Case Study Report

Collaboration in planning nature-based solutions:
Replication tools for place-based urban regeneration

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Abstract

The report is presenting part of the results and ongoing work of the EU Horizon2020 project proGIreg (productive Green Infrastructure for post-industrial urban regeneration: Nature for Renewal). ProGIreg project aims to demonstrate the integration of nature-based solutions (NBS) into business models that are economically self-sustaining and provide multiple benefits for the economic, ecological and social regeneration of deprived urban areas suffering from the consequences of de-industrialisation. More specifically, the case-study report will focus on the use of methodological tools for the replication process of the proGIreg initiative from Front Runner Cities (FRC) (Dortmund, Turin, Zagreb, Ningbo) to Follower Cities (FC) (Cascais, Cluj-Napoca, Piraeus, Zenica). The tools have been created starting from the outcomes of experiences and lessons learnt from the FRC implementation process. The Replication Toolkit and the Roadmap, the two replication tools, are being tested for the first time by FC, being potentially replicable by other worldwide cities that struggle with post-industrial areas regeneration. The tools were created to ease the development of Regeneration Urban plans, a transformation strategy focused on generating structural environmental and socio-economic changes through NBS. The report aims at describing how FC are approaching replication methodology and how they are being supported throughout the overall process, in order to build a coherent, local-based strategy for the replication and integration of the NBS within the local urban planning context.

Keywords

Collaboration for post-industrial urban regeneration; Nature-based solutions; Co-design; Green transition, Co-creation

1. Introduction - Post-industrial cities and green transition

Worldwide, post-industrial cities have to cope with multiple environmental, social, health and economic challenges. These urban environments suffer from social and economic inequalities, lack of green spaces and are significantly more vulnerable to climate change effects and natural hazards. Soil pollution and poor soils unsuitable for vegetation, often inaccessible brownfields, and abandoned buildings, but also heat island effects in dense urban areas are causing health risks, undermining the well-being of urban dwellers. The economic decline exacerbates these problems when unemployment, few economic opportunities for businesses and entrepreneurship, declining and ageing population, few educational opportunities result in increasing social segregation of post-industrial neighbourhoods. In response, cities are seeking new, greener ways to transform former industrial districts with solutions that use natural systems and processes. Re-introducing natural systems as nature-based solutions (NBS) for

urban regeneration makes use of principles such as cyclicality, self-sustenance and self-regulation, resilience to change and local adaptability. Building a sound knowledge base of the advantages of this approach to complement or substitute technological/technical solutions can thus support policy-making.

2. ProGIreg – Productive Green Infrastructure Regeneration

2.1. ProGIreg objectives and collaboration structure

The EU H2020 project "Productive Green Infrastructure for post-industrial urban Regeneration" (proGIreg) aims at transforming underutilized, derelict post-industrial urban areas into liveable and productive green urban environments, with empowered local communities, while fostering local economies. Nature-based solutions (NBS) are the ecosystem supported components of Green Infrastructure (GI), therefore using NBS can contribute to improving environmental quality, social life and local economies in urban areas. Strengthening the green infrastructure system in post-industrial urban regeneration requires a common narrative among stakeholders to establish the long-term vision and context within the planning framework. A key objective is to demonstrate the integration of NBS into self-sustaining business models, providing multiple benefits for the economic, ecological and social regeneration shared between public authorities, civil societies and industry/SMEs.

The proGIreg is set-up by four so-called front-runner cities (FRC) (Dortmund DE; Turin IT; Zagreb HR and Ningbo CN), created Living Labs in post-industrial regeneration areas to develop NBS within the GI networks that are citizen owned and co-developed by state, market and civil society stakeholders. Methodological steps include pilot NBS co-creation processes, implementations, and monitoring and assessment methods in diverse locations and contexts across Europe and China to evaluate the benefits/co-benefits and negative impacts of deployed NBS.

Figure 1 - proGIreg set-up of partner cities

The objective of the replication process is to increase awareness of the comparative advantages of NBS, their efficacy and efficiency, allowing sound decision-and policy making considering the potential

of NBS. Based on scientific evidence from the Living Labs and knowledge-sharing between FRC, four so-called follower cities (FC) in Eastern and Southern Europe (Cascais PT, Cluj-Napoca RO, Piraeus GR, Zenica BA) will be co-steering replicability and adaptability potential to develop urban plans for integrating NBS interventions suited to their local context. This ensures that NBS are not readymade solutions but are embedded in local planning processes and adapted to create co-ownership of GI in a given replication location.

2.2. The 8 NBS - green solutions supporting green transition

NBS use features and complex system processes of nature. Locally adapted NBS are energy and resource-efficient solutions and resilient to change and foster urban transformation with and for citizens.

In proGIreg, the 8 NBS to be tested include NBS types for sustainably and multifunctionally managed ecosystems (ThinkNature. (n.d.). ThinkNature | Platform for Nature-Based Solutions, https://www.think-nature.eu/) such as creating community-based urban agriculture and making renatured river corridors accessible for local residents. Designing and managing new or artificial ecosystems such as aquaponics regenerating industrial soils biotic compounds or green roofs and walls work with innovative technologies to alleviate urban challenges (see fig. 2). Integrating these NBS supports urban regeneration and sustainable urbanization, climate adaptation and mitigation, restoring degraded ecosystems while stimulating economic growth and promote circular economy processes, e.g. rainwater management strengthens the water cycle or re-using waste, material and nutrients resource flows for greater resource and energy efficiency.

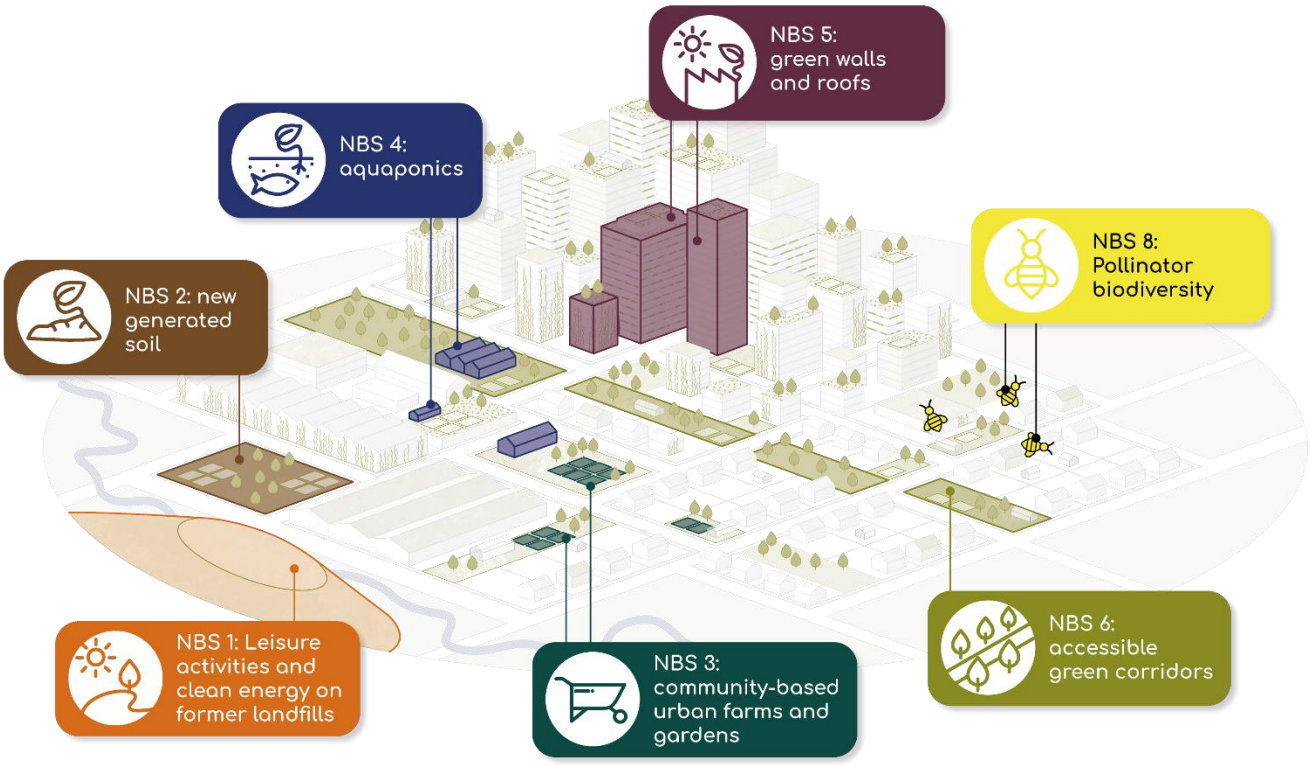


Figure 2 - Spatial representation of proGIreg NBS, RWTH University

NBS provide multiple simultaneous benefits on different scales to improve human well-being and socially inclusive green growth to achieve environmental quality, human health and wellbeing, socio-

cultural inclusiveness and local economies in sustainable climate resilient cities, thus being an essential component of the global effort to achieve the goals of the Paris Agreement on Climate Change and SDGs.

Figure 3 - NBS benefits (RWTH)

These interventions are firstly tested and proved their sustainability in the FRC context, paving the way for NBS innovative transformations practices. The adaptation of the set of NBS at local level through collaborative planning resulted in various forms of place-based solutions. Each solution is tackling different aspects of the environmental challenges that cities are facing. The solutions are complementary to each other, offering the chance to link them through various sustainable value chains, capitalizing sustainably on the same resource, transforming outputs into inputs for a different use, triggering a circularity of relations.

NBS	Description
1 Leisure activities and clean energy on former landfills 	Landfill sites are common in post-industrial areas, as are the challenges of securing them and making use of the space when no longer in use. Their well-exposed high shapes can however be an advantage; they are ideal for producing solar or wind energy, their slopes can be used for different sports, and they provide scenic views when converted into public parks.
2 New regenerated soil 	After decades of neglect, the soil in post-industrial areas is often of poor quality, unfit for any use. Importing fertile soil from elsewhere is costly, both environmentally as well as economically. Carbon-neutral methods to restore soil fertility involve combining the poor-quality soil with compost from organic waste and biotic compounds.
3 Community-based urban farms	Post-industrial areas often lack green spaces for public use. Turning unused urban land into productive community gardens can have a

and gardens 	positive impact on locals, contributing to improved mental and physical health through exposure to nature and healthy sources of food and a community feeling.
4 Aquaponics 	Aquaponics is the combination of raising fish (aquaculture) in tanks together with soilless cultivation of plants (hydroponics) in a symbiotic environment, whereby the fish wastewater provides the nutrients needed to feed the plants. Aquaponics is ideal for promoting local food production in areas with contaminated or poor-quality soil.
5 Green walls and roofs 	Green roofs and vertical gardens improve a building's insulation, reduce storm water run-off, capture CO2, filter pollutants, and increase biodiversity. This all leads to reduced energy consumption and increased urban resilience. Available technology is advanced, but the challenge is to increase uptake by integrating it into local urban policies.
6 Accessible green corridors 	Needed for transporting goods, rivers were a common feature of early industrialization. Nowadays in post-industrial cities, they are often left derelict and inaccessible for locals. While other existing projects are involved in renaturing the rivers and green corridors of the Living Labs, the focus of proGIreg is to improve the accessibility to these green corridors so that the cities become more liveable, and locals can connect more to nature.
7 Local environmental compensation processes 	As shown within these nature-based solutions, measures to compensate the environment are available. However, embedding them into mainstream policies and urban planning procedures requires more effort, in the shape of establishing the evidence-base for NBS and unlocking funds for example via adaptation funds, taxes or public-private partnerships.
8 Pollinator biodiversity 	This nature-based solution complements and links all other greening actions of proGIreg since pollinators are essential to a healthy and functioning ecosystem. To make urban areas more pollinator-friendly, cities can reduce pesticide usage and increase the size of green spaces and plant species diversity. Also, green networks and corridors help prevent in-breeding of isolated populations, which can lead to species extinction.

3. ProGIreg implementation and replication framework

3.1 Co-design – at the core of sustainable green transformation processes

Co-design of NBS is at the core of creating valuable context-based and community-driven solutions that are sustainable at different urban scales. It means systematically involving all relevant

stakeholders from the very start by engaging them as equal co-creators during co-design, co-implementation and co-maintenance process phases. The aim of co-design is to achieve mutually valued outcomes, joint ownership of NBS implemented and a good fit between NBS and the local context. Therefore, a key task in co-design includes identifying, analysing, and mapping context-specific stakeholder networks to facilitate the engagement of citizens in participatory and trans-disciplinary planning processes throughout all project phases. However, gradients of co-design emerged as stakeholders engage in varying intensities: Tools such as the Public Participation Planner map degrees from inform, consult to empowering residents. In addition, co-design allows for assigning roles and responsibilities, e.g. establishing stakeholders that contribute to NBS benefit assessment. During co-design, technological and non-technological barriers of NBS implementation can be identified in FRC, which are flagged for FC in order to maximize the impact of replicating NBS.

3.2. Innovating green-infrastructure urban transformations – Context of Front-Runner Cities

During the project's implementation, the four proGIreg FRC of Dortmund (DE), Turin (IT), Zagreb (HR) and Ningbo (CN) created Living Labs (LL) in urban areas facing post-industrial regeneration challenges. FRC's contexts differ in scale, challenges faced, local technical capacities and stakeholder's availability.

FRC Dortmund (ANNEX 1: FRC Dortmund Living Lab area)

FRC Dortmund's Living Lab comprises a vast and complex peripheral area of the city, situated along the Emscher River and about 2km west of downtown Dortmund, facing problems related to lack of green infrastructure, land ownership, high rate of social welfare recipients and above-average unemployment rate. This complexity allowed testing different nature-based solutions:

Nature-based solution	Intervention
NBS1	Integrating solar energy in Deusenberg landfill and Huckarde district
	Sports infrastructure in an existing park in Huckarde
NBS3	Food forest and permaculture orchard in Huckarde
	Community gardening in Huckarde
NBS4	Aquaponics
NBS6	Connection of Huckarde borough with the renatured Emscher river and Deusenberg sites
NBS8	Improving and monitoring pollinator biodiversity in Huckarde

Apart from integrating solar energy, implementations of other NBS interventions are in progress.

FRC Turin (ANNEX 2 - FRC Turin Living Lab area)

Turin's Living Lab is located in the Mirafiori district, aiming at improving the green infrastructure network, poor urban quality, social and economic inequity and safety concerns. Within proGIreg, Turin started the realization of the following interventions:

Nature-based solution	Intervention
NBS2	New Soil production by Sangone Park
NBS3	Mirafiori Castle's ruins recovery and new planting

	Gardens in Cascina Piemonte (Orti Generali)
	Pollinator friendly garden at WOW
	Gardens around the houses
	School garden in box
	Micro vegetable garden in schools
	Community school garden
NBS4	Aquaponic test system
NBS5	New green roof at Casa nel Parco
	Green wall in a school
	Green wall on a homeless dormitory
	New green roof at WOW
NBS6	Green corridor
	Local natural heritage enhancement in green corridor
NBS7	Tools for environmental compensation processes
NBS8	Butterfly gardens in school and for disadvantaged people

FRC Zagreb (ANNEX 3 - FRC Zagreb Living Lab area)

The FRC Zagreb situated its Living Lab in the eastern neighbourhood of Sesvete: a heavily fragmented urban area that is still developing with a growing young population and different facets, including an unattractive central area to residents and economic/ commercial zones. The demographics boom calls for different functions. The initiatives started within proGIreg respond to the local needs of multi-functionality, increase of resilience to climate change impacts and availability of public spaces for community activities.

Nature-based solution	Intervention
NBS3	Modernization of existing urban garden
	New therapy garden in Sesvete
	Info point
NBS4	Aquaponic installation
NBS5	Seedling factory with aquaponics installations and green roof
NBS6	New cycling track
NBS7	New protocols

FRC Ningbo (ANNEX 4 - FRC Ningbo Living Lab area)

Finally, Ningbo focused its implementation process on the Moon Lake Park, a small shallow inner-city lake suffering from high level of pollution. The interventions are located around the lake shore, with the aim of reducing the pollution of the lake and ameliorating its surroundings.

Nature-based solution	Intervention
NBS3	Community-based urban farms and gardening on post-industrial sites – plantation of acquatic plants
NBS7	Local environmental compensation processes

3.3. Collaboration and transferability – Context of Follower Cities

Within proGIreg project, the four FC of Cascais (P), Cluj-Napoca (RO), Piraeus (GR) and Zenica (BIH) are accompanied in co-designing tailor-made strategies for the integration of already tested set of NBS by

FRC into their local framework, with the purpose of triggering the regeneration of local post-industrial areas identified at the beginning of the process.

The Urban Plans, representing the main output of the FC, will set the basis for the future integration of the solutions, within the local urban planning frameworks. The Urban Plans will establish the most suitable way of co-implementing the NBS identified as the most suitable ones, gathering the necessary stakeholders already in the design phase, elaborating together the vision for the transformation of the area and elaborating a strategy which identify the right means, methodologies, and tools for its achievement.

Based on methods applied and learnings from FRC, the FC can build their own process in the identified Urban Regeneration Area (URA), where green interventions are planned. This approach offers the opportunity of anticipating and avoiding possible bottlenecks and challenges or applying already tested solutions to overcome common issues related to both the overall process, as well as specific NBS.

FC Cascais (ANNEX 5 – FRC Cascais Urban Regeneration Area)

The Cascais' Regeneration Area includes parts of the localities Tires and Zambujal in São Domingos de Rana. The Regeneration Area delineated is characterized by a dense morphology of the built environment, crossed by a major road, part of an important system of road-infrastructure. The area is crossed by a blue infrastructure represented by the Marianas stream.

Cascais is planning to implement the following NBS:

NBS3	Community-based urban gardening and farming on post-industrial sites
NBS6	Making post-industrial sites and renatured river corridors accessible for residents
NBS8	Pollinator biodiversity improvement activities and citizen science project

FC Cluj Napoca (ANNEX 6 – FRC Cluj Urban Regeneration Area)

Cluj-Napoca URA is a very complex one, that includes a vast undeveloped land along the blue-green corridor of the Somes river, which is currently used for power-plants upstream. Cluj-Napoca will engage in the planning of the following NBS:

NBS3	Community-based urban gardening and farming on post-industrial sites
NBS5	capillary GI on walls and roofs
NBS6	Making post-industrial sites and renatured river corridors accessible for residents
NBS7	Establishing protocols and procedures for environmental compensation at local level

FC Piraeus (ANNEX 7 – FRC Piraeus Urban Regeneration Area)

The Piraeus' URA is divided among two different districts of the municipality: district C', mainly residential, surrounded by the Kifissos river and the highway; and district E', located on the mainland, with residential and commercial areas hosting the passenger port. The regeneration areas are mainly restricted to the tram line on Marias Kouris street.

Piraeus is going to work on three NBS:

NBS3	Community-based urban gardening and farming on post-industrial sites
NBS6	Making post-industrial sites and renatured river corridors accessible for residents

NBS8	Pollinator Biodiversity

FC Zenica (ANNEX 8 – FRC Zenica Urban Regeneration Area)

Finally, the industrial FC of Zenica, which is struggling with poor air quality and limited availability of land, focused its area of intervention on the river Bosna banks, especially on one side of the riverbank, which is neither protected nor renatured or accessible for residents. Zenica is also considering the expansion of the area towards a more residential/ industrial one, the Blatuša – Banlozi area. The following NBS have been identified as the most suitable ones:

NBS3	Community-based urban gardening and farming on post-industrial sites
NBS5	Capillary GI on walls and roofs
NBS6	Making post-industrial sites and renatured river corridors accessible for residents

4. Methods and tools for replication processes

4.1. proGIreg Roadmap

Based on good practice examples developed by FRC, FC will engage in a comprehensive process of creating Urban Plans. To support them in their replication process, a replication methodology has been elaborated. The main component of this methodology is the Roadmap towards urban planning in FC, structured as a step-by-step guide that leads to the development of Urban Plans for integrating NBS within FC local framework. The roadmap follows an interactive and incremental approach, being flexible and allowing for throwbacks and rethinking of the process as necessary. The roadmap enables cities to proceed with the development process based on a consolidated wealth of knowledge.

This tool is meant to be:

- Adaptable to each specific local FC context, and adjustable to respond to different necessities and conditions.
- Comprehensive, encouraging the collection of all necessary information and their integration into the planning process (local policy framework, synergies with other projects, stakeholder mapping, etc.)
- People-centred, placing stakeholders and co-design at the core of the Urban Plans' development process.

The Roadmap is broken down into four phases. Each phase is composed by various blocks, which are further divided into steps to facilitate the FC proGIreg process. The blocks are characterised by symbols representing re-routing points, challenging points and milestones which lead to the consultation of ancillary tools provided within the replication methodology.

1. **Preparatory phase** – This phase helps the FC in setting-up the framework on which to build their process towards the elaboration of the strategy. It encompasses the following blocks:

   1.1. Updating the Spatial analysis – focused on analysing the existing plans and policies to create synergies that could support the future development of the NBS, identifying possible drivers and barriers and mapping the stakeholders to be involved in the activities foreseen during the implementation, as well as selecting, among them, the members of the local group (LG), directly supporting and following the project's progress.

1.2. Preliminary Vision – Aimed at constructing, together with the stakeholders the vision to be achieved in the URA, the specific objectives and activities to be conducted for its achievements, as well as the means to get the political approval for their development.

1.3. Consolidation of the URA – Based on the vision, the selection of the transformation areas and the NBS can be consolidated.

1.4. Consolidated stakeholder map – Following the consolidation of the transformation areas and the NBS to be implemented, a reanalysis of the stakeholders to be involved and a solid strategy for their involvement is needed.

2. **Planning the URA transformation** – This phase is focused on the actual transformation of the areas selected, planning the specific interventions to be carried out and adapting them as business models. The second phase foresees three main blocks:

2.1. Local actor activation – To spread awareness at a more general level on the benefits of implementing NBS at local level and involve marginalized groups.

2.2. Development of possible scenarios – A scenario approach will be organized within FC to help them in their decision-making process for selecting the most fitting interventions.

2.3. Scenario consolidation – A step in which the final set of NBS and interventions is defined.

3. **From co-design to co-implementation** - Representing the transition between the design of solutions and their co-implementation, approaching the concrete strategic planning process:

3.1. Design of action plans – Elaboration of work and time-plan, establishment of a management structure and assessment of resources' availability for implementation.

3.2. Implementation framework – Development of a locally contextualized implementation framework that can ensure sustainability beyond the end of proGireg project, through the assessment of possible synergies with other projects and initiatives and a way of ensuring long-term involvement of stakeholders and general public.

4. **Implementation** – The actual implementation of the urban plans is not part of the proGIreg FC's objectives, but the replication methodology based on the FRC process offers support and valuable information for FC to implement their solutions beyond the project.

The entire process of Urban Plans' development will be conducted within the participatory framework, at the core of proGIreg project, carried on especially through three rounds of local workshops. Each round will focus on a specific phase of the path towards the elaboration of the urban plans:

- First workshop "Analysis", aimed at achieving a consolidated knowledge of the area and at elaborating a shared vision for its transformation.
- Second workshop "Scenario-building", in which cities will engage in the process of building scenarios for the selection of suitable path for NBS implementation.
- Third workshop "Design", focused on guiding the design of first drafts of Urban Plans and correlated Action Plans.

Papina, C.; Budau, O.E.; Olbertz, O.

Collaboration in planning nature-based solutions

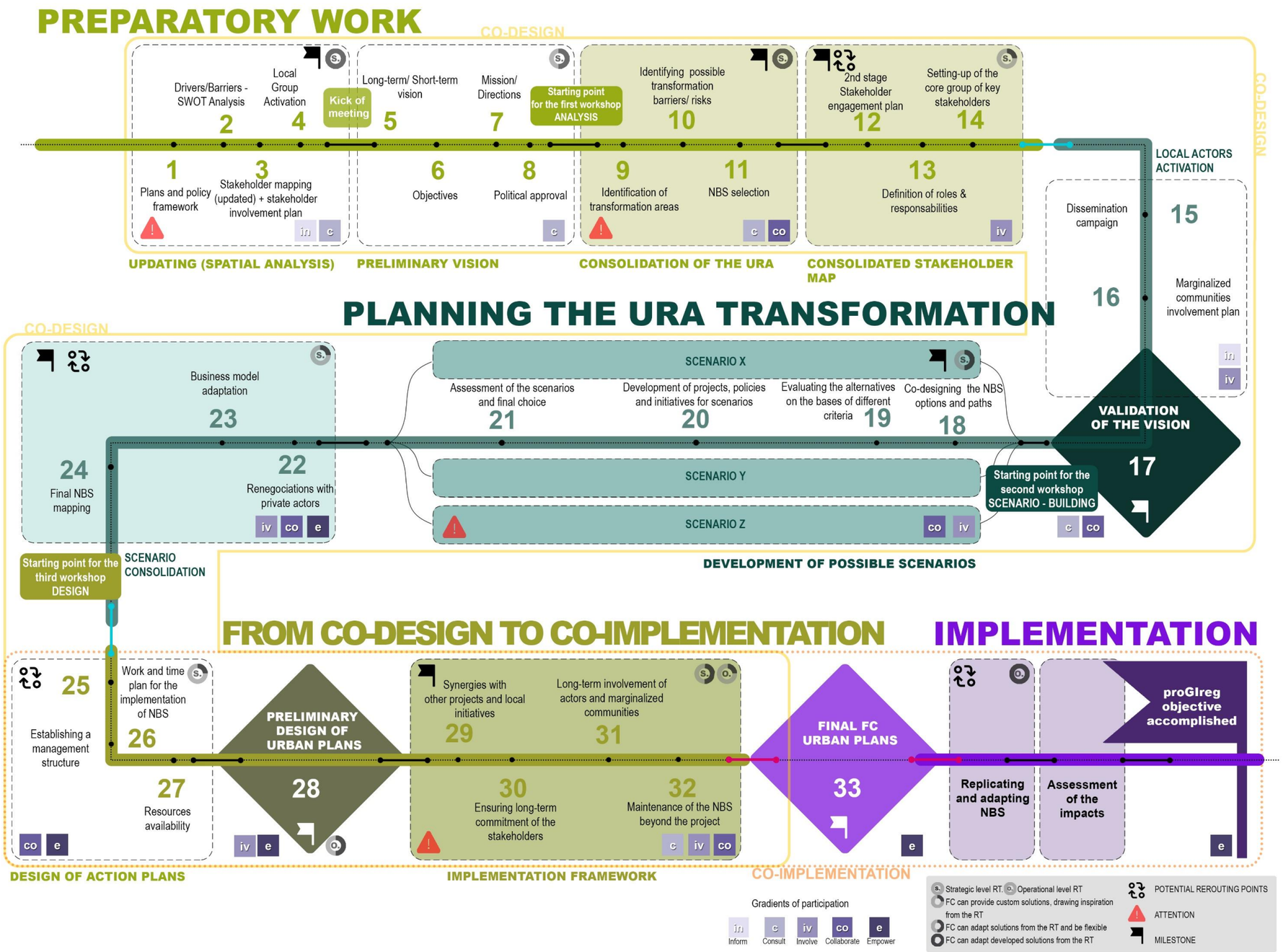


Figure 4 - ROADMAP towards urban planning. Source: URBASOFIA

4.2. Ancillary supporting tools

In order to better facilitate the transferability of proGIreg solutions, two other instruments supporting replication were constructed, as ancillary tools for the Roadmap: Challenges & Lessons Learned and the Replication Toolkit (RT).

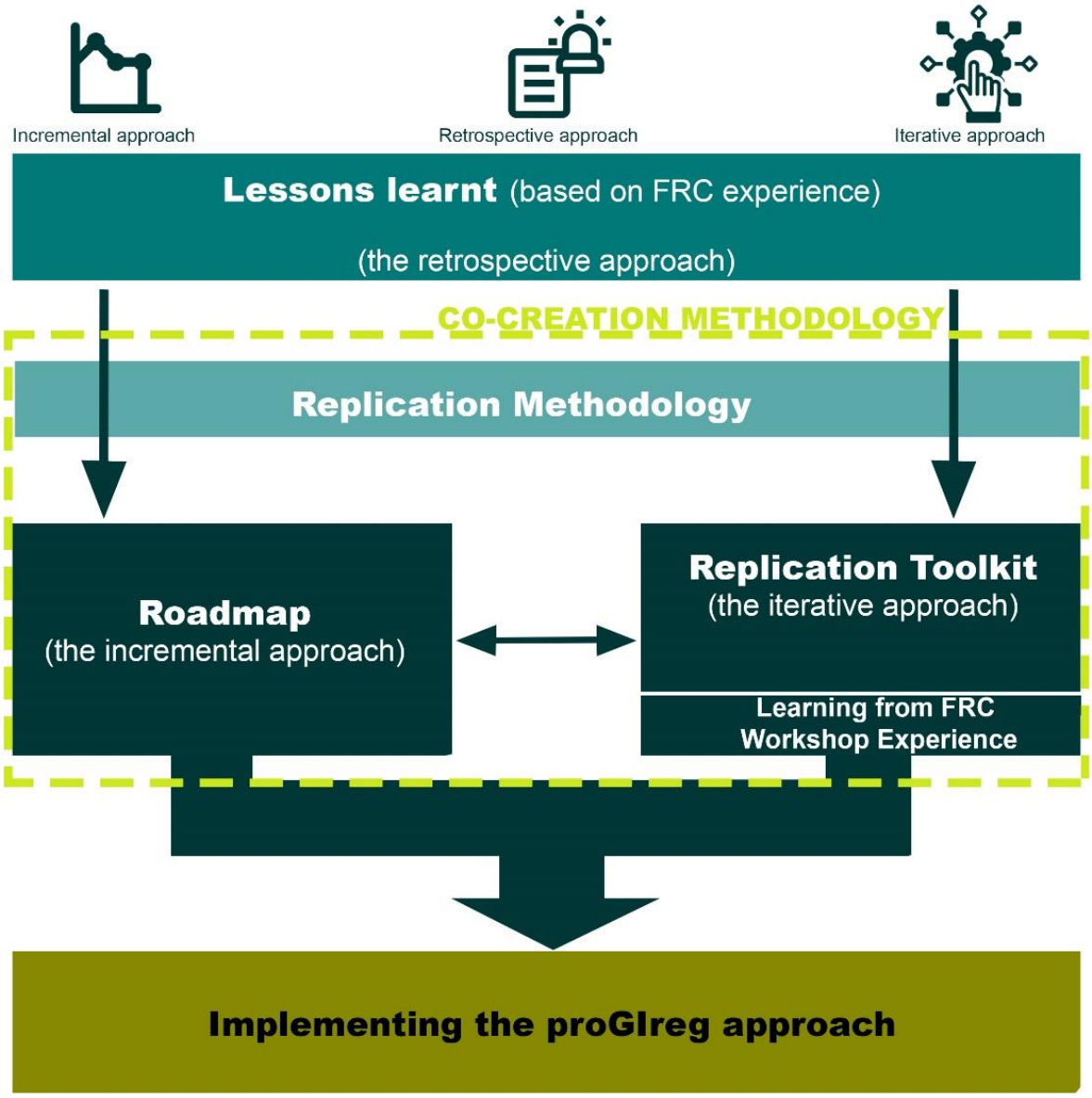


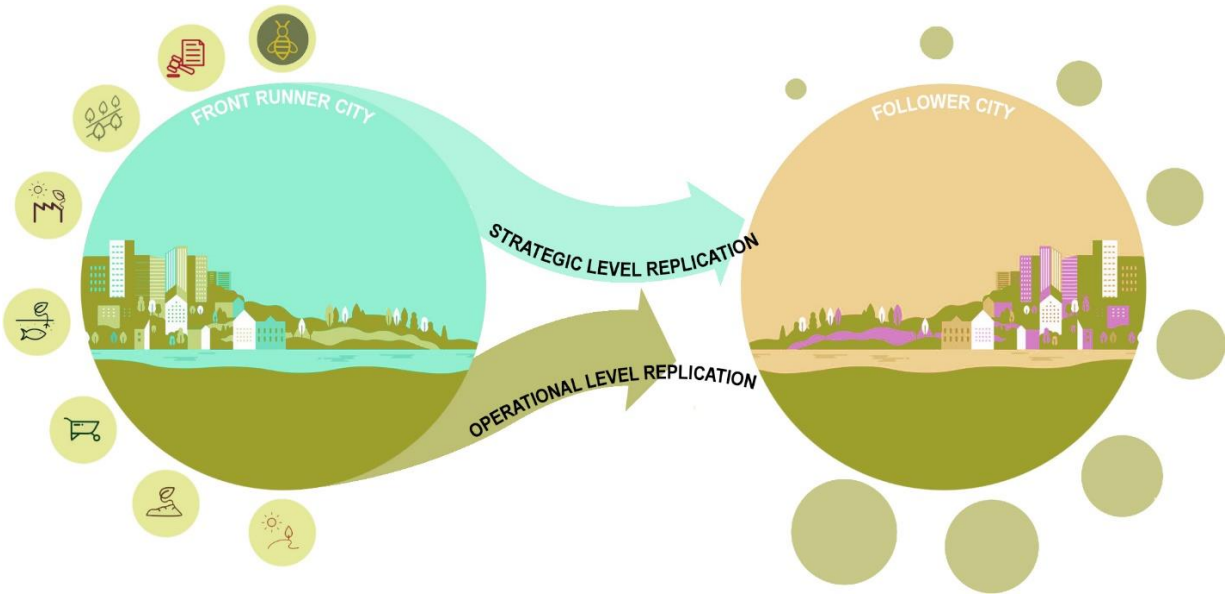
Figure 5 - Main components of the Replication methodology. Source: URBASOFIA

Before engaging in the FC co-design process towards the creation of Urban Plans, a thorough analysis of the local process in each FRC was conducted. A series of discussions, interviews and questionnaires were organized for the purpose of creating a comprehensive set of Challenges & Lessons Learnt, based on the first two years of implementation in the FRC LL. The information collected served as a first step for developing the Replication Toolkit and the Roadmap. Challenges & Lessons Learnt are structured as a table, categorized in accordance with the different stages of green solutions transition,

reported also in the Roadmap: (1) Preparatory work; (2) Planning the URA Transformation; (3) From co-design to co-implementation; (4) Implementation.

As a research project, proGIreg is critically and objectively assessing all obstacles encountered, and the mitigation solutions used and potential risks. FRC analyses of good practices are feeding the ancillary tools: Challenges & Lessons Learnt, and the Replication Toolkit, which takes into consideration all challenges previously identified.

The RT presents the re-elaborated information in the form of two tables: (1) The Strategic Level RT and (2) The Operational Level RT. The strategic level refers to more general proGIreg planning and implementation processes whilst the operational level provides a set of recommendations that applies to specific NBS.



The two tools' Challenges & Lesson Learnt and Replication Toolkit (RT) complement the Roadmap, providing useful recommendations to deploy the co-design process towards the co-creation of FC Urban plans.

4.2 FC replication process (in progress)

May 2021 represented the official starting point of FC implementation of the Roadmap with the aim of developing Final Urban Plans. The collaboration between FRC and FC is twofold: firstly, FRC process represented the basis on which the replication methodology was created, and secondly FRC and FC will continue to exchange knowledge and experience until the end of the project, FRC being in the phase of testing solutions' usability and sustainability over time. The collaboration between cities is being moderated by proGIreg team, offering guidance and technical support by providing additional explanations, guides, templates and methodologies in order to help FC implementing the Roadmap efficiently.

In the first months of implementation, FC have organised local actions needed to accomplish the steps of the roadmap, concluding with an Official Kick-off Event and Local Group Activation. Local stakeholder groups composed of key entities for the successful implementation (e.g., representatives of

different municipalities' departments, education and schools' representatives, NGO's representatives, people from local organizations spontaneously formed etc.).

FC differ in several issues: (1) Composition of Local Group and their specific expertise; (2) Approaches on URA transformation direction and priorities in implementing NBS; (3) Complexity of measures to be developed, as a result of different socio-economic context and different typologies of URA.

Currently, FC are working to organize the First Workshop – Analysis, as a series of activities which will help in achieving steps 5-11, followed by steps 12-14. The achievement of the steps of the Roadmap can follow an iterative approach. To ease the process of implementing the Roadmap and adapting it to the local needs of each FC, a specific methodology for concluding the entire first phase of the Roadmap was constructed:

Stage 1: Preparation activities for blocks 2 and 3. Building on the results and reflections from Block 1, in this stage is important to elaborate the information/maps/analysis that will be used as basis for discussions and activities planned within the First Workshop Analysis. A first transformation URA Vision will be constructed with the help of the Local Group of stakeholders (LG).

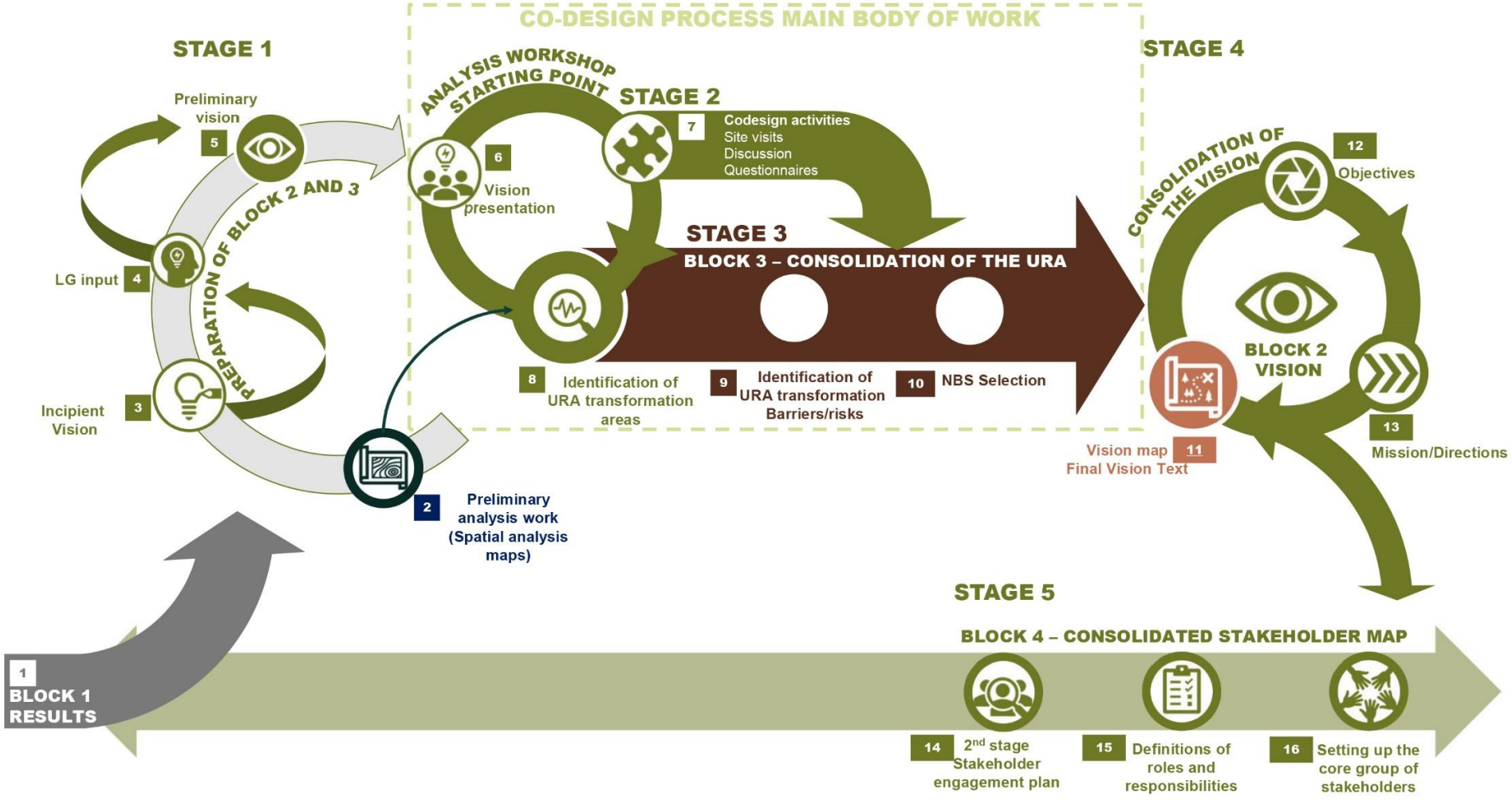
Stage 2: Analysis workshop starting point (set of activities). Depending on the FC, stage 2 will be implemented as one intense activity or divided into sub-activities/exercises. In addition to the LG, a wider group of stakeholders should be included in various forms: actively participating in co-design activities, interviews on-site, large-scale online questionnaires for the local communities, etc., Wider stakeholder groups to be involved in the First Workshop Analysis can vary, depending on the characteristics of URA and the preliminary Vision. For this reason, preparatory work and the creation of analysis maps are needed.

Stage 3: Block 3 Steps – Consolidation of the URA. For achieving the steps of Block 3, the following co-design exercises are necessary: URA diagnosis, mapping the key areas of intervention, mapping the disfunctions and the transformation potential.

Stage 4: Consolidation of the Vision (elaboration of steps 5-7 of Block 2). This stage is composed of steps of Block 2. At this point, after completing the work in First Workshop Analysis, the FC will be able to construct the consolidated vision (updated and developed accordingly to the outcomes of previous stages of the presented methodology).

Papina, C.; Budau, O.E.; Olbertz, O.

Collaboration in planning nature-based solutions



5. Conclusions

ProGIreg project is an innovative initiative supporting cities in their green transition, providing solutions and practices for one of the most vulnerable types of developments in the urban areas – post-industrial sites. NBS are used as important additions to the existing (and fragmented) green infrastructure of these areas, in order to valorise its potential of brining benefits to the local communities. NBS, not only provide valuable ecologic/ecosistemic services, but also help in the improvement of the urban landscape, contributing to the overall socio-economic regeneration of the studied areas.

The Case-study Report present the on-going work within the proGIreg project. The project is in the process of completing the first phase of implementing NBS in FRC, laying the ground for potential large-scale urban-transformation processes. In contrast to FRC, which experimented with local physical interventions, FC have the opportunity of developing a more comprehensive strategy, leveraging on FRC already-tested solutions and best practices, with the aim of supporting cities' green transition. The NBS planned in the co-designed FC Final Urban Plans will be acknowledged by local decision-makers and included in the local framework (to different levels, depending on the municipalities regulations/procedures).

The key criteria for developing powerful urban planning decisions is collaboration**.** ProGIreg cities engaged in a collaborative process at two levels: (1) international collaboration between FRC and FC, learning from past experiences and exchanging information of the current work, (2) local collaboration between the city/municipality and local communities, stakeholders, and relevant local actors.

In order to support the FC in their journey for nature-oriented and community-driven urban transformations, the proGIreg team provided a series of tools and instruments, ensuring an efficient process of co-design towards the creation of tailor-made plans. The Roadmap and the Replication Toolkit are two instruments that guide the FC in developing their own step-by-step co-design process. The methodology strongly relies on the outcomes of the FRC implementation processes, incorporating the knowledge generated in the first years of proGIreg implementation and providing solutions and recommendations for the adaptation to new contexts, dealing with similar post-industrial regeneration challenges. The replication of NBS into FC local context is at an early stage. The replication tools developed for the purposes of supporting cities in embedding NBS in their local framework, coherently with local strategic and regulatory framework, are being adapted to fit specific needs. The aim is to demonstrate the possibility of creating comprehensive but time flexible tools allowing general applicability by cities dealing with post-industrial regeneration challenges, but strongly adaptable to local characteristics.

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ANNEX 1: FRC Dortmund Living Lab area

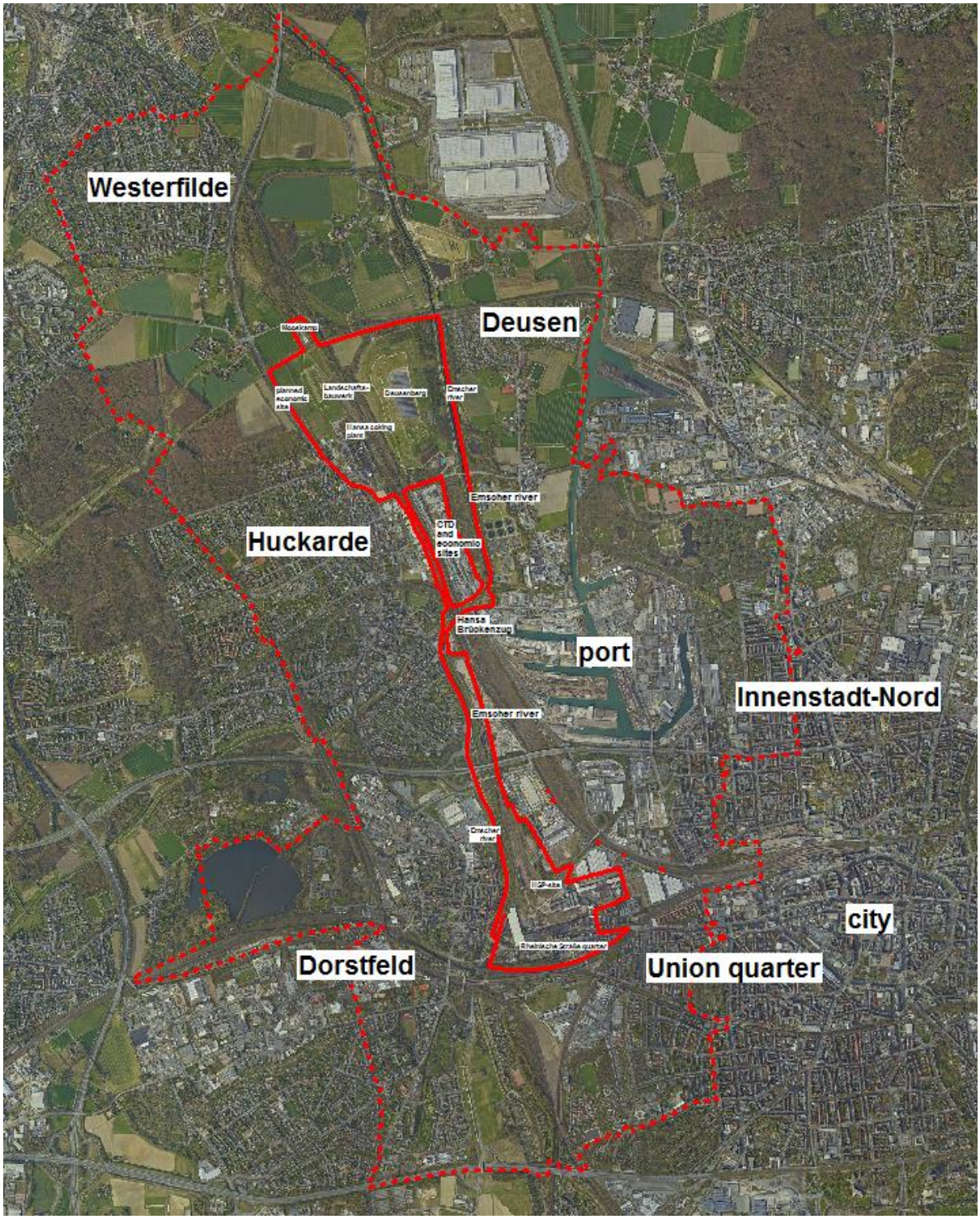

Figure 6 - LL Area of Dortmund. Settlements and location of port within Regeneration Area

ANNEX 2 - FRC Turin Living Lab area

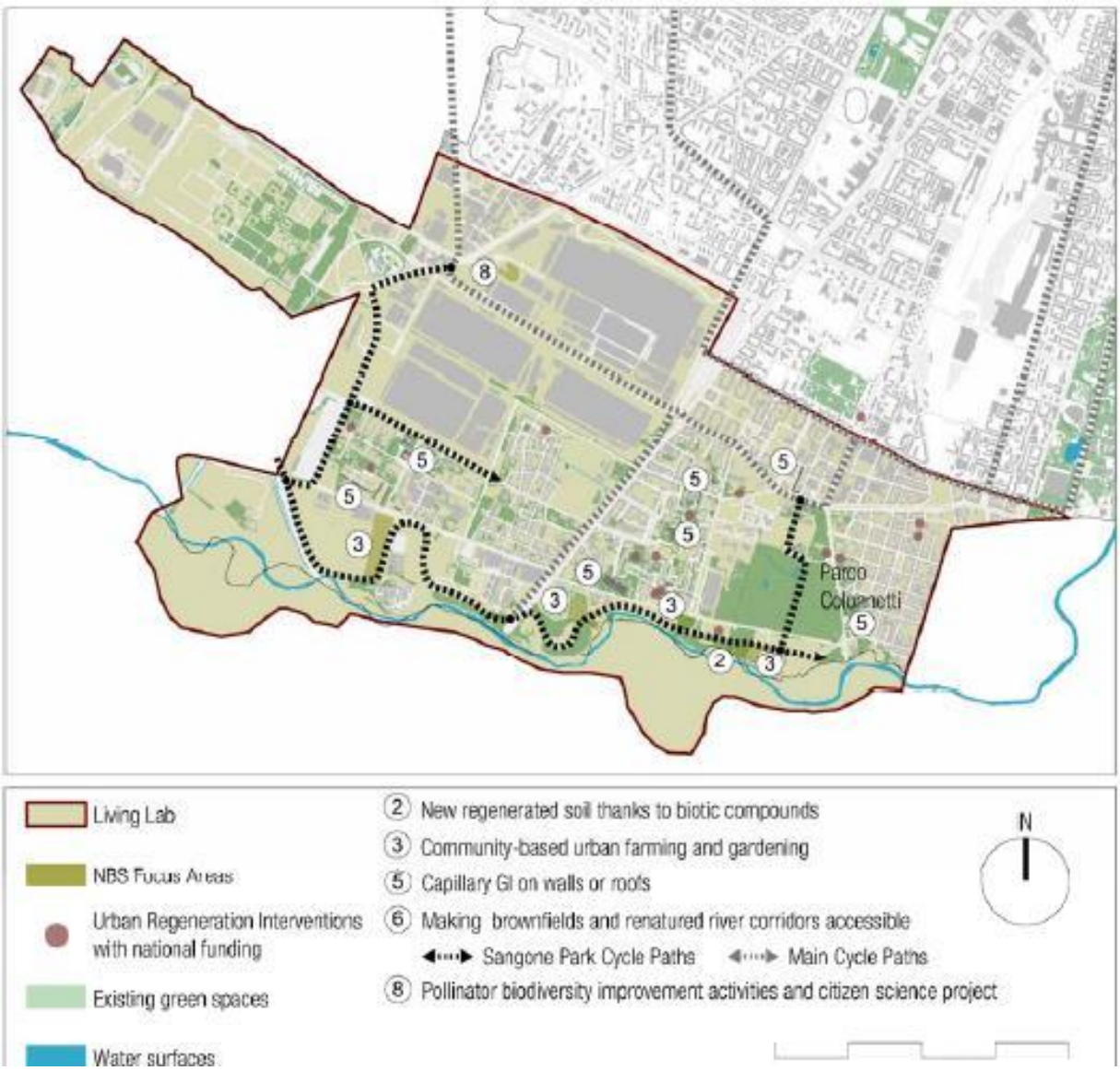

Figure 7 - Living Lab in Turin. Source: proGIreg AF

ANNEX 3 - FRC Zagreb Living Lab area

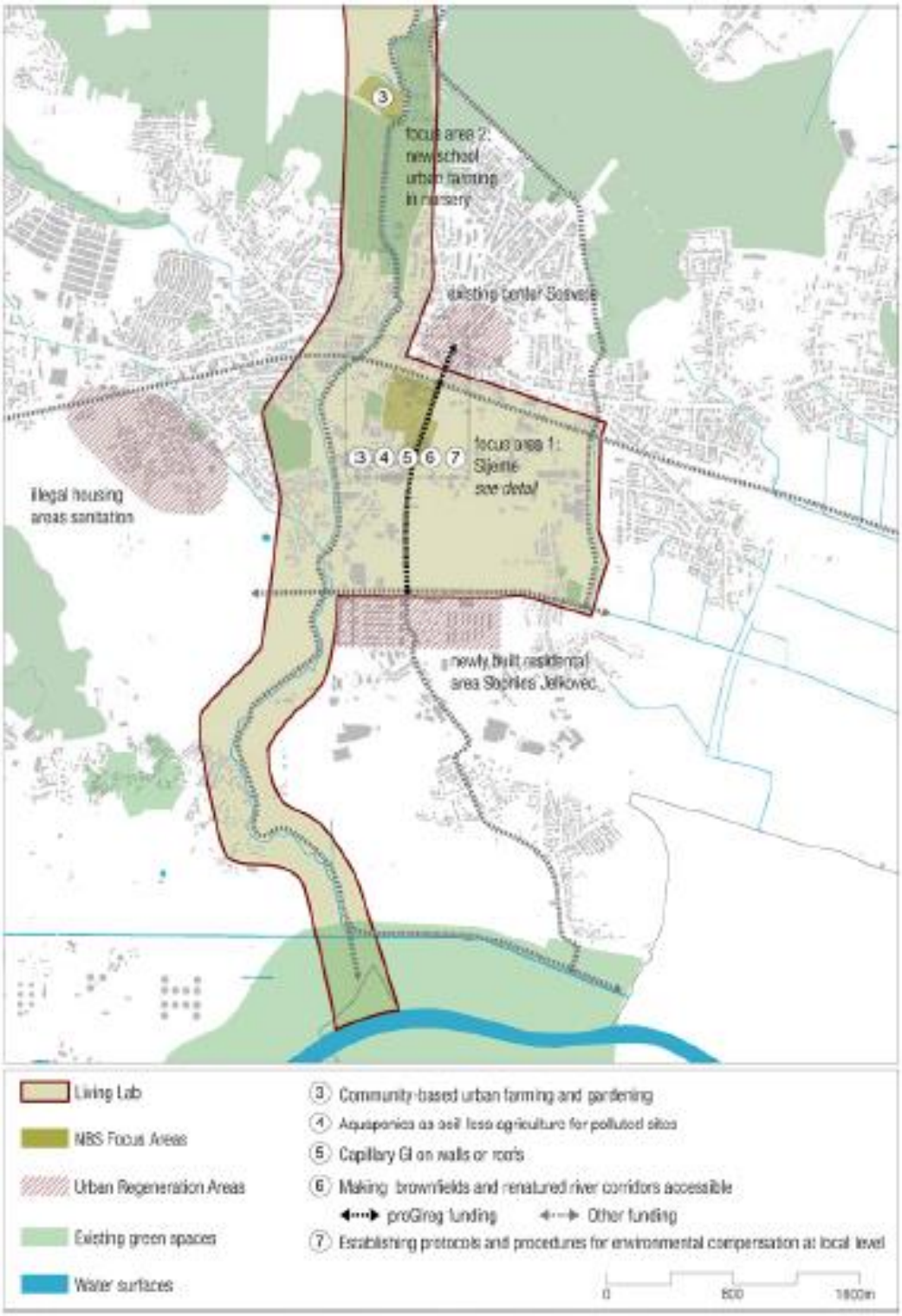

Figure 8 - Living Lab in Zagreb. Source: ZZPUGZ, proGIreg AF

ANNEX 4 - FRC Ningbo Living Lab area

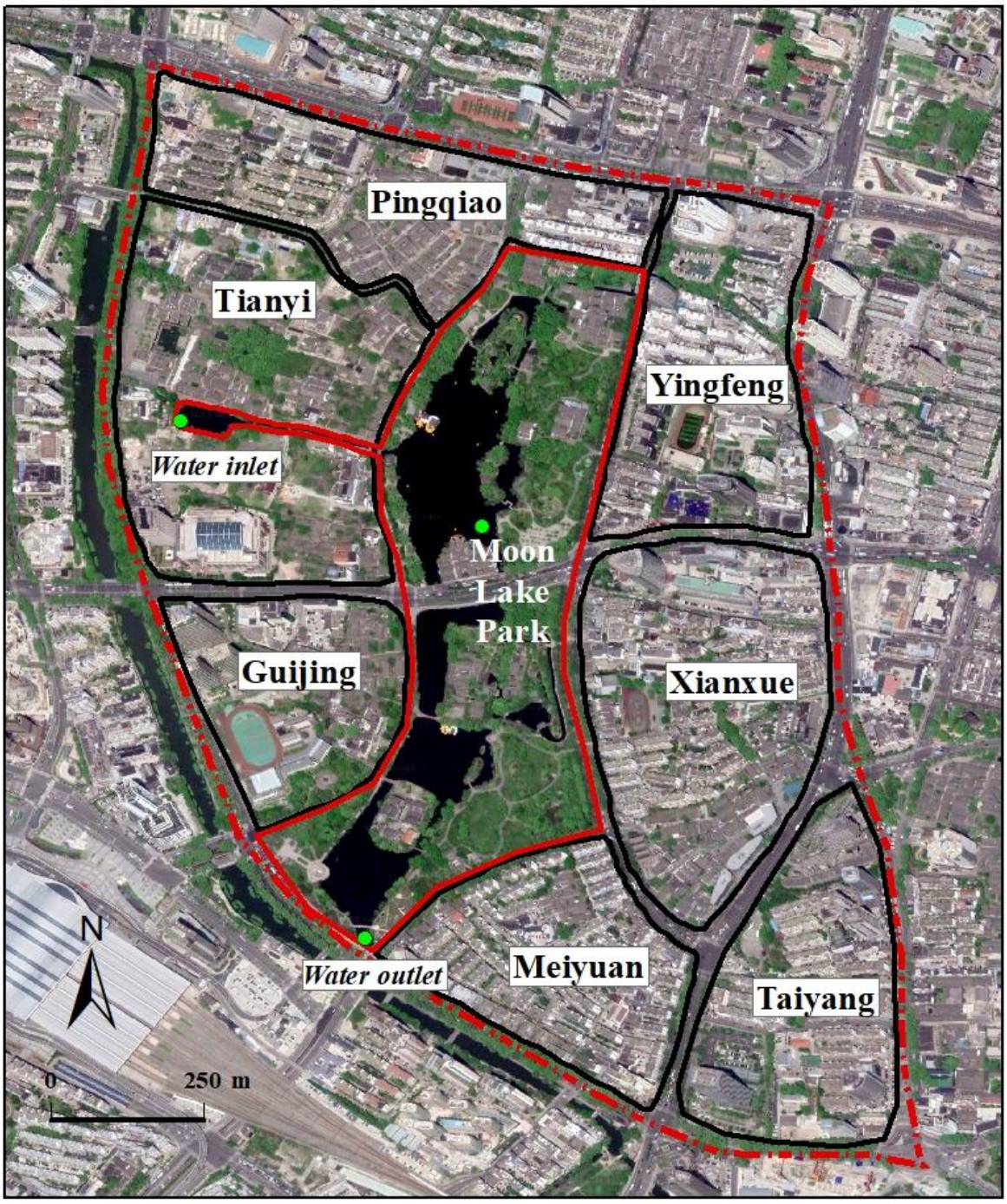

Figure 9 - Living Lab (red continuous line), Analysis Area (red dotted line) and 7 communities (black continuous line) of Haishu, Ningbo.

ANNEX 5 – FRC Cascais Urban Regeneration Area

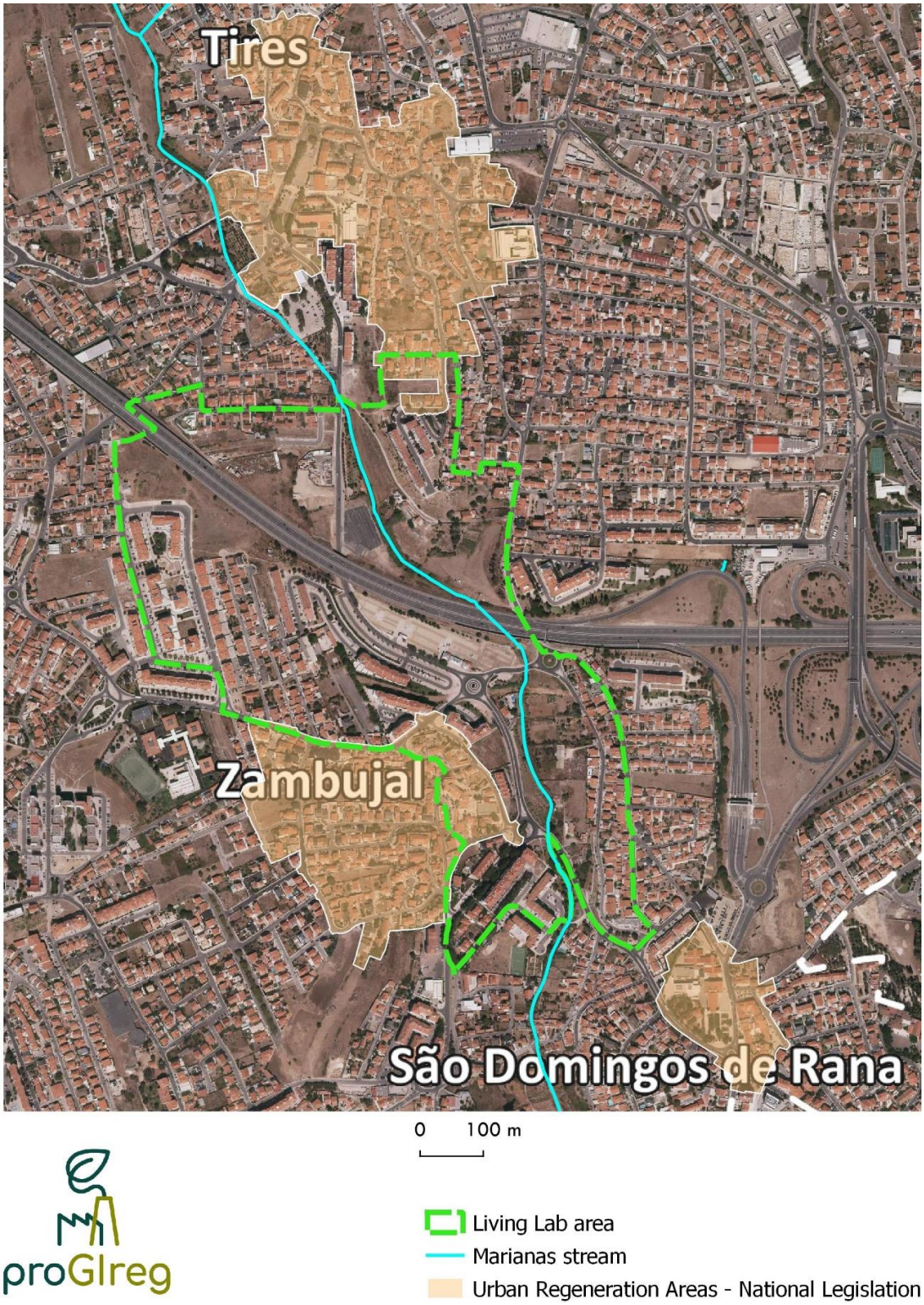

Figure 10 - Cascais' Urban Regeneration Area's identification

ANNEX 6 – FRC Cluj Urban Regeneration Area

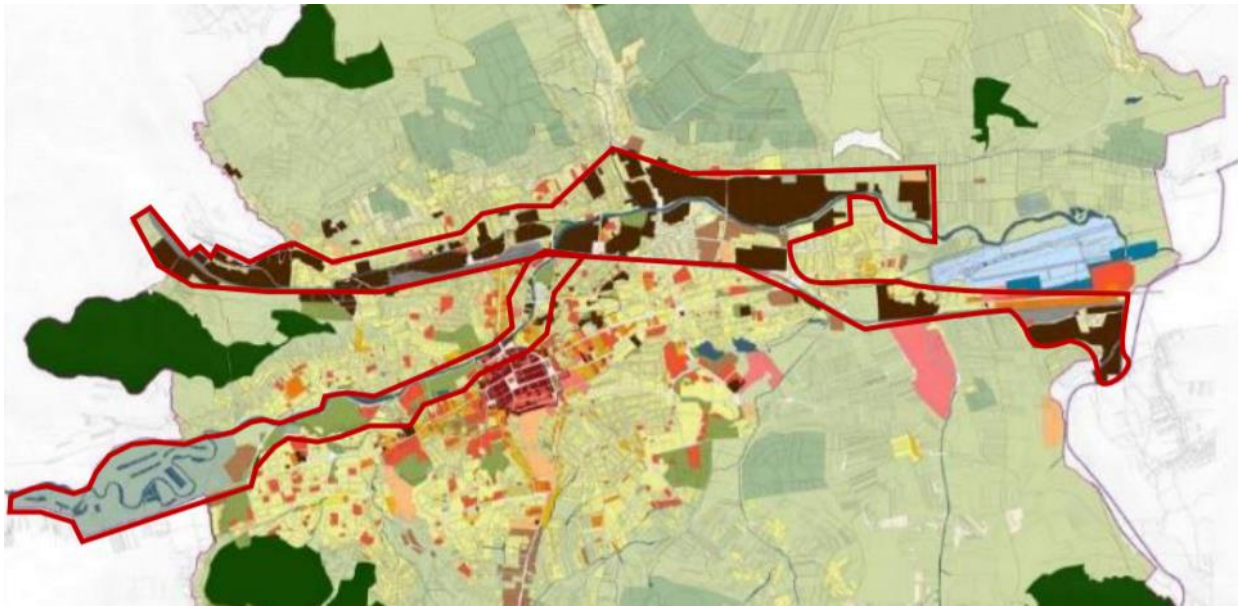

Figure 11 - The potential Regeneration Areas (in red) in the Cluj-Napoca Municipality

ANNEX 7 – FRC Piraeus Urban Regeneration Area

Figure 12 - City Plan of Piraeus and its 5 districts; delineation of the potential regeneration areas. Source: Municipality of Piraeus, Urbasofia.

ANNEX 8 – FRC Zenica Urban Regeneration Area

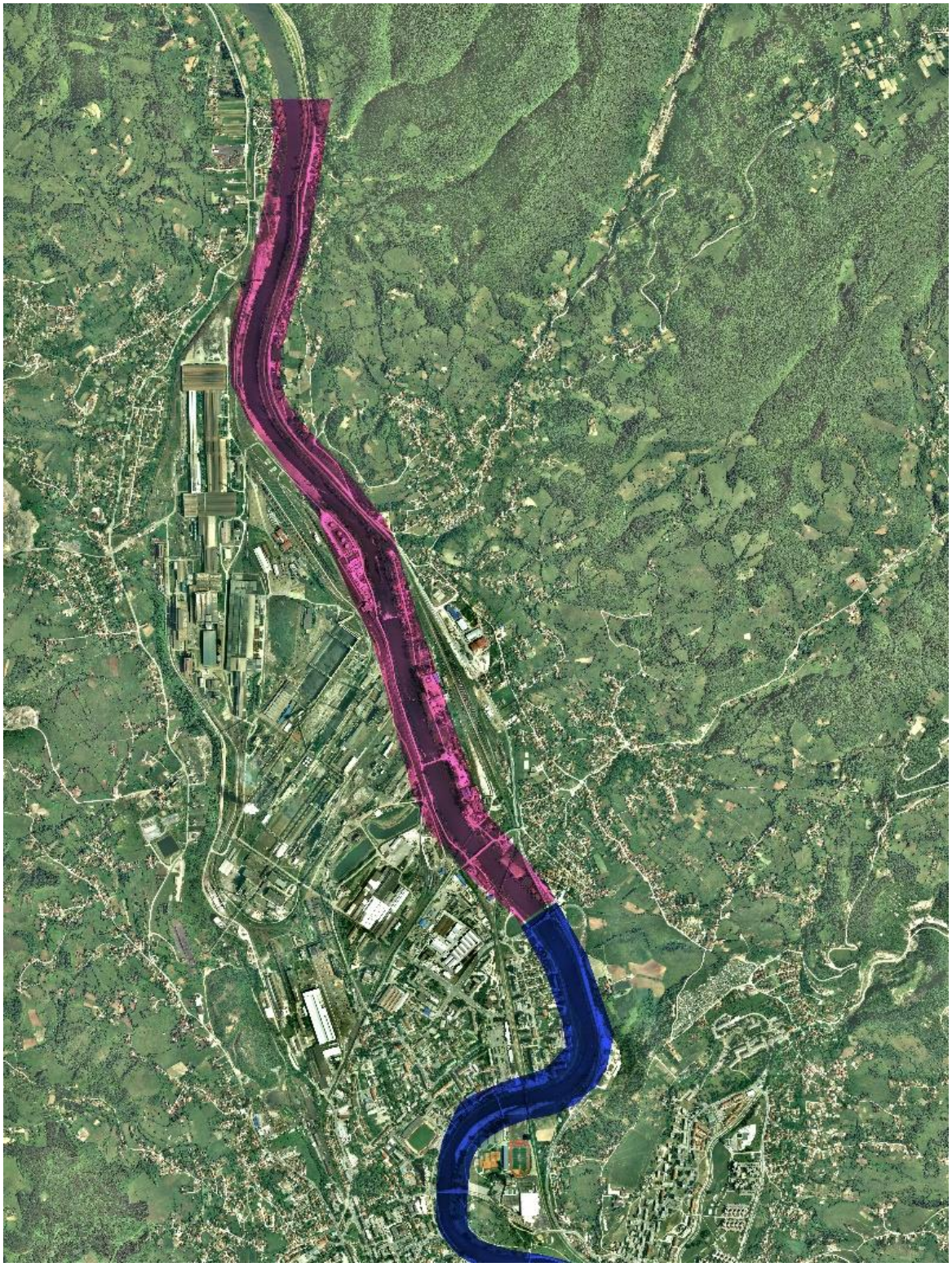

Figure 13 - Zenica's Urban Regeneration Area