of district 3 managed by ASL TO1. The will to set up the project had at first arisen from doctors, professional educators and users of Mental Health Centers (MHC) of the city, that asked the collaboration of the University. It was the first Italian *Citizen Science* project where citizen scientists were users of Mental Health day centres. Accompanied by the staff of the zoology laboratory of DBIOS (UNITO), the users have: - to set up a green area with foodplants and nectar plants; - to survey regularly butterflies that visited the green area; - to involve the citizens of District 3 by distributing seeds, foodplants and nectar plants to be placed in private gardens or balconies; - to activate a project (“Butterflies go to school”) of knowledge transfer and awareness raising with a Primary School of the same district, carrying out for two years workshops and caterpillars breeding (*Vanessa cardui*) with children.
Administrative procedures	Direct contract between the City of Turin and the Cooperativa La Rondine
Technical and social analysis	
Other activities	
3. Management structure and responsibilities	

Main partner (coordinator) and role/function	UNITO: coordination of project activities
2nd Partner and role/function	City of Turin: coordination of exchange among “Farfalle in ToUr” and other proGIreg activities
3 rd Partner and role/function	La Rondine cooperativa: co-designing activities with the disabled
4 th Partner and role/function	Il Margine cooperativa: co-realization of project activities with La Rondine cooperativa
4. Co-design activities and stakeholder engagement	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	The City of Turin, with the help of Fondazione Mirafiori, found out what vulnerable groups in the district could be interested in the butterfly activities. Together with the “Farfalle in ToUr” group, the City decides how many and what type of activities could be conducted by the group of psychically and mentally disabled people who became scientific disseminators.
Notes on major achievements/success factors/critical issues/barriers (to be updated) (link to WP5)	**Major achievements:** • (8) disabled people were trained and became “butterfly scientists” • Creation and maintenance by “Il Margine” users of a butterfly garden in centro l’Aquilone • Realization of “InGenio” exhibition (Turin, 13 - 25 September 2019), with urban butterfly photos and laboratories • Participation in educational activities within the PON (National Operational Programme on Education) project won by the I.C. Racconigi Primary School • Planning of many educational activities in schools and in other cooperatives/communities hosting fragile people (2021)
Current situation and next steps (to be updated)	Pollinator monitoring in Cascina Piemonte starts in March for butterflies and in April for bees, carried out by the experts of DBios and DIFASA (University of Turin). We published an online kit implemented continuously, that collects all the materials produced in the lockdown period

	School activities took place at Scuola Cairoli in May. Children, with the help of fragile people, built a new Butterflies Oasis in the school garden. Also they established a small breeding of Papilio machaon in order to understand the butterfly life cycle Next steps: ● From June to September the users of social cooperatives Il Margine and La Rondine will irrigate the gardens in Orto WOW in collaboration with Fondazione Mirafiori. and Parco del Nobile ● From May to July Farfalle in ToUr plan 3 laboratories focused on urban butterfly conservation in Orto WOW.; ● next year (2022): activities planned (school activities, workshop in other cooperatives/communities,construction of new Butterfly Oasis)
5. Other activities	
Synergies with other proGIreg activities	UNITO has suggested suitable plants for pollinators for actions 3.2 3.3, 3.4 3.5. 5.1, 5.2, 6.1. They are collaborating with schools: they will do laboratories with pre-primary and middle schools. They will do the school PrimaVera Festa in 2021. They will do some training and dissemination events in connection with pollinator friendly garden.
Links with other external project or activity	"Biodiversity Turin for pollinators" project for monitoring and conservation of pollinators in Piemonte Park in collaboration with Orti Generali and CRT funding.
Business model (link to WP5)	A preparatory meeting was held in December 2019 in cooperation with PhD Innovation for the Circular Economy, but the model still needs to be done.
Technology Readiness Level (TRL) **(link to WP5)**	
Communication activity (link to WP6)	A press release was written on the occasion of the visit to the city of Piraeus (September 2019). The local press has published several articles on this action. The project group manages a website (*http://www.farfalleintour.it/*) and a Facebook account (*https://www.facebook.com/farfalleintour/*), which publishes

	scientific contents and updates on the activities on an ongoing basis.
6. State of Play and Monitoring	
Current situation (to be updated)	*State of play* With proGIreg the project "Farfalle in ToUr" will be strengthened, expanded and in particular concentrated in the area of Mirafiori South. The reference centre for activities with the disabled identified is the accommodation community l'Aquilone in Strada Castello di Mirafiori 142 in Turin. During 2019 it was the venue for the training course for 10 users of the city's Mental Health Centres, identified on the basis of their skills and interest in the project. The course also had a final evaluation and some of them will be offered a work grant for the years 2020 and 2021. The activities for disabled people will concern: ● the care of a butterfly garden created in the centro Aquilone; ● the care of the website and facebook page of "Farfalle in ToUr"; ● participation in dissemination events and parties in connection with other proGIreg actions (e.g. green roof, pollinator friendly garden); ● participation in training interventions in schools, in a refugee centre, in social housing, in a residential centre for the elderly. *Monitoring* In Turin, biodiversity monitoring (NBS8) involves floral, bees and butterfly surveys, in agreement with the EU Pollinators Initiative (2018). Pollinator monitoring focus area is Cascina Piemonte, a large green area (19 hectares) in Mirafiori Sud, located along the Sangone river. The park has been object of unauthorized agricultural and grazing activities until 2018. Currently, thanks to the work done by the Coefficiente Clorofilla association (Orti Generali project) in the NBS3, the park hosts 170 urban gardens, and a building used for raising of chicken and for beekeeping. The monitoring of pollinators and flora were carried out in 2018 and 2019, from April to September, to cover the main flowering period and butterfly and bee activity in Turin. Surveys were conducted along two transects (T1 and T2) with different ecological characteristics. The first (T1) is characterized by a transitional environment (ecotone) between the river and open grazed meadow; the second one (T2) is conducted between urban gardens, where a “pollinators avenue” has been implemented. In the area an apiary of 7-9 beehives has been placed in June 2018. Butterfly, bee and

flower surveys were carried out in order to evaluate the success of NBS implemented, by combining butterfly and bee responses at community level.

- Butterfly surveys: semi-quantitative surveys were performed by experts walking along fixed-route 300 m transects12 along T1 and T2. Butterfly species were identified, and individuals of each species counted. The observations were conducted between 10:00 am and 3:00 pm.
- Bee surveys: 250 m long linear transects were walked in 50 min. Each transect start point and direction walked were randomly determined. All bees unambiguously identifiable were recorded and all others that could not be identified in the field were caught with a hand net and identified in the laboratory. Six observation sets were made, conducted between 9:00 am and 5:00 pm.
- Flower surveys: larval food plants of butterflies as well as flower surveys to identify plants visited by bees and/or butterflies for nectar, and pollen and honeydew for bees were carried out in parallel to the bee and butterfly surveys along the transects. Plant species were collected and identified according to Pignatti (2018)16.

Shannon Diversity Index and Shannon Evenness Index were calculated for butterflies and bees in order to quantify the biodiversity in a community and the homogeneity of individual distribution between species in the community respectively. Shannon Diversity Index and Shannon Evenness Index provide valuable information about the fauna richness and composition and they take into consideration both the number of different species observed and their relative abundances. Both the indexes used turned out to be repeatable and standardized, easily applicable to different fauna taxonomic groups; the data collection has been cheap and quick.

Notably, biodiversity surveys in Cascina Piemonte represent the first Italian urban transect to be part of the European Butterfly Monitoring Scheme (eBMS), and it represents the only example of coupled monitoring between butterflies and bees in an urban context.

Pollinators monitoring will continue involving neighbouring areas, as a green corridor and a social cooperative's green area. The green corridor (NBS6), co-designed and planned for 2020, will connect Cascina Piemonte with another green area (Colonnetti park). Users of the community have been trained in butterfly recognition and transect sampling method: it will be possible to involve citizens in butterflies survey, through Citizen Science project "Farfalle in ToUr" (NBS8).

Next steps **(to be updated)**	The whole dataset of pollinator monitoring will elaborate in the next year .
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	The progress of the activities is often slowed because users need more time to carry them out. However, sometimes the great motivation leads users not to abandon the project, as it is a way to feel part of the community and then overcome loneliness; the participation of users could be low in hours' term, but constant.
7. NBS maintenance and outlook	
Maintenance	Each butterfly garden is created by an association or community that will take care of it.
Sustainability after project conclusion	Il Margine and La Rondine cooperatives will continue to carry on the project and to support it with their own funds, proposing the activities to their users. To convince the other associations that will participate in the project to keep the commitment, a membership fee will be required of anyone who wants to be part of "Farfalle in ToUr" and receive training workshops. For school activities will be required to the school a contribution. These financial contributions will help to finance project activities and materials.
Additional resources	http://www.farfalleintour.it/ https://www.facebook.com/farfalleintour/

4. Living Lab results and perspectives

4.1 Conclusions of the Implementation phase

As indicated, the IP represents a document that gathers, as exhaustively as possible, information on the implementation of 18 different implementations linked to 7 NBS types. Many of the planned and ongoing activities are still in progress or will be implemented by next year, so not all the information is yet available.

Nevertheless, the information collected is already a very important wealth of knowledge, which in itself represents a result in line with what proGIreg has established.

We highlight the relevance of the post-implementation phase, both for understanding barriers (technological and non-technological) and new business models (WP5) to be developed from the NBS realized, and for understanding benefits (see WP4), as well as for handover and long-term sustainability.

The first release of the IP was developed in about five months of work (February - June 2020). This phase coincided with the outbreak and spread of the Covid-19 pandemic which severely affected the implementation of several NBS. Both the physical implementation activities and all those involving the participation of the beneficiaries (citizens, associations, students) were stopped, cancelled or suspended. The finalization of this document coincides with the loosening of the restrictive measures imposed by the authorities to prevent the spread of contagion. However, the consequences of this tragic situation have yet to be fully assessed and, above all, there are fears that a new wave of the virus will occur.

4.2 Results obtained and criticism

The working methodology conceived and put into practice, since the City has been a candidate to become a partner of proGIreg, has been the **diffused green development approach**: the idea is to carry out multiple interventions, of limited but generative scope, in a widespread and fragmented way along a vast and fragmented territory. Secondly, **a strategy for the activation of abandoned areas and places has been carried out: small interventions that help in bringing back the interest of the community and politicians in that area.** Finally, we worked t**o build large partnerships and synergies** with local key actors believing, as also identified as a significant methodological element of proGireg (Quadruple Helix approach), that thanks to the involvement of different key actors we could obtain greater and lasting benefits over time.

In this sense, without detracting the important contributions of the all partners, the role of the Mirafiori Foundation, as a partner rooted, recognized and very active in the territory, has allowed it to reach different groups of citizens (from students to neighborhood associations) and involve them in the implementation activities.

If we look at the socio- economic features and the problems and challenges identified thanks to WP2 and summarized in chapter 2, we can try to summarize some elements of analysis that the proGIreg project and the NBS implementation have faced.

Even if the NBS (3.3 and 5.4) are not completed, we can already say that the objective of **revitalizing abandoned spaces** (generally former industrial plants or abandoned grey areas) has been achieved thanks to the activities of proGIreg. In fact, at the property located in Via Onorato Vigliani 102 (renamed **WOW**) some interventions have been carried out with the aim of activating a place (owned by the Municipality) long abandoned and therefore perceived as unsafe by citizens. In this sense, specific procedural steps have been taken to allow a private entity to operate, for public purposes, on a publicly owned building. In addition, the design for the temporary use of the structure was experimented.

These activities have also made it possible to transform a place perceived as insecure into a living area where nature-related activities can be carried out. A public space then, which has begun to be returned to the citizens. There is no doubt that given the size and state of the building, additional resources and commitment will be needed to ensure that the space returns to be a point of reference for the neighborhood and the city. but certainly a first step has been taken thanks to proGIreg.

With similar intention, NBS 3.2: Gardens in Cascina Piemonte (Orti Generali), allowed an NGO to completely transform an abandoned and unsecure area in a lively and crowded community

Almost all the NBS implemented in Turin focus on fostering participation and active citizenship. The civic engagement is intended also as an antidote or cure for isolation and loneliness which, as outlined in chapter 2, represents a critical factor for many (elderly and single-parent families first and foremost) inhabitants of the district.

It worth mentioning that these involvement activities (especially in NBS 5.3 and 8.1) have also been addressed **to marginal groups (disabled people, homeless, etc.) thus achieving proGIreg inclusion objectives.**

In relation to the characteristics of the district, in this case physical, we tried to provide for the uneven distribution of greenery (and the consequent fragmentation and separation of the different areas of the Mirafiori District) through the NBS 6.1 and 6.2, carrying out interventions that allow to cross and to reach green areas of the neighborhood remaining on natural paths, adequately marked and enhanced.

With regard to health and pollution issues, it seems too early to assess the benefits of NBS and reference is to WP4 monitoring and evaluation activities. But **proGIreg has certainly contributed to regenerate and recover the district:**

- **by disseminating ideas and examples of good practice as seeds for future developments;**
- **by contributing to build a new and green identity of the District.**

As noted in Chapter 1, due to the large number of actors involved and the NBS implemented in Turin, it was necessary to set up a management structure to coordinate the tasks, also ensuring a communication channel among them and managing continuous contact-feedback. Secondly, thanks to the identification of specific resources, a common narrative and communication strategy and plan has been built.

The key innovation features of the implemented NBS

NBS 2.1 (New soil production in a plot of land of about 2000 s.m. within Sangone Park) was considered a core intervention in the Turin Living Lab. The outcome of this experimentation, **a new regenerated soil, has a great potential impact on the future urban development in Turin and beyond.**

Many NBS in Turin are carried out together with students and teachers from almost all schools of Mirafiori Sud district (of all grades). We believe that these activities constitute a positive and easy entry point to foster awareness and knowledge among young generations.

As indicated above and in the monitoring deliverables (D.3. first implementation monitoring report), administrative procedures have very often caused delays and obstacles to a rapid implementation. COTO has worked hard on this issue trying to overcome the bureaucratic obstacles that, in the first place, hinder the construction of public-private partnerships. For this reason, the City has identified some models of agreement:

- **Experimental agreement**: the City adopted this partnership agreement to facilitate the testing (i.e innovative solutions) on specific topics selected by the City. In this contract, the duties and rights of the City and the proposing companies have been specified; the methods and duration of the trials; the regulations relating to the publicity of the initiative.
- **Collaboration pacts:** under the rules stated by the local **Regulation on Urban Commons** this new tool allows active citizens (informal groups, associations, NGOs) to be engaged in the management of urban commons. These pacts are a powerful tool to trigger a widespread civic sense and to foster the idea of a change in the type of relation between residents and the local authority.
- **Temporary use concession:** this contract allows private actor to work in public buildings and areas. It is a quite simple and easy procedure aimed at facilitate the revitalization of abandoned or underused buildings. This contract helps in finding private ideas or solutions in case the city still has not decided (or hasn't find the resources) the final destination of the area.
- **Convention for public works**: this is a traditional public contract used in this case thanks a specific article of the public tender law (D.lgs 50/2016), that allows a private actor to carry out works, with own resources, for public purpose.

It is not possible to go into the specifics of each agreement here, but we believe that a consideration on these forms of agreement can be very useful, both for FRC and FC. Despite the various legislative constraints to which nations and cities are subject, it is important find innovative tools in order **to increase public-private synergies** and ultimately guarantee resources for urban development projects.

As previously indicated, the **issue of sustainability** is linked, first, to the short-term (after the implementation phase and until the end of the project in 2023) maintenance of the works carried out. In the monitoring deliverable (D.3.3) this issue has already been identified and please refer to that document for further details. Here it seems appropriate to point out that the issue is strongly perceived by all the actors involved.

The issue of long-term sustainability (after the end of the project) is even more challenging, and it will be needed to take it in great consideration.

The diffused development approach has made it possible to carry out numerous interventions. However, the NBS implemented are often small and the effects of these solutions both in terms of improving environmental conditions and as positive tools for climate risk mitigation (i.e. heat islands) have yet to be assessed.

The added value of proGIreg NBS in Turin, lies in achievement of social inclusion goals as social inclusion, livability, and new community identity.

More generally, and in line with what has just been written, it will be necessary to identify additional resources to support, in the long term, new urban regeneration programmes and activities. With this perspective it will be interesting to investigate the possibilities of dissemination and replication in other city contexts of the NBS realized in Mirafiori Sud (see replication workshop by WP2).

ProGIreg in Turin has already served as an attractor of additional resources and urban development projects in the Living Lab area. A National fund for research on smart agriculture and innovative collaborative gardens (MIUR) and "**AXTO** action" (National Operational Programme "Citta' Metropolitane" (NOP Metropolitan Cities) have brought funds to support innovative testing and social inclusion activities in Mirafiori Sud District.

Moreover, the knowledge acquired with proGIreg activities will be used to implement green corridors (NBS 6.1) within other EU funded project (**ToNite** - Urban Innovative Action programme) to be implemented in other part of the city.

Finally, it will be necessary to further investigate the possibility of generating innovative business models starting from the NBS implemented.

It's worth mentioning the creative responses to Covid-19 restrictions. COTO and other partners have developed ideas and activities to overcome the physical distancing imposed by the authorities in order to reduce the chances of virus infection by continuing the implementation activities. Please see D.3.3. (First implementation monitoring report) for details.

4.3 Further developments

This chapter will be completed after the end of the implementation phase. As a first lesson learnt we can highlight the importance of a grassroots participation to foster citizen awareness and public goods ownership.

The contribution of the results obtained in relation to an integrated urban planning with NBS and GI is still to be discussed. Undoubtedly this also represents a great challenge in terms of sustainability of the initiatives realized by proGIreg.

During the implementation phase it is our intention to involve all partners and stakeholders in order to understand what results have been perceived and what possible developments these actions can be undertaken both as a future development of the living lab and as integration of the NBS in urban planning tools.

COTO is strongly interested in continuing to work both in the Mirafiori Sud district and on NBS issues. At the moment the City is partner of three European projects that, also learning from the knowledge and results (and critical points) obtained with proGIreg, will develop initiatives consistent with what has been achieved with this project:

City Water Circles (CWC - Interreg Central Europe): Urban Cooperation Models for enhancing Water Efficiency and Reuse in Central European functional urban areas with an integrated Circular Economy approach. The CWC project aims to help municipalities to reform outdated urban water infrastructure systems via applying a circular economy approach, which offers many economic and environmental benefits.

CONEXUS (Co-Producing Nature-Based Solutions And Restored Ecosystems: Transdisciplinary Nexus For Urban Sustainability - Horizon 2020): the aim is to develop multifunctional micro green areas, identifying new opportunities for retrofitting public areas previously dedicated to street waste collection, establishing sustainable urban drainage systems (SUDS), increasing biodiversity and improving health and well-being. The pilot project will test the latest generation design with approaches combining shading and rainwater management services and integration with street furniture.

Fostering the Urban food System Transformation through Innovative Living Labs Implementation (**FUSILLI** - Horizon 2020): The aim of FUSILLI is to support cooperation and knowledge sharing and mutual learning of the food system transformation. The main objective is to build an urban food plan to reach an integrated and safe holistic transition towards healthy, sustainable secure, inclusive, equitable and cost-efficient food systems, through feasible and replicable innovative urban policies leading to deploy improving actions in all stages of the food value chain. The testing locations selected by the City will be in Mirafiori South District.

Annex 1: Turin Living Lab Map

Mirafiori Sud Living Lab Torino | Mirafiori Sud Living Lab Turin

Mappa del Living Lab | Living Lab map

Update: MAY, 2021

proGIreg

Obiettivi e vision generale del LL
Living Lab goals and overall vision

Rigenerare e valorizzare le aree insicure o abbandonate del quartiere di Mirafiori coinvolgendo i cittadini nella progettazione e gestione di spazi verdi pubblici.
To regenerate and enhance the abandoned or unsafe areas of the Mirafiori district by involving citizens in the design and management of public green spaces.

Promuovere nuove professionalità e modelli di business basati sulle soluzioni naturali.
To promote new professionalism and business models based on natural solutions.

Valorizzare i benefici multipli (sociali, ecologici, economici e per la salute) delle soluzioni naturali inserendole negli strumenti di pianificazione e rigenerazione urbana.
To demonstrate the multiple benefits (social, ecological, economic and health) of nature-based solutions as an integral tool of urban planning and regeneration.

Dettagli sulla NBS 2 | Details on NBS 2

NEW REGENERATED SOIL THANKS TO BIOTIC COMPOUNDS FOR URBAN FORESTRY AND URBAN FARMING

Produzione di nuovo suolo rigenerato nel Parco Sangone.
Descrizione: Creazione di un'area di "foresta urbana" lungo le sponde del Sangone attraverso l'utilizzo di suolo rigenerato (New Soil), a base di inerti e compost da FORSU e biostimolanti innovativi.
Partners: Dual, Envipark (Acea e ccs come terze parti), Unito (DISAFA e Dip. Chimica), Città di Torino.

New Soil production in Sangone Park.
Description: Creation of an area of "urban forest" along the banks of the Sangone through the use of regenerated soil (New Soil), based on aggregates and compost from FORSU and innovative biostimulants.
Partners: Dual, Envipark (Acea e ccs as third parts), Unito (DISAFA and Dip. Chimica), City of Turin.

Dettagli sulla NBS 3 | Details on NBS 3

COMMUNITY-BASED URBAN FARMS AND GARDENING ON POST-INDUSTRIAL SITES

Recupero rovine Castello di Mirafiori.
Descrizione: Trasformazione paesaggistica per valorizzazione area di interesse storico-ambientale.
Partner: Orti Generali - Comitato Borgata Mirafiori

Castello di Mirafiori ruins recovery.
Description: Landscape transformation for enhancement of an area of historical and environmental interest.
Partner: Orti Generali - Comitato Borgata Mirafiori

Orti Generali.
Descrizione: Orti individuali e collettivi assegnati con contributo spese ai singoli cittadini, area didattica comune per attività formative e associative.
Partner: Orti Generali

Gardens in Cascina Piemonte (Orti Generali).
Description: Collective gardens rented to individual citizens, common educational area for training and community activities.
Partner: Orti Generali

Giardini fioriti al WOW.
Descrizione: Giardino in cassone e arnie.
Partners: Orti Alti, Fondazione Mirafiori, Miravolante, Città di Torino.

Pollinator friendly gardens at WOW.
Description: Box gardens and beehives.
Partners: Orti Alti, Fondazione Mirafiori, Miravolante, Città di Torino.

Orto a scuola in cassone.
Descrizione: Realizzazione o integrazione di orti didattici in cassone e di laboratori scientifici rivolti alla scuola primaria e superiore sui temi di proGIreg.
Partners: Fondazione Mirafiori, Miravolante, Unito (DBios e DISAFA).

School garden in box.
Description: Realization or integration of educational gardens and scientific laboratories aimed at primary and high schools on the topics of proGIreg.
Partners: Fondazione Mirafiori, Miravolante, Unito (DBios e DISAFA).

Ortomobile.
Fornitura di uno stock di cassette per la realizzazione di "micro-orti" e compostiere per le scuole e corso pratico per gli insegnanti.
Partners: Iter, Unito (DBios e DISAFA).

Portable school gardens.
Supply of a stock of wood cassettes for the realization of "micro-garden" and composters for schools and practical course for teachers.
Partners: Iter, Unito (DBios e DISAFA).

Orti comunitari a scuola.
Descrizione: Orto didattico in cassone.
Partners: Iter, Liceo Scientifico Primo Levi, Unito (DBios e DISAFA)

Community school gardens.
Description: Vegetable garden in wood boxes (raised bed).
Partners: Iter, Liceo Scientifico Primo Levi, Unito (DBios e DISAFA)

Orto tra le case.
Descrizione: Posa di cassoni fissi per orticoltura urbana.
Partner: Fond. Mirafiori, Miravolante.

Gardens between houses.
Description: Placing of fixed containers for urban horticulture.
Partners: Fond. Mirafiori, Miravolante.

Dettagli sulla NBS 4 | Details on NBS 4

AQUAPONICS AS SOIL-LESS AGRICULTURE FOR POLLUTED SITES

Test di acquaponica.
Descrizione: Sistema di acquaponica su piccola scala, progettato dalla comunità, e installato in un sito pubblico attualmente abbandonato.
Partner: Città di Torino.

Aquaponics test.
Description: Small-scale community - designed aquaponics system, to be set up on an abandoned public site.
Partner: City of Turin..

Dettagli sulla NBS 5 | Details on NBS 5

CAPILLARY GI ON WALLS AND ROOFS

Nuovo tetto verde Casa Nel Parco.
Descrizione: Ripristino dell'accesso del tetto verde di Casa Nel Parco
Partner coinvolto: Città di Torino, Fondazione Mirafiori.

New green roof at Casa nel Parco.
Description: Restoration of the Casa nel Parco green roof access
Partners: City of Turin, Fondazione Mirafiori.

Parete verde a scuola.
Descrizione: Pareteindoorconsistema a vaschette estraibili. Partecipatore partecipata e co-gestione per la cura delle pareti con coinvolgimento di studenti e personale scolastico.
Partnes: Città di Torino, Politecnico di Torino (DAD e DIATI).

Green Wall at school.
Description: Green indoor wall with removable tray system. Participatory processes and co-management for the mantainence of the green walls with the students and the school staff.
Partners: City of Turin, Politecnico di Torino (DAD and DIATI).

Parete verde dormitorio senzatetto.
Descrizione: Parete verde autoportante esterna, convaschetterimovibilietasche in feltro. Progettazione partecipata e co-gestione per la cura delle pareti con coinvolgimento degli utenti.
Partners: Città di Torino, Politecnico di Torino (DAD e DIATI).

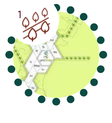
Green wall at homeless shelter.
Description: Outdoor self-supporting green wall, with removable trays and felt pockets. Participatory design process/co-management for the mantainence together with the users.
Partners: City of Turin, Politecnico di Torino (DAD and DIATI).

Tetto verde al WOW.
Descrizione: Realizzazione di un tetto verde estensivo sull'edificio WOW.
Partners: OrtiAlti, Città di Torino.

Green roof at WOW building.
Description: Realization of an extensive green roof WOW building.
Partners: OrtiAlti, City of Turin.

Dettagli sulla NBS 6 | Details on NBS 6

ACCESSIBLE GREEN CORRIDORS



Corridoio verde.
Descrizione: Realizzazione di un percorso verde e pollinator friendly.
Partner: Città di Torino.

Green corridor.
Description: Creation of a green and pollinator friendly course.
Partner: City of Turin.

Dettagli sulla NBS 6 | Details on NBS 6

ACCESSIBLE GREEN CORRIDORS

Valorizzazione del patrimonio naturalistico nel corridoio verde.
Descrizione: Potenziare la fruizione dell'area naturalistica 6.1 e promuovere l'utilizzo della pista ciclabile tramite segnaletica verticale e arredo urbano.
Partner: Fondazione Mirafiori

Local natural heritage enhancement in green corridor.
Description: Enhancement of the naturalistic area 6.1 and promotion of the cycling path through the creation of vertical signage and street furniture.
Partner: Fondazione Mirafiori

Dettagli sulla NBS 7 | Details on NBS 7

LOCAL ENVIRONMENTAL COMPENSATION PROCESSES

Partenariato strategico pubblico-privato per il verde in città
Descrizione: Identificare, raccogliere e mostrare strumenti e opportunità concrete per permettere all'amministrazione di migliorare il patrimonio verde della città grazie alla collaborazione pubblico-privato.
Partner: Città di Torino.

Strategic public-private partnership for greening the City
Description: Identify, collect and display tools and concrete opportunities in order to allow the Administration to improve the green assets of the City through public private collaboration.
Partner: Città di Torino.

Dettagli sulla NBS 8 | Details on NBS 8

POLLINATOR BIODIVERSITY IMPROVEMENT ACTIVITIES AND CITIZEN SCIENCE PROJECT

Giardino farfalle nelle scuole e presso centri per disabili mentali.
Descrizione: Realizzazione di un corso e di varie attività formative sulla vita delle farfalle. Supporto alla realizzazione del giardino delle farfalle. Biomonitoraggio con il metodo del transetto.
Partners: Unito (DBios) e Unito (DISAFA).

Butterfly gardens in schools and for disadvantaged people.
Description: Realization of training activities on the life of butterflies. Supporting the creation of the butterfly garden. Biomonitoring with the transect method.
Partners: Unito (DBios) e Unito (DISAFA).

Partner locali proGIreg (e altri importanti stakeholders)
Local proGIreg partners (and other important stakeholders)

Città di Torino · Università degli Studi di Torino · Politecnico di Torino · Environment Park · Fondazione della Comunità di Mirafiori Onlus · Dual S.r.l. · Orti Alti

Legenda | Legend

Soluzioni nature based
Nature based solutions

- Rigenerazione di suolo — NBS 2: Regenerating soil
- Orticoltura di comunità — NBS 3: Community urban gardening and farming
- Acquaponica — NBS 4: Aquaponics
- Tetti verdi e verde verticale — NBS 5: Green roofs and vertical gardens
- Migliorare l'accessibilità ai corridoi verdi — NBS 6: Improving accessibility to green corridors
- Processi di compensazione ambientale — NBS 7: ICT Tools
- Insetti impollinatori e biodiversità — NBS 8: Pollinator biodiversity

Stato di implementazione
Implementation status

- Realizzato — implemented
- In corso — in progress
- Programmato — in planning

Legenda dei colori
Colour palette

- Parchi/aree verdi — parks/green spaces
- Zone boschive — Forest
- Fiumi/laghi — waterways/lakes
- Costruito — built up areas
- Aree industriali — industrial areas
- Confini del Living Lab — Living Lab area boundary

Scale: 1: 10000

Map by Politecnico di Torino, Dep. Architecture and Design

Productive Green Infrastructure for post-industrial urban regeneration (proGIreg)
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Zagreb Living Lab Implementation Plan

Deliverable 3.4

ANNEX - 4

Work package: 3

Dissemination level: PU

Lead partner: COTO

Author: Iva Bedenko – ZAGREB

Due date: 30 June 2021

Deliverable	Zagreb Living Lab Implementation Plan
Deliverable No.	3.4
Work Package	3
Dissemination Level	
Author(s)	Iva Bedenko- ZAGREB
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Revision	
Reviewed by (if applicable)	
Information to be used for citations of this report	

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CONTENTS:

Tables

Partner organizations

No.	Name	Short name	Country
4	GRAD ZAGREB	ZAGREB	Croatia
27	SVEUCILISTE U ZAGREBU ARHITEKTONSKI FAKULTET	AF ZAGREB	Croatia
28	ZAVOD ZA PROSTORNO UREDENJE GRADA ZAGREBA	ZZPUGZ	Croatia
29	KOMFOR KLIMA GRUPA DOO ZA PROIZVODNJU TRGOVINU I USLUGE	KKG	Croatia
30	UDRUGA ZELENE I PLAVE SESVETE	ZIPS	Croatia

Abbreviations

EC:	European Commission
ERDF:	European Regional Development Fund
D. No:	Deliverable Number
FC:	Follower Cities
FRC:	Front Runner Cities
GA:	Grant Agreement
GI:	Green Infrastructure
GIS:	Geographic Information System
IP:	Implementation Plan
LL:	Living Lab
NBS:	Nature-Based Solutions
NGO:	Non-governmental organization
proGIreg:	Productive Green Infrastructure for post-industrial urban regeneration
SOPARC	System for observing play and recreation in communities
TRL:	Technology Readiness Level
WP:	Work Package
DE:	Germany
IT:	Italy
HR:	Croatia (Hrvatska)
CN:	China
BA:	Bosnia and Herzegovina
PT:	Portugal
GR:	Greece
RO:	Romania

Introduction

1.1 Project Framework

This document is a living and working document that will produce, at the end of the implementation phase, a comprehensive description about the Living Lab and NBS implemented in Zagreb. The first release of the IP is July 2020. Attached to this document a Living Lab Map displaying graphically a summary of the information of each NBS.

Cities are increasingly facing the effects of climate change. Temperature and precipitation extremes make everyday life difficult, and the importance of green infrastructure as a means of mitigating these extremes in cities is increasingly recognized in Europe and the world. Thus, the City of Zagreb, together with Dortmund, Turin and Ningbo, applied to the European Commission and proposed the proGIreg project (productive green infrastructure for urban renewal), which aims to raise the quality of life of the local community by introducing nature-based solutions to post-industrial areas in Zagreb Sljeme Sesvete.

The coordinator of local activities of the EU project proGIreg is the City of Zagreb, the City Office of Strategic Planning and Development of the City, and local partners are the Faculty of Architecture, University of Zagreb, Department of Physical Planning, Komfor Klima Grupa d.o.o., and the Association of Green and Blue Sesvete.
The EU project proGIreg, funded by Horizon 2020, started in June 2018 and will run for 5 years (until the end of May 2023). The project coordinator is the University of Aachen. For the purposes of the project, the leading cities plan to introduce green solutions in urban areas facing the challenges of post-industrial reconstruction. The accompanying cities in the project are Cascais (Portugal), Cluj-Napoca (Romania), Piraeus (Greece) and Zenica (BiH).

1.2 ProGIreg in Zagreb

The City of Zagreb and its local partners Zagreb Architecture Faculty, City Bureau for Physical Planning, Green and Blue Sesvete NGO and Komfor Klima Grupa co. will implement five nature based solutions. This will include the elaboration of the necessary technical and construction plans, obtaining of the necessary construction permits, the contracting of all necessary works and services and the management and supervision of the construction works and sites.
The Zagreb LL is located in the eastern neighborhood of Sesvete, 10.2 km from the city centre. Sesvete is a traditional and closely-knit community which has never developed a clear urban form or clear identity in the past. However, thanks to the activities of a local NGO in recent years it is now developing an increased sense of confidence with people demanding better connected public spaces and parks, bike lanes, more public facilities and a hub for start-up businesses and culture, to create a new urban identity.
The surface of Sesvete is cca 165 km² (1/4 of overall surface area of the city), with 70.000 inhabitants (9% city population) and lowest average population age (37.8 y).

The core of the LL will be on the edges of the 128 000 m2 brownfield site of the former meat processing factory Sljeme which is now owned by the Zagreb Holding Company, and

transferral of ownership to the City of Zagreb is underway. The LL is located by the railway line, south to the present centre of Sesvete. It is connected to the railway and is part of the economic zone that now lies between the older centre of Sesvete and the new neighbourhood Novi Jelkovec with 11 000 inhabitants.

The project will include several interventions: a new therapeutic garden will be built, the existing city garden will be modernized using innovative groundwater treatment technology, a green wall and roof will be installed on a public building to examine their microclimatic and insulating effect, the info point of the project within the Chess Club Sesvete will be equipped, and the construction of a bicycle path in the profile of the road connecting Sesvetska Sopnica with the area of the former factory will be financed.
Project activities are implemented through several units - NBS (Nature Based Solutions)

Following are the NBSs that will be realized in Zagreb LL:

NBS 3: Community-based urban farming and gardening on post-industrial sites
NBS 4: Aquaponics as soil-less agriculture for polluted sites
NBS 5: Capillary GI on walls and roofs
NBS 6: Making post-industrial sites and renatured river corridors accessible for local residents
NBS 7: Establishing protocols and procedures for environmental compensation at local level

1.3 Management Activities

Upon invitation of Aachen University, the City of Zagreb has chosen a former industrial site in the eastern suburb of Sesvete, and set up a local consortium consisting of the local government body (City of Zagreb), municipal planning bureau (ZZPUGZ), Faculty of Architecture, ZIPS- a local NGO that has together with AF previously developed planning documents to resolve the development problems of the city district, since the former industry is located centrally and divides the neighborhood in half. ZIPS provides a link to the local community and ensures that the needs and aims of the local community are being recognized and respected.

The consortium has appointed a task force of people intensively involved in the project activities, that regularly meets and plans the activities and overcoming of the barriers threatening to slow down or prevent the project's successful implementation.
A wider task force, including all the relevant administrative bodies in the City of Zagreb, and all the partners, has been set up and approved by the Mayor. The wider task force meets annually, but appointed members communicate closely with the partner consortium and assist when needed.

The responsibilities of the main partners are clear and listed in Table 1.

Table 1- Partner and activity

Partner	Specific activities	Cross-sectional activities
GRAD ZAGREB	Overall coordination of the implementation NBS 3 activities, except Info point	Overall coordination Co-design activities WP3 coordination activities
SVEUCILISTE U ZAGREBU ARHITEKTONSKI FAKULTET	NBS 4, 5 and 7	Spatial analysis Co-design activities
ZAVOD ZA PROSTORNO UREDENJE GRADA ZAGREBA	NBS 6 and 7	Spatial analysis Co-design activities Overview and coordination with the national and local policies
KOMFOR KLIMA GRUPA DOO ZA PROIZVODNJU TRGOVINU I USLUGE	Practical expertise with the NBS 4 and 5	Co-design activities
UDRUGA ZELENE I PLAVE SESVETE	Operation of Info point Coordination of local activities NBS 3 and 6	Co-design activities Communication with the local community Field work

Our Living Lab

2.1 Our Living Lab

Zagreb is the capital of Croatia, covering 641 km². It has 17 districts and 790,017 inhabitants (2011 census). Zagreb plays a very important role in the wider metropolitan region. Its two neighbouring counties provide a portion of its natural resources and food, as well as providing residential space for commuters who including many workers, students and others. This surrounding area fulfils Zagreb citizens' needs for recreation, nature and housing, thus creating further demand for commuting, suburbanisation and the growth of towns in the area. The population of Zagreb together with the Zagreb metropolitan region, consisting of the larger area of 690 municipalities, includes around 1.1 million inhabitants. In recent years, the suburban population has grown, whilst in contrast, the City of Zagreb, especially its historical centre, has witnessed a decline in population. Zagreb continues to integrate and incorporate former suburbs within its urban fabric. Positioned between the historical centre and the newly planned New Zagreb, the Sava River and its surrounding area form the geographical axis of the city.

Sesvete is a district of the City of Zagreb and a part of the Zagreb urban agglomeration. It is the easternmost neighbourhood of the Zagreb administrative area, covering 20% of the overall surface area of Zagreb. According to the 2011 census, Sesvete has 70,009 inhabitants; the number of households is 22,512 and the number of dwellings 30 256. The population has grown by 10,000 people since 2001, whilst the number of households has grown by 5,000 and the number of dwellings by 10,000. Sesvete has the youngest population in Croatia, with an average age of 38. It is connected to the city centre by railway and several important city roads (Zagrebačka, Branimirova, Slavonska and Vukovarska in the future). The nearby tram station of Dubec may be extended to provide access to the centre of Sesvete. The Sesvete District is also located on important European traffic corridors leading to Budapest, Riga, Germany, Austria, Belgrade, Sofia, Athens and Istanbul. It has an industrial tradition, which has today been replaced with other economic activities including transport, automobile and the construction industry.

2.2 Our Living Lab challenges and goals

The main challenges in the development of the Zagreb living lab come from the outdated planning documents and the lack of inclusive and sustainable principles in the planning. Also, the factory area is positioned in the central area, making it unattractive and unusable to the local residents. The large zone south of the railroad, which divides the district in half, is also planned as an economic/commercial zone, while the demographic boom of the district calls for different functions. As a way of directing the future development towards a green path, the proGIreg project introduces new perspectives on soft development through small but eye-opening interventions.

The following territorial levels were used in the spatial analysis, with the first two being also further investigated in the analysis: 1. The City Level (641 km²) – divided into 17 districts, 2.

The Living Lab analysis area – District Sesvete (165.25 km²), bordering on the eastern side with Zagreb and including 36 smaller self-contained settlements. 3. The Living Lab of Zagreb, which primarily consists of the former meat processing factory Sljeme (0.128 km²), and a N-S green corridor connecting with the Sava river. As a community, Sesvete is somewhat traditional and closely-knit.

Although with an entrepreneurial mind-set, Sesvete has never developed a clear urban form or clear identity in the past. However, thanks to the activities of a local NGO in recent years it is now developing an increased sense of confidence with people demanding better-connected public spaces and parks, bike lanes, more public facilities and a hub for start-up businesses and culture, to create a new urban identity. These objectives have been articulated in the study “Green and Blue Sesvete” (2016) which proposes the development of a new housing area for more than 20,000 inhabitants on a former industrial site, which will connect the two existing neighborhoods. The core of the LL will be the 128,000 m² brownfield site of the former meat-processing factory Sljeme that is now owned by the City of Zagreb. It is located south of the railway line and is part of the economic zone that now lies between the older centre of Sesvete and the new neighborhood development to the South in Novi Jelkovec with 11,000 inhabitants. Its location is adjacent to the present centre of Sesvete. It is connected to the railway and will be well served by the future road network.

Distinctive, tall silo buildings form a unique industrial heritage, which is characteristic of the local identity of Sesvete. Several existing buildings will be reused to accommodate the public facilities, which will be created for the local community. In addition to the architecturally attractive heritage, the new part of the city will be green, sustainable and smart and will promote healthy and sustainable lifestyles, entrepreneurial opportunities and a “share culture”.

The main objective of the brownfield regeneration program in the Zagreb LL is the creation of new public spaces, to ensure spaces for required public facilities and introduce principles of sustainable urban planning. The GI approach must strengthen initiatives regarding urban resilience (low water table, storm water), wellbeing programs (jogging and cycling paths, recreation areas), community activities (urban gardens, green market) and bioclimatic building principles (mitigating city heat islands, natural cooling, green roofs and facades).

3. The NBS in Zagreb

In this chapter, the NBS, which is being implemented in Zagreb, are discussed in detail. The completion of the planned and then carried out activities for the implementation of the individual NBS took place in cooperation with the project partners. The information contained in the NBS tables is also included in the Living Lab Vision Map. The information contained in the individual tables will be regularly updated by the project partners.

Table 2 - NBS to be implemented in Zagreb

NBS type	NBS Title (CTRL+ click to jump to each action)
NBS 3: Community-based urban farming and gardening on post-industrial sites	NBS 3.1: Modernization of existing urban garden
	NBS 3.2: New therapy garden in Sesvete
	NBS 3.3: Info point
NBS 4: Aquaponics as soil-less agriculture for polluted sites and NBS 5: Capillary GI on walls and roofs	NBS 4: Aquaponics as soil-less agriculture for polluted sites and NBS 5: Capillary GI on walls and roofs
NBS 6: Making post-industrial sites and renatured river corridors accessible for local residents	NBS 6: New cycling track
NBS 7: Establishing protocols and procedures for environmental compensation at local level	NBS 7 : New protocols

NBS 3.1: Modernization of existing urban garden

	
1. General information	
Compilation date and update	June/2021 - third draft version
NBS type	NBS3- Community-based urban farming and gardening on post-industrial sites
NBS title	Modernization of existing urban garden
Brief project synthesis	The "City Gardens" project is an example of sustainable land use in Zagreb, improving the quality of life of citizens and the spatial quality and functions of the urban environment. The aim of the project is to enable citizens to produce food (vegetables and strawberries), herbs and flowers for their own needs. City gardens, besides providing space for healthy food and improving the home budget of citizens, also offer the possibility of traditional food production and coexistence with nature. They enable quality use of leisure time and augment the quality of life of citizens in a social, economic and healthy way. The "City Gardens" project started in September 2013. The procedure for giving garden plots for use is initiated by a public invitation to submit a request for giving garden plots for use for persons residing in the City of Zagreb who do not own, co-own, lease or use any other arable land. An application for the use of a garden plot can be submitted by only one member of the joint household on the Application Form with a Statement to the City Office for Agriculture and Forestry within 15 days from the date of publication of the Public Invitation. The criteria for giving garden plots for use are: the applicant's residence, social status, Croatian veteran status, pensioner status and number of household members, and based on the total points earned, the List for giving garden plots for use on arable land is determined. A contract on the use of a garden plot on arable land for a period of 2 years without financial compensation is concluded with the users, with the possibility of

	extending the use, provided that the user treats it with the care of a good owner. Arable land consists of garden plots up to 50 m2 and common parts with common equipment (access roads and paths, wooden and prefabricated storage of tools and organic fertilizers, composters, benches and waste bins, garden gazebos and canopies). The areas of all City Gardens are fenced, and the common part is intended for socializing and recreation of users, for education and workshops. The existing Sesvete city garden will be upgraded with solar purifying water pumps, as the garden is watered directly with underground water. Spores were detected in the water used for the gardens so it needs to be purified. Application of the CPC photoreactor with flexible supported catalyst technology as innovative solution for water purification in the city garden.
Area of implementation	Zagreb's city gardens have become a gathering place for different generations and neighbors who almost never knew each other before. In addition to contributing to the sustainable development of green urban systems, urban gardens bring many benefits. Work and contact with nature enables socializing and relaxation in a green environment, and organic nutrition, in addition to health, also brings secure financial savings. This is how the users of the garden plots described this valuable project of the city of Zagreb in Sesvete. 65 garden plots were distributed to local residents in Rimski put Street in 2014. Approximate coordinates: 45°49'22.2"N 16°06'22.6"E
Target groups (Beneficiaries)	Target groups are citizens of Zagreb who do not own, co-own, lease or use any other arable land.
Timing (start and end date)	Start: 08/2020; End:12/ 2021 (planned)
Main responsible partner	City of Zagreb: City Office for Agriculture and Forestry City Office of Strategic Planning and Development- overall coordinator
ProGIreg partners involved	ZIPS- contact point and link to the local community AF- consultation on spatial planning ZZPU- consultation on planning regulations and requirements
Other stakeholders involved	NGOs gathering people who use the gardens
Total Budget	proGIreg Partners funds: Zagreb- 110.000 € Other funds: City of Zagreb- to be defined Total budget of the implementation: - to be defined

2. Pre-implementation activities	
Planning and preparatory activities	The purification and solar pumps were developed at the Faculty of Geotechnical Engineering, University of Zagreb
Administrative procedures	The administrative procedure is mainly related to public procurement for the new fixtures.
Technical and social analysis	
Other activities	The preparatory activities include public procurement procedure to provide grounds for successful implementation
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Zagreb, City Office of Agriculture and Forrestry, coordinator of activities relating to the garden
2nd Partner and role/function	City of Zagreb, City Office of Strategic Planning and Development, local project coordinator
3 rd Partner and role/function	ZIPS, local NGO
4. Co-design activity and stakeholder engagement in planning process	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	Co-design The city gardens project is well established but there is no particular NGO that organizes the users, they are rather gathered through the activities of the City Office of Agriculture and Forestry. This activity was less developed in the codesign workshops as it does not modify the principles of functioning of the gardens, but it is rather a technological improvement. Co-implementation The implementation phase will begin when the design is complete and all the necessary procedures are done.

Notes on major achievements/success factors/critical issues/barriers related to stakeholder engagement **(to be updated)** **(link to WP5)**	
Current situation and next steps **(to be updated)**	
5. Other activities	
Synergies with other proGIreg activities	Therapy garden is closely intertwined with the activity of the Info point and can be also connected with the NBS 4/5 self standing fixture as an educational platform. The inclusion and constant dissemination are crucial to ensure activity and awareness of the importance for the local community and beyond
Links with other external project or activity	The NBS is linked also to the city gardens project and the Info point
Business model (link to WP5)	The urban garden is funded by the City of Zagreb, and its maintenance will be included in the maintenance programme.
Technology Readiness Level (TRL) **(link to WP5)**	Current TRL: 7 Planned TRL: 9
Communication activity **(link to WP6)**	All project activities are being advertised in the Info point through lectures, exhibitions, discussions, film projections and other events, and the programme of the Info point is published in the local media, especially the social media.
6. State of Play and Monitoring of NBS implementation	

Current situation (to be updated)	
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	
Next steps **(to be updated)**	
7. NBS maintenance and outlook	
Maintenance	Maintenance of the urban garden will be included in the budget and activity plan of City Office of Agriculture and Forestry.
Sustainability after project conclusion	The urban garden project has been successfully running since 2013, therefore it is safe to expect that the project will continue and that the innovative feature might be replicated in other gardens.
Additional resources	

NBS 3.2: New therapy garden in Sesvete

1. General information	
Compilation date and update	June/2021 - third draft version
NBS type	NBS3- Community-based urban farming and gardening on post-industrial sites
NBS title	New therapy garden in Sesvete
Brief project synthesis	The City gardens project was introduced in 2013, with the aim of using the land owned by the City as gardens for the citizens. While the project implementation started, the idea of conceiving the new garden as therapy garden came up and was welcomed by the partners and local community alike. The codesign workshops were used as opportunity to gather the potential stakeholders and to include them in the planning phase, ensuring that the garden is planned adequately to cater to the needs of all the possible users- local people with various disabilities. Local users are being represented by NGOs who were actively involved in the codesign process, and influenced the design of the therapy garden so it suits the needs of the prospective users. The garden will be managed by the City Office of Agriculture and Forestry and directly by Mali Dom daycare center for children with disabilities.
Area of implementation	The therapy garden will be implemented on a portion of land of 5300 m2, in the southern part of the Sljeme factory area. The area is currently covered in low vegetation and is situated by the Industrijska road. Implementation will require construction of a sidewalk. Approximate coordinates: 45°49'14.3"N 16°06'28.9"E

Target groups (Beneficiaries)	As the project's target groups are disadvantaged and socially excluded, the project has potential to promote their social equality within the community and reduce discrimination and prejudice based on social status, ethnicity, disabilities and other characteristics. Target groups specifically include residential communities of autistic people in the neighboring housing development of New Jelkovec, local people with physical and mental disabilities, children and grown-ups with disabilities from the entire city
Timing (start and end date)	Start: 08/2020; End: June 2021
Main responsible partner	City of Zagreb City Office for Agriculture and Forestry Branka Mrakuzic branka.mrakuzic@zagreb.hr City Office of Strategic Planning and Development- overall coordinator
ProGIreg partners involved	ZIPS- contact point and link to the local community AF- consultation on spatial planning ZZPU- consultation on planning regulations and requirements
Other stakeholders involved	Mali dom-Zagreb, Daycare center for the rehabilitation of children and youth founded by the City of Zagreb
Total Budget	proGIreg Partners funds: Zagreb- 350.000 € Other funds (specify the source): City of Zagreb- 60.000 € (not final) Total budget of the implementation: - to be defined
2. Pre-implementation activities	
Planning and preparatory activities	The therapy garden site and general layout were defined within the codesign workshops, where all the relevant stakeholders attended and became involved in the planning process. The stakeholders include local institutions and NGOs registered in the surrounding area, especially in the New Jelkovec housing estate on the south of the LL area.
Administrative procedures	The land was owned by the Zagreb holding company at the beginning of the project, but in the first semester of 2020 it was acquired by the City of Zagreb. The legal procedures are currently being defined so we expect that the land will be free for planning in the second part of the year. A local firm dealing with

	landscape architecture is preparing the design of the garden, after getting the task through public procurement procedure.
Technical and social analysis	In the codesign workshops the situation was analyzed and finally the optimal solution was defined as the programme task, which was handed to the landscape architect.
Other activities	
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Zagreb City Office of Strategic Planning, City Office of Agriculture and Forestry, coordinator of activities relating to the garden City Office of Strategic Planning and Development, local project coordinator
2nd Partner and role/function	Mali dom, manages the garden under supervision by City Office of Agriculture and Forestry Mali dom Zagreb is an institution whose purpose is to provide highly specialized and comprehensive services to children with visual impairments and other multiple disabilities in a stimulating and positive environment, that will encourage each child and help them realise and fully develop their potential, to reach their maximum possible level of independence and a sense of self-realization. Mali dom-Zagreb is a public institution founded by the City of Zagreb that operates as a Daycare center for the rehabilitation of children and youth in a new, modern, properly designed and well-equipped center at Trešnjevka. This provides further expansion of the Mali dom-Zagreb's programs and its development towards the referral center in the field of care for children with multiple disabilities. Around hundred children with visual impairments and additional influential disabilities are involved in programs and activities of Mali dom-Zagreb and additional 300 children pass annually through our program of transdisciplinary assessment and counseling.
4. Co-design activity and stakeholder engagement in planning process	

Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	Co-design In the codesign workshops, the LL partners had mapped out all relevant groups and NGOs, and have been systematically reaching out to them and involving them via meetings and workshops for the therapeutic garden (NBS3). This was facilitated by the fact that different NGOs in the district already cooperate and work together on joint events and workshops The City office of Social Care has provided a list of NGOs and organizations in the area and they were invited to the codesign meeting. Co-implementation The implementation phase will begin when the design is complete and all the necessary procedures are done.
Notes on major achievements/success factors/critical issues/barriers related to stakeholder engagement **(to be updated)** **(link to WP5)**	
Current situation and next steps **(to be updated)**	The codesign process is in its final phase, and when the design is finished and revised by all the stakeholders, the next steps will be laid out.
5. Other activities	
Synergies with other proGIreg activities	Therapy garden is closely intertwined with the activity of the Info point and can be also connected with the NBS 4/5 self standing fixture as an educational platform. The inclusion and constant dissemination are crucial to ensure activity and awareness of the importance for the local community and beyond
Links with other external project or activity	The NBS is linked also to the city gardens, especially the Borovje garden that is planned in the eastern part of Zagreb
Business model (link to WP5)	The therapy garden is funded by the City of Zagreb, but additional funding for long-term activity can be searched for in EU funds

Technology Readiness Level (TRL) **(link to WP5)**	Current TRL: 7 Planned TRL: 9
Communication activity **(link to WP6)**	All project activities are being advertised in the Info point through lectures, exhibitions, discussions, film projections and other events, and the programme of the Info point is published in the local media, especially the social media.
6. State of Play and Monitoring of NBS implementation	
Current situation (to be updated)	
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	
Next steps **(to be updated)**	
7. NBS maintenance and outlook	
Maintenance	Maintenance of the therapy garden will be included in the budget and activity plan of City Office of Agriculture and Forestry. The Mali dom organization will organize attendance and maintenance within the budget.
Sustainability after project conclusion	The operating of the therapy garden is in line with the Goal 5 of the City of Zagreb Development Strategy, Improving the quality of life; Priority 5.2 - Social integration of local communities, safety and quality leisure time; Measures 5.2.4. Facilitate greater inclusion of persons with disabilities in the community life and 5.2.5. Facilitate greater community inclusion of children and young people with developmental difficulties. Therefore, the long-term aim of the City is to ensure the operation of the therapy garden.
Additional resources	http://www.malidom.hr/about-us/126

NBS 3.3: Info point

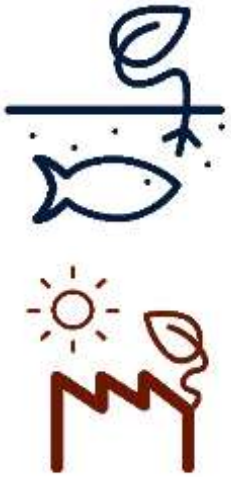
	
1. General information	
Compilation date and update	June/2021 - third draft version
NBS type	NBS3- Community-based urban farming and gardening on post-industrial sites
NBS title	proGIreg info point
Brief project synthesis	The Info point provides a venue for the proGIreg project activities and their dissemination, as well for promotion of similar and complementary activities, such as tree planting action that took place in Sesvete in October 2019, gathering several hundred people from the surrounding area. The Info point is managed by ZIPS, one of the local partners and a major NGO gathering people of Sesvete and ensuring good visibility in the public.
Area of implementation	The info point is located in the ground floor of the residential building, across the street from the main entrance to the former factory and next to the LL core.
Target groups (Beneficiaries)	Target groups include local farmers and local schools, as well as company owners that wish to benefit from the green technologies.
Timing (start and end date)	Start/End: June/December 2018 The info point is open since December 2018
Main responsible partner	City of Zagreb City Office of Strategic Planning and Development- overall coordinator

ProGIreg partners involved	ZIPS- contact point and link to the local community AF- consultation on spatial planning ZZPU- consultation on planning regulations and requirements
Other stakeholders involved	Sesvete Chess Club, who originally used the Info point space before the project
Total Budget	proGIreg Partners funds: Zagreb- 32.000 €
2. Pre-implementation activities	
Planning and preparatory activities	
Administrative procedures	After the project task and budget are fixed, the City will deal with the administrative procedures necessary to implement the task.
Technical and social analysis	Draft of the technical and social analysis were set in the study, and further actions are being prepared in course of drafting of this document.
Other activities	Further co-design and dissemination activities will take place in Info point before, during and after implementation. Mr Lugovic gave a lecture on vertical gardens and aquaponics in June 2019
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Zagreb City Office of Strategic Planning, City Office of Agriculture and Forestry, coordinator of activities relating to the garden City Office of Strategic Planning and Development, local project coordinator
2nd Partner and role/function	ZIPS, local NGO
4. Co-design activity and stakeholder engagement in planning process	

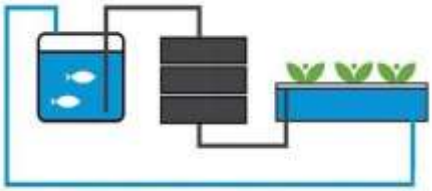
Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	Co-design The co-design workshops took place in the Info point, allowing the process to develop on-site. As this particular activity started before the rest of the project, its implementation is finished and it serves as a tool for successful implementation of the other NBS, especially regarding the public involvement and dissemination.
Notes on major achievements/success factors/critical issues/barriers related to stakeholder engagement **(to be updated)** **(link to WP5)**	
Current situation and next steps **(to be updated)**	The next step is installation of the showcase hydroponic and vertical garden mini fixture with the aim of introducing the technology to the local residents and the interested public. Public events will take place in accordance to the epidemiological situation in Croatia.
5. Other activities	
Synergies with other proGIreg activities	The NBS is linked to the city gardens. A small-scale vertical garden installation is planned to demonstrate the simple and non-expensive options for the citizens, schools, public institutions and companies. The inclusion and constant dissemination are crucial to ensure activity and awareness of the importance for the local community and beyond
Links with other external project or activity	
Business model (link to WP5)	The Info point is operating with minimal cost, as it fits in regular operation of ZIPS and the partner organization Chess club Sesvete.
Technology Readiness Level (TRL) **(link to WP5)**	Current TRL: 7 Planned TRL: 9
Communication activity **(link to WP6)**	The Info point is in itself a communication tool for the proGIreg project. Other project activities are being advertised in the Info point through lectures,

	exhibitions, discussions, film projections and other events, and the programme of the Info point is published in the local media, especially the social media.
6. State of Play and Monitoring of NBS implementation	
Current situation (to be updated)	The Info point is operating since the end of 2018., so preparation activities such as codesign and similar workshops, as well as partners' meetings, are being held in the venue.
Notes/critical issues/barriers (to be updated)	
Next steps (to be updated)	The next step is installation of the showcase hydroponic and vertical garden mini fixture with the aim of introducing the technology to the local residents and the interested public. Public events will take place in accordance to the epidemiological situation in Croatia.
7. NBS maintenance and outlook	
Maintenance	The maintenance is organized by ZIPS, as it is their primary headquarters during the project. The City of Zagreb is in charge of equipment and furniture through the project implementation.
Sustainability after project conclusion	After the project ends, ZIPS will continue to organize local events for the residents and interested public, as it is one of their usual activities. All the successfully implemented NBS will have access to this exhibition and discussion venue.
Additional resources	https://zeleneiplavesesvete.com/

NBS 4 and 5: Seedling factory with aquaponics installations and green roof



Local community



Sketch of aquaponics

1. General information	
Compilation date and update	June/2021 - third draft version
NBS type	NBS4- Aquaponics as soil-less agriculture for polluted sites NBS5- Capillary GI on walls and roofs
NBS title	Seedling factory with aquaponics installations and green roof
Brief project synthesis	In the project preparation stage, the innovation hub with fab lab in the former administration building was planned in the former administration building of the Sljeme factory. It was planned to target the younger population and network individual and group initiatives, schools, NGO and other groups. The Hub building would have been equipped with green walls and green roof and photovoltaic fixture, and the aquaponics installation placed on the roof. The situation with the COVID pandemic and the March 2020 5.5 earthquake in Zagreb and the financial and operational consequences have practically put the HUB project to a halt, so the alternative plan that was developed as a risk management solution. The “Plan B” included designing a new complete solution that integrates green roof, green wall and aquaponics technologies. This scenario would create a new green technology center in the Sljeme factory area. The advantage of implementation of such a comprehensive solution is that the system will be accessible to all citizens, simpler operational management of the system, clear measurement of efficiency and benefits, and participation of a larger number of stakeholders as it is more accessible. On one side is the unit housing the aquaponic system with water quality management equipment for fish, processing area, storage area, and packaging

	area. On the other side is a hydroponic system for growing plants, irrigated with water coming from the pond to the left. An open public space between the two buildings is covered by a green roof and would serve for educations, mini market, STEM workshops, plant transplanting etc. A green wall structure would be erected around the buildings, to protect the area from the sun and to collect the excess rainfall and collect it for later use.
Area of implementation	The original implementation area was at the administrative building, but the new site can be modified as the green technology center. However, the area next to the therapy garden is considered as the optimal site.
Target groups (Beneficiaries)	Target groups include local farmers and local schools, as well as company owners that wish to benefit from the green technologies.
Timing (start and end date)	Start: 01/2021 End: 072021 (planned)
Main responsible partner	City of Zagreb City Office of Strategic Planning and Development- overall coordinator
ProGIreg partners involved	ZIPS- contact point and link to the local community AF- consultation on spatial planning ZZPU- consultation on planning regulations and requirements
Other stakeholders involved	Vesela Motika- The Happy Shovel
Total Budget	proGIreg Partners funds: Zagreb- 148.800,00 € Other funds: City of Zagreb- the exact amount still has to be determined Total budget of the implementation: to be determined
2. Pre-implementation activities	
Planning and preparatory activities	Originally the Faculty of Architecture has drafted the concept design of the HUB building in Sesvete by refurbishing the existing administration building, with the green walls and roof, and aquaponic installation on the roof. After the earthquake Zagreb experienced budgetary cuts which resulted in postponing of the implementation of the HUB. The City of Zagreb has ordered a study on implementation of the NBS in the former factory area from the Happy Shovel company, in order to define a new implementation task within the project. However, in the planning stage in the first year of project implementation it was clear that the HUB implementation will take longer and that the project implementation in the planned timeline might be endangered.

Administrative procedures	After the project task and budget are fixed, the City will deal with the administrative procedures necessary to implement the task.
Technical and social analysis	Draft of the technical and social analysis were set in the study, and further actions are being prepared in course of drafting of this document.
Other activities	Further co-design and dissemination activities will take place in Info point before, during and after implementation. Mr Lugovic gave a lecture on vertical gardens and aquaponics in June 2019
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Zagreb City Office of Strategic Planning, City Office of Agriculture and Forestry, coordinator of activities relating to the garden City Office of Strategic Planning and Development, local project coordinator
2nd Partner and role/function	ZIPS, local NGO
3 rd Partner and role/function	Happy Shovel
4. Co-design activity and stakeholder engagement in planning process	
Stakeholders, engagement processes, in co-design and co-implementation (link with WP2)	Co-design Stakeholders were identified and involved in the project during the co-design meetings that took place in Sesvete in 2018 and 2019. Engagement of right partners will ensure successful implementation and longevity of the project activity. Co-implementation The implementation phase will begin when the design is complete and all the necessary procedures are done.

Notes on major achievements/success factors/critical issues/barriers related to stakeholder engagement **(to be updated)** **(link to WP5)**	At the moment, the main stakeholders, beside the project partners, are the Happy Shovel company. Other stakeholders are schools and citizen organizations, as necessary mediators to citizen involvement in the project. Installation of a small-scale fixture in the Info point is supposed to make the technology seem more approachable and to encourage the citizens and institutions to learn about the technology and to explore the possibilities of using it
Current situation and next steps **(to be updated)**	The codesign process is finished, and the final design is defined by the Happy Shovel. The container that will house the farm is expected to be delivered by the end of June, and the interior and exterior elements will be ready to be mounted by then.
5. Other activities	
Synergies with other proGIreg activities	The NBS is linked to the city gardens, especially to the Info point where a small-scale vertical garden installation is planned to demonstrate the simple and non-expensive options for the citizens, schools, public institutions and companies. The inclusion and constant dissemination are crucial to ensure activity and awareness of the importance for the local community and beyond
Links with other external project or activity	
Business model (link to WP5)	Given the high cost of operations of this type of project implementation, the cost-effectiveness of the project is questioned. The solution to the viability of implementing this scenario could be a private public partnership in which the private company could use the NBS for commercial purposes.
Technology Readiness Level (TRL) **(link to WP5)**	Current TRL: 7 Planned TRL: 9
Communication activity **(link to WP6)**	The NBS will be intensively communicated in the Info point and in local institutions. Link to the city garden project will be stressed and distribution of the local seedlings will be published in the local media, especially the social media.
6. State of Play and Monitoring of NBS implementation	

Current situation (to be updated)	The research study “RESEARCH ON THE SUSTAINABILITY OF IMPLEMENTATION OF NATURE-BASED SOLUTIONS AND LOCAL COMMUNITY INCLUSION” is finished, as a basis for the following steps.
Notes/critical issues/barriers (to be updated) (link to WP5)	
Next steps (to be updated)	The next step is on-site construction and educational activities are expected to begin in September 2021.
7. NBS maintenance and outlook	
Maintenance	The maintenance will be defined in the management plan of the NBS.
Sustainability after project conclusion	Success in the implementation phase and adequate and necessary sharing of the potential benefit of the activity will be key to project success and to sustainability of the activity after ending date of the proGIreg project. As sustainability and replicability are of utmost importance in research projects, great effort needs to be undertaken to ensure sustainability and visibility.
Additional resources	https://www.facebook.com/veselamotikica/

NBS 6: New cycling track

1. General information	
Compilation date and update	June/2021 - third draft version
NBS type	NBS6- Making post-industrial sites and renatured river corridors accessible for local residents
NBS title	New cycling track
Brief project synthesis	A new 850 m long cycling path will connect Sljeme brownfield area with Novi Jelkovec neighborhood. The cycling track is part of the newly planned road, defined in the detailed plan of the former factory area.
Area of implementation	The new cycling track is stretching on a North-South axis, leading from the middle part of the New Jelkovec housing estate up to the south of the former factory, connecting the estate that is today badly connected, with no direct road and no pedestrian path, making the Novi Jelkovec ghetto-like.
Target groups (Beneficiaries)	Target groups are all residents of the Novi Jelkovec housing estate, especially the young and active. However, introduction of a well-planned and safe cycling path will encourage people from all age groups to engage in a more active

	lifestyle, and also make the swimming pool and sports facilities accessible to the other residents of Sesvete.
Timing (start and end date)	Start: 01/2022 End 06/2022 (planned)
Main responsible partner	City of Zagreb City Office of Strategic Planning and Development- overall coordinator The Road Sector of the City Office for Physical Planning, Construction of the City, Utility Services and Transport, coordinator of road planning and construction
ProGIreg partners involved	ZIPS (Green and Blue Sesvete NGO) - contact point and link to the local community AF (Zagreb Faculty of Architecture)- consultation on spatial planning ZZPUGZ (City Bureau for Physical Planning and Development) - consultation on planning regulations and requirements
Other stakeholders involved	
Total Budget	proGIreg Partners funds: Zagreb- 40.000€ Other funds: City of Zagreb- to be defined Total budget of the implementation: - to be defined
2. Pre-implementation activities	
Planning and preparatory activities	The cycling path is part of the road that is planned to be built, and the City of Zagreb is taking care of all the activities.
Administrative procedures	The construction permit will be obtained by the City after the acquisition of the land is finished. The city will organize and manage the construction documents and the construction itself.
Technical and social analysis	
Other activities	
3. Management structure and responsibilities	

Main partner (coordinator) and role/function	City of Zagreb City Office of Strategic Planning and Development, local project coordinator
2nd Partner and role/function	ZZPUGZ (City Bureau for Physical Planning and Development) - consultation on planning regulations and requirements
3 rd Partner and role/function	AF (Zagreb Faculty of Architecture)- consultation on spatial planning
4. Co-design activity and stakeholder engagement in planning process	
Stakeholders, engagement processes, in co-design and co-implementation **(link with WP2)**	Co-design The detailed design of the cycling track was defined in course of co-design among the partners, in order to fit into the green infrastructure requirement criteria. The original concept design was modified in order to enable smooth cycling with as little interruptions as possible and to create potential of a wider green zone to the east of the road. Co-implementation The implementation phase will begin when the design is complete and all the necessary procedures are done.
Notes on major achievements/success factors/critical issues/barriers related to stakeholder engagement **(to be updated)** **(link to WP5)**	
Current situation and next steps **(to be updated)**	The cycling path design is in the final stage, and the next step is obtaining of a location permit. After that, acquisition of land from the private owners will begin.
5. Other activities	
Synergies with other proGIreg activities	The cycling path is connected to all the NBS as it connects physically the large portion of the local inhabitants and users of the future NBS- especially urban garden and therapy garden.
Links with other external project or activity	The cycling path is part of the newly planned road- Road 6, connecting Novi Jelkovec and the center of Sesvete. Future expansion across the railway is expected.

Business model (link to WP5)	The road is financed from the city budget, and its maintenance will be also part of the road maintenance programme of Zagreb.
Technology Readiness Level (TRL) **(link to WP5)**	Current TRL: 8 Planned TRL: 9
Communication activity **(link to WP6)**	All project activities are being advertised in the Info point through lectures, exhibitions, discussions, film projections and other events, and the programme of the Info point is published in the local media, especially the social media.
6. State of Play and Monitoring of NBS implementation	
Current situation (to be updated)	The implementation is still expected, currently the City is in preparation of buying land for the new road, and it will begin after the parceling project is finished.
Notes/critical issues/barriers **(to be updated)** **(link to WP5)**	The main barrier at the moment is the time-consuming procedure of land acquisition, and the possibility of reluctance of some of the land owners to sell the land.
Next steps **(to be updated)**	After the land acquisition process is over, the construction permit will be obtained and the construction can begin.
7. NBS maintenance and outlook	
Maintenance	The cycling track will be part of the city street and road network, and will be maintained within the regular city road maintenance program.
Sustainability after project conclusion	The cycling track is expected to be used by many of the 5000 inhabitants of the Novi Jelkovec housing estate.
Additional resources	

NBS 7: New protocols

1. General information	
Compilation date and update	June. 2021 - third draft version
NBS type	NBS7- Establishing protocols and procedures for environmental compensation at local level
NBS title	New protocols and changes to planning procedures and policy development processes
Brief project synthesis	The procedures and regulations in Croatia aren't up-to-date with contemporary needs and requirements of the changing climate and endangered nature in the cities and beyond. To rectify that, the proGIreg team is going to prepare guidelines for changing of the existing regulations in line with the recognized needs, monitor the situation and initiate the

	procedure of policy change when the opportunity is recognized. The Zagreb local task force will prepare the necessary documents and use the experience of implementation of the local measures to identify the policy changes needed.
Target groups (beneficiaries)	
Timing (start and end date)	Start: 06/2019 End: 06/2023 (Planned)
Main responsible partner	City of Zagreb City Office of Strategic Planning and Development- overall coordinator
ProGIreg partners involved	ZIPS- contact point and link to the local community AF- consultation on spatial planning ZZPUGZ- consultation on planning regulations and requirements
Other stakeholders involved	Local government bodies, Ministry of Construction
Total Budget	proGIreg Partners funds: Zagreb- 28.000 €
2. Pre-implementation activities	
The existing regulatory framework	1. City of Zagreb Development Strategy (local) 2. Utilities Act (national) 3. Decision on Communal Order of the Municipality (local) 4. Ordinance on simple and other buildings and works (national) Participation and partnership: All city administrative bodies, companies, institutions and associations as well as public, civil, business, and scientific sectors provide active contributions in drawing-up of the city strategic documents, while the Partners' Council, consisting of prominent experts from the scientific, public, civil, and business sectors, provide a special contribution. The Partners' Council, as the advisory expert authority, participates in every phase of preparation and drawing up of the strategic documents. Many thematic studies and research are organised in the process of

	drawing up strategic documents, and numerous workshops, working meetings, and other forms of work and participation by all stakeholders. During the last several years, the City of Zagreb has implemented an integrated and inclusive policy towards persons with disabilities, the elderly and other vulnerable groups in accordance with the adopted strategic documents.
The management of public green	The public green areas in Zagreb are managed and maintained by the City of Zagreb Holding Company. The planning of the public green zones, as well as mapping of the existing and planned zones, and assets, are managed by the city (on the areas within the city boundaries)
The needs and the goals	The main goal of the NBS7 in Zagreb is to define the legal framework, point out the parts that can be changed on local and national level, and outline the necessary activities. Also the barriers encountered in implementation phase point at the necessary changes.
3. Management structure and responsibilities	
Main partner (coordinator) and role/function	City of Zagreb City Office of Strategic Planning, City Office of Agriculture and Forestry, coordinator of activities relating to the garden City Office of Strategic Planning and Development, local project coordinator
Other partners	ZZPUGZ, coordinator and maker of planning regulations AF, actively involved in implementation of green directives into local policies
4.The tools/solutions	
Container food production	During the planning phase for implementation of mini urban farm (NBS 4 and 5), it became clear that the Ordinance on simple and other buildings and works, that defines the legal framework of implementing structures for agriculture, can be updated toi include container /indoor gardening and farming as well as the currently allowed glasshouses, to be built without permit, just with the simple documentation, which makes the process cheaper and simpler. ZZPUGZ and the City (GUSPRG) will prepare the documents for changes to be made to the Ordinance. Other activities are still to be defined.
7. Case studies	
Case study or practical experience name	
7. Further developments of the tools/solutions	

Next steps	
Notes/critical issues/barriers	
Link to other NBS	

4. Living Lab results and perspectives

4.1 Conclusions of the Implementation phases

In June 2020, the only finished activity is the Info point, operating since December 2018 and finished/equipped in the summer of 2019. Currently the other NBS are in various phases of planning.
In June 2021, the Therapeutic garden is finished and the activities have started. It was opened officially after two months of construction in the beginning of May 2021, and after some finishing touches the users have started with the gardening activities in the first half of the month.

4.2 Results obtained and points of criticism

This paragraph will be completed at the end of the implementation phase

4.3 Further integrations

The project activities are in part temporary/mobile and in part permanent. The info point might over live the project as a local venue for communication of the institutions and the public, and as a sort of “speakers’ corner” for the green and new initiatives. The urban garden and the therapy garden will serve as a pilot project for the innovative purification method and a public therapy garden, since most therapy gardens are connected and open to a specific institution.
The local seedlings factory and aquaponic installation will be an experiment and its sustainability will depend on its success in engaging the local people, especially the users of the urban garden.
The cycling track is part of a planned road, and its maintenance is in the city road maintenance plan.
The policy change NBS is turning out to be among the most important activities in the project, so the partners will work hard to include the draft changes and new items in the local and national policies, in order to provide long-term sustainability of the project principles.

Annex 1: Zagreb Living Lab Map

Karta Living Laba, Sesvete, Grad Zagreb | Living Lab Map, Sesvete, City of Zagreb | 14/05/2020

proGIreg

Ciljevi Living Laba
Living Lab goals

Gradovi se sve više suočavaju s posljedicama klimatskih promjena te se u Europi i svijetu sve više prepoznaje važnost zelene infrastrukture kao sredstva za ublažavanje ekstrema u gradovima. Grad Zagreb zajedno s Dortmundom, Torinom i Ningbom kroz projekt proGIreg (produktivna zelena infrastruktura za urbanu obnovu) radi na podizanju kvalitete života lokalne zajednice uvođenjem rješenja temeljenih na prirodi uzimajući u obzir potrebu za produktivnošću.

Cities are increasingly facing the effects of climate changes so the importance of green infrastructures is being recognized in Europe and in the world as a means of mitigating extremes in the cities. City of Zagreb together with Dortmund, Turin and Ningbo through the proGIreg project (productive green infrastructure for urban regeneration) works to raise the quality of life of the local communities by introducing nature-based solutions considering the need for productivity.

NBS 7: Uvođenje NBS-a u regulativu
NBS 7: Introducing NBS into regulation

* uspostavljanje protokola i procedura za okolišnu naknadu te prilagodba regulative kako bi se olakšalo uvođenje zelenih rješenja.
* establishment of environmental compensation protocols and procedures and adjusting regulations to facilitate green solutions.

NBS 3: Izgradnja novog terapijskog vrta, modernizacija postojećeg gradskog vrta uz korištenje inovativne tehnologije pročišćavanja podzemnih voda, Info centar projekta

NBS 3: Construction of a new therapeutic garden, modernization of the existing city garden using innovative groundwater treatment technology, project Info point

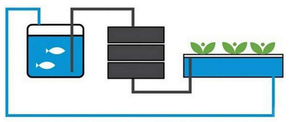

The site of new therapeutic garden


Existing city garden


Info point

NBS 4: Pokazna instalacija akvaponike u svrhu upoznavanja lokalnog stanovništva s tehnologijom

NBS 4: Demonstration installation of aquaponics in order to introduce this innovative technology to the local community


Shematic aquaponic tehnology

NBS 5: Zeleni zid i krov na javnoj zgradi kako bi se ispitao mikroklimatski i izolacijski efekt

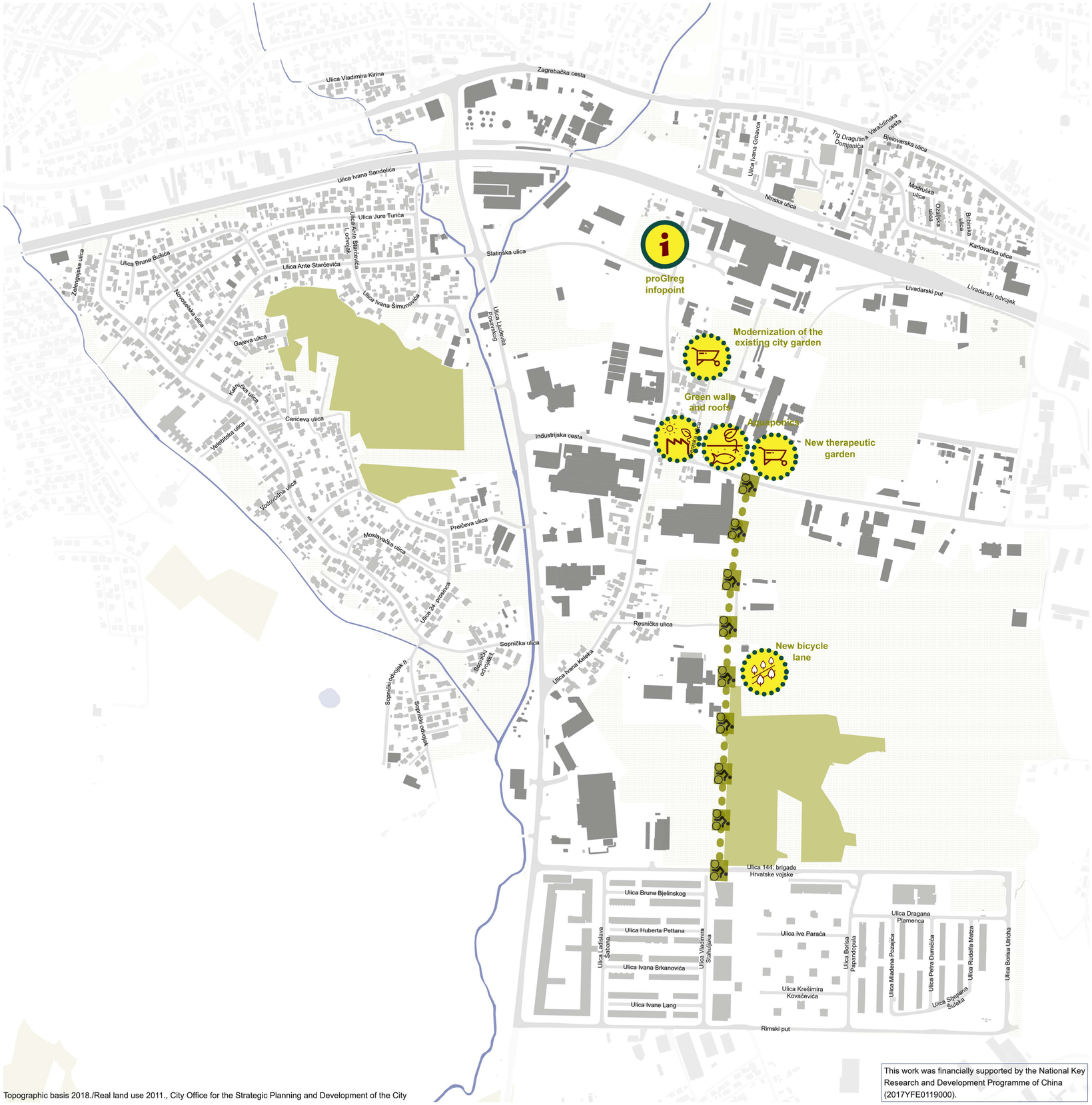
NBS 5: Green wall and roof on a public building to test the microclimate and isolation effect


HUB building

NBS 6: Izgradnja nove biciklističke staze u koridoru ceste koja povezuje Novi Jelkovec s područjem bivše tvornice

NBS 6: Construction of a new cycle path in the road corridor linking Novi Jelkovec with the area of the former factory

Sljeme Sesvete factory



Topographic basis 2018./Real land use 2011., City Office for the Strategic Planning and Development of the City

Rješenja temeljena na prirodi
Nature - based solutions

- Modernizacija postojećeg gradskog vrta — NBS 3: Modernization of the existing city garden
- Novi terapijski vrt — NBS 3: New therapeutic garden
- Akvaponika — NBS 4: Aquaponics
- Zeleni zidovi i krovovi — NBS 5: Green walls and roofs
- Nova biciklistička staza — NBS 6: New bicycle lane

Provedbeni status
Implementing status

- Planirano — In planning
- Provedeno — Implemented

- proGIreg infocentar — proGIreg infopoint
- Vodotoci — Waterways
- Park — Park
- Šuma — Forest
- Neuređene zelene površine — Undeveloped green area
- Prometna infrastruktura — Road infrastructure
- Zgrade — Buildings
- Gospodarske zgrade — Commercial buildings

0 50 100 200 m

Koordinator lokalnih aktivnosti / Coordinator of local activities:

GRAD ZAGREB
GRADSKI URED ZA STRATEGIJSKO PLANIRANJE I RAZVOJ GRADA

Lokalni partneri projekta / Local project partners:

ZAVOD ZA PROSTORNO UREĐENJE GRADA ZAGREBA

zelene i plave Sesvete

KOMFOR KLIMA GRUPA

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