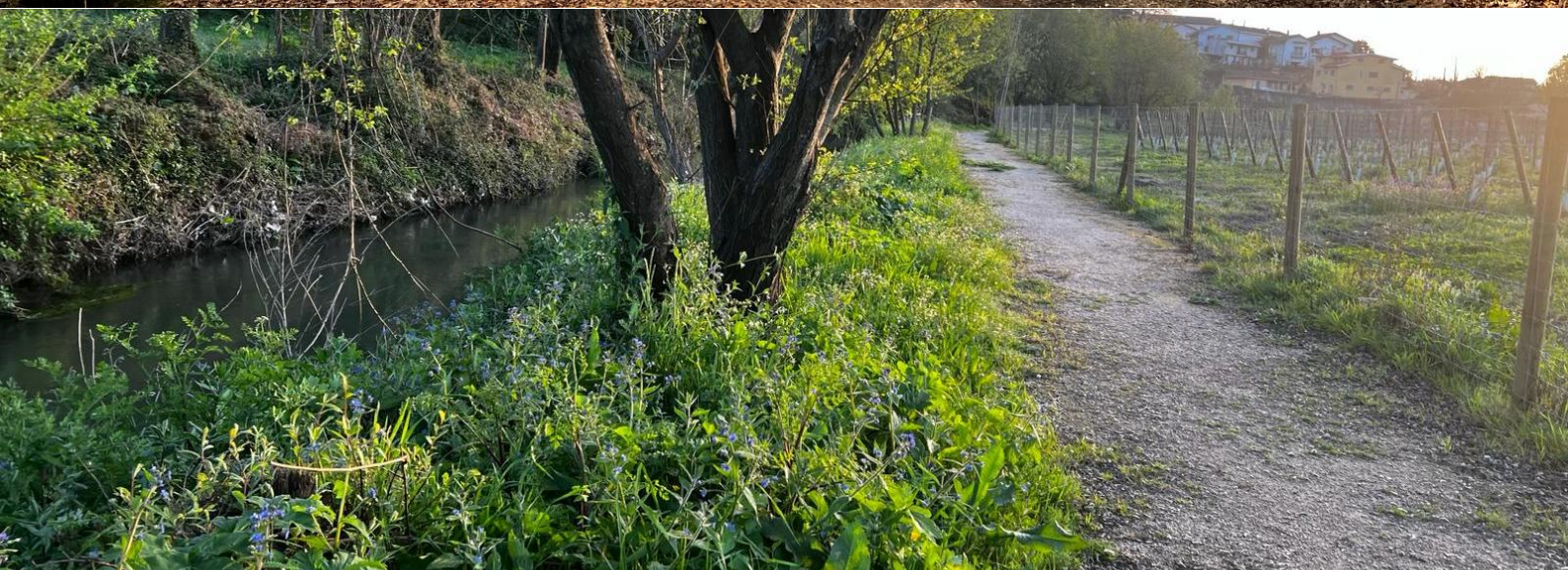
URBACT IV

BiodiverCITY

Community-based approaches to foster urban biodiversity

INTEGRATED ACTION PLAN

GUIMARÃES



Adelina Pinto

Vice-Mayor of the City of Guimarães

President of the Landscape Laboratory

Since 2013, Guimarães has been on a clear journey of climate action and sustainability. Step by step, with schools, communities, the private and public sectors, and universities, we have placed nature and education at the centre of our city's future. In 2026, Guimarães will be European Green Capital - an achievement that honours our collective effort, but above all, sets a responsibility to go further.

We are fully aware of the challenges. Despite the increase in our City Biodiversity Index (CBI) between 2013 and 2023, and more than 95 hectares of new green areas created in the same period, only 2% of these areas are functionally connected. Although 88% of residents live within 400 metres of a green space, too many of these spaces remain fragmented and isolated. Our tree canopy, one of our most promising practices, is still low and uneven, leaving large areas exposed to heat and flooding. And 82 invasive alien species already threaten our ecosystems.

This Integrated Action Plan is about turning these challenges into opportunities: connecting parks, schoolyards, and river corridors, while creating new spaces for life - ponds, flowering meadows, pocket woodlands, restored riverbanks, healthier soils, and permeable surfaces where heat and flooding are most critical.

The Landscape Laboratory, which I have the honour of chairing, has been a cornerstone in this journey and will continue to guide and coordinate the work ahead, ensuring that science and innovation remain close to everyday action. But this is not a plan of institutions alone. Its strength lies in the community—in citizens, teachers, students, associations, and companies that make Guimarães what it is. Together, we will deliver concrete results, set clear milestones, and publish simple annual updates so that everyone can follow the transformation of their city.

This plan is not only about biodiversity. It is about education, health, and quality of life. It is about preparing Guimarães for the future, showing that as European Green Capital 2026 we are ready to inspire other cities with a model of resilience and hope. And it is also about safeguarding our natural capital on the path towards a climate-neutral city by 2030.

TABLE OF CONTENTS

Executive Summary

The Integrated Action Plan (IAP) of Guimarães, developed within the URBACT framework, places ecological connectivity at the heart of its vision for urban biodiversity and sustainable development. Habitat fragmentation, urban pressure, and climate change pose urgent challenges to the ecological integrity of the territory and to community well-being.

This IAP outlines priority action areas aimed at strengthening the links between natural, agricultural, and urban spaces by promoting ecological corridors and green infrastructure that bring nature closer to the city. The proposed approach combines technical measures with participatory processes, ensuring that citizens, scientific institutions, civil society organizations, and local authorities actively contribute to co-created solutions.

The key actions include the restoration and enhancement of urban and peri-urban habitats, the implementation of biodiversity gardens, urban forests, and green corridors, the establishment of citizen science programs for biodiversity monitoring, the promotion of educational and community-based projects to raise awareness and engagement, and the integration of biodiversity into local planning and policy frameworks.

Through this strategy, Guimarães reinforces its commitment to the principles of the *One Planet City* framework, positioning itself as a pioneering territory in the articulation between environmental sustainability, cultural identity, and social cohesion. The IAP thus emerges as a guiding instrument for the ecological regeneration of the territory, contributing to a greener and more resilient city.

Quick facts

URBACT

The URBACT Programme has been a cornerstone in fostering sustainable urban development across European cities. It enables cities to collaborate, exchange best practices, and co-develop innovative solutions for urban challenges. URBACT promotes integrated and holistic urban planning, balancing economic, social, and environmental goals, and supports cities in achieving broader European objectives for sustainable, inclusive, and resilient urban development. The programme operates through transnational networks and an integrated participatory approach, engaging a wide range of stakeholders in the co-design and implementation of sustainable urban strategies. In the context of Guimarães (Portugal), participation in URBACT is operationalized through the Landscape Laboratory, which ensures that the city's strategic planning aligns with the programme's European principles and methodologies.

The BiodiverCity Network

The BiodiverCity Network is an URBACT initiative that provides a transnational framework for integrating biodiversity and ecosystem services into urban planning. Within the network, participating cities develop community-based approaches to valorise, measure, and account for biodiversity and related ecosystem services. The network supports European objectives such as the EU Biodiversity Strategy 2030 by fostering participatory and cross-sectoral approaches to sustainable urban development. The Landscape Laboratory, will ensure the translation of strategic goals into local actions for biodiversity and ecological integration. The participating cities included Dunaújváros & Veszprém (Hungary), 's-Hertogenbosch (Netherlands) Vratsa (Bulgaria), Poljčane (Slovenia), Cieza (Spain), Siena (Italy), Limerick (Ireland) and Sarajevo (Bosnia and Herzegovina).

Integrated Action Plan (IAP)

An IAP is a strategic instrument that defines objectives, actions, and interventions to address urban challenges in an integrated and participatory manner. It provides a structured framework to coordinate, implement, and monitor urban strategies across multiple sectors. The IAP is coordinated by the Landscape Laboratory and operationalizes the city's engagement with the BiodiverCity Network. Its development and implementation are actively supported by the Urban Local Group (ULG), which ensures that local expertise, community perspectives, and cross-sectoral collaboration are fully embedded in strategies for enhancing urban biodiversity, ecological connectivity, and Nature-based Solutions (NbS).

URBACT Local Group (ULG)

The URBACT Local Group (ULG) constitutes a multi-stakeholder body that supports the design, development, and implementation of the IAP. It integrates representatives from municipal authorities, academic institutions, civil society organizations, community groups, and other relevant actors, ensuring that planning processes are participatory, evidence-based, and locally grounded. In Guimarães, the ULG incorporates local municipal departments, academic partners, NGOs, and community representatives, thereby embedding local expertise and societal perspectives into urban biodiversity planning and governance.

PART I: City context and definition of the policy challenge

1. Local context and policy challenge

1.1 Local context

Guimarães is located in the district of Braga, Northern Portugal (NUTS II), within the Ave Valley (NUTS III). The municipality covers 240.95 km^2, with a population of around 156,800 inhabitants across 48 parishes, of which 14,000 live in the urban core. Guimarães' Historic Centre is classified as a UNESCO World Heritage Site since 2001, with 38 hectares protected and a wider buffer zone of 167.6 hectares, including several national monuments and sites of public interest. The conversion of urban industrial spaces into science and creativity centers and the creation of Nature based Solutions that protect the city from flooding allowed the enhancement of the UNESCO world heritage area in 2023 (Figure 1).

Population	156,830 inhabitants
Density	≈ 650.7 Inhabitants/km^2 Age 0 – 17 16% Age 18 – 64 % ~59% Age 65+ ~24%
Demographic profile	75,740 Men 82,112 Female
Life expectancy	~ 82.6
GDP	Pro 17,746.7 €/capita

***Fig.1**-Location and demographic overview of Guimarães, Northern Portugal.*

Despite being highly industrialized, Guimarães holds an exceptional natural and cultural heritage as a result of significant investments in fostering harmony between humans and nature. The goal is to balance combination of urban, forest and agricultural ecosystems while promoting healthy environment and biodiversity. The Penha Mountain, part of the National Ecological Reserve, represents the city's green lung, contributing to the 39.7% of urban green

spaces. Its hydrographic network is dominated by the Ave, Selho, and Vizela rivers, alongside the historic Costa/Couros river (Figure 2).

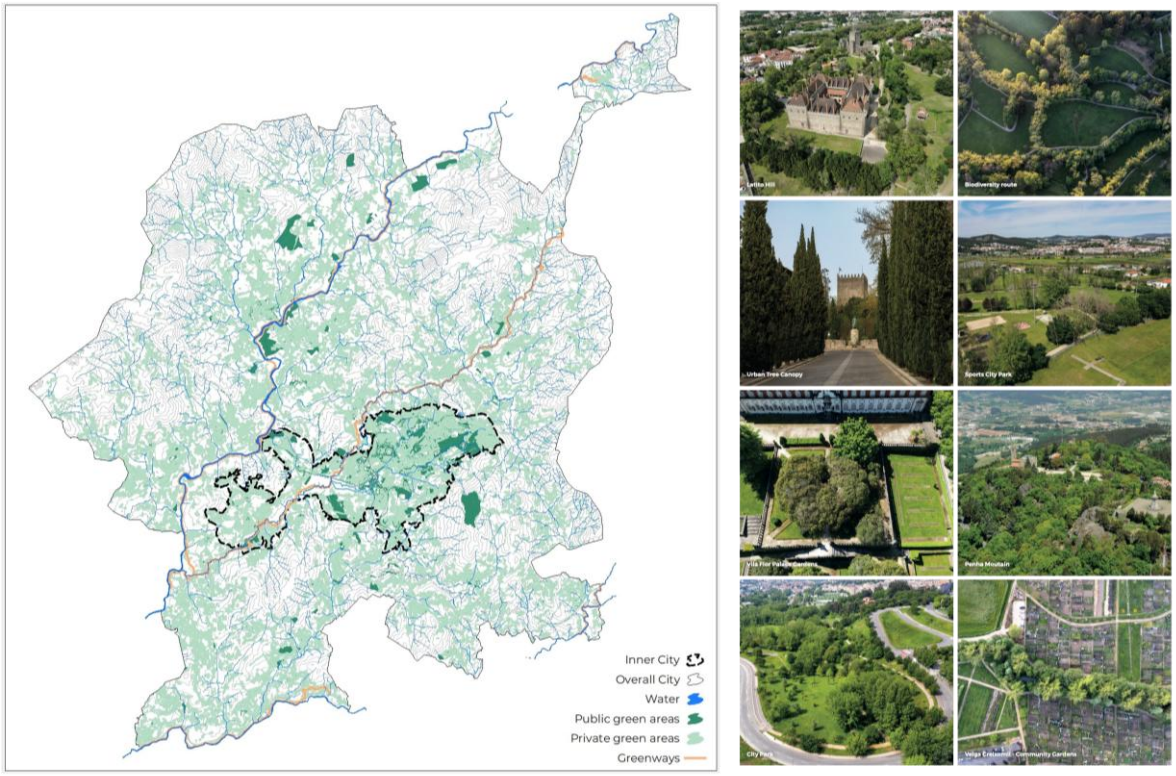


Fig.2-*Guimarães green and blue areas connectivity and coherence. Source: EGC2026 application.*

Guimarães pairs cultural heritage with living nature. Monte Latito and Guimarães City Park hold the international Green Flag Award, evidencing high-quality park management. The Penha Biodiversity Route (3.5 km) links mountain habitats to the urban core, guiding visitors through native ecosystems. Along the Costa/Couros river, three engineered water basins improve storm-water retention and urban cooling. The Gymnastic Academy of Guimarães, a near-zero-carbon facility, showcases low-carbon design in the city fabric. Together, these elements form a blue-green backbone that supports biodiversity, climate adaptation, and public well-being (Figure 3).

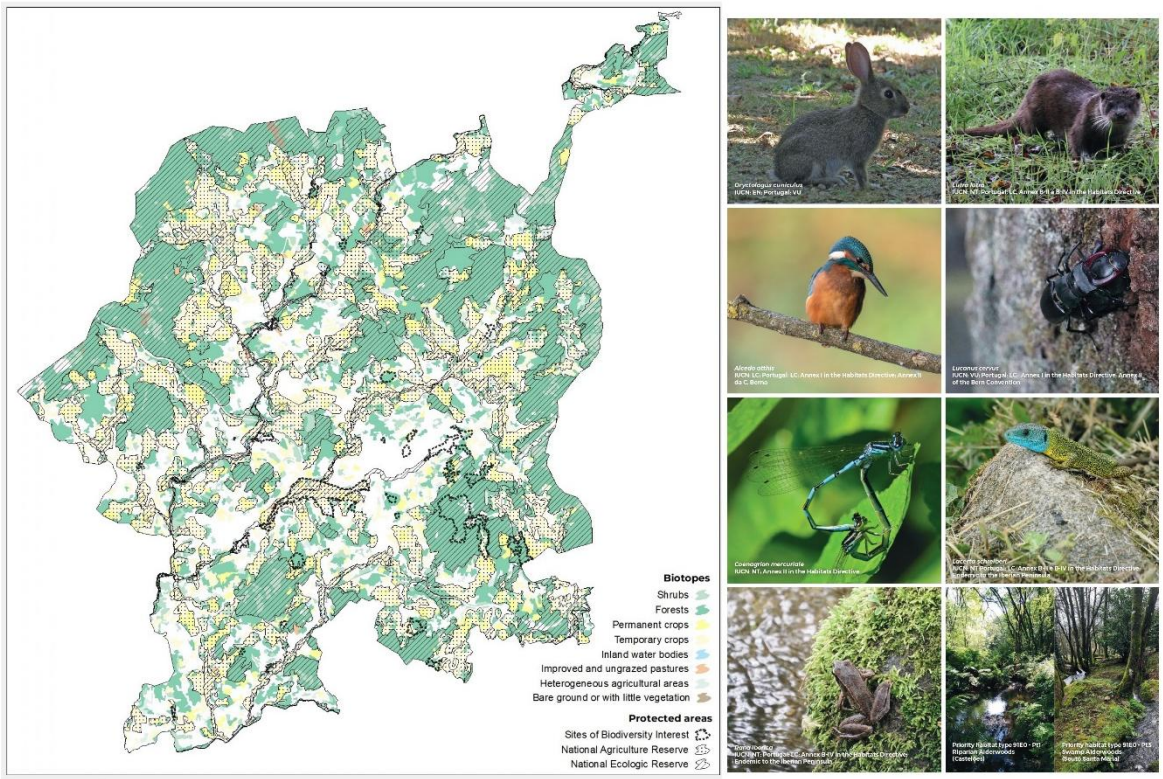


Fig.3-*Guimarães Protected areas, biotope, habitats and species of conservation interest.*

1.2. Key characteristics and priority topics

Guimarães has established itself as a leader in sustainable development, driven by its governance model "Guimarães 2030: Governance Ecosystem", implemented in 2013. This innovative and participatory approach prioritizes decarbonization and climate action, with the ambitious goal of transforming Guimarães into a *One Planet City* by 2050, where 100% of citizens are engaged in environmental preservation. The Governance Ecosystem addresses key themes such as Climate Change and Energy, Nature, Landscape and Biodiversity, Waste and Eco-Innovation, among others. The Mission Structure – Guimarães 2030, based at the Landscape Laboratory, is responsible for the implementation and monitoring of the Sustainable Development Action Plans, involving higher education institutions and a broad Consultative Council. The Landscape Laboratory plays a central role in research, education, project management, and environmental communication. Its work spans climate, biodiversity, water resources, health and well-being, often incorporating citizen science to strengthen public involvement. Guimarães has also been a pioneer in addressing European sustainability challenges. It signed the Green City Accord (2021), was the first Portuguese city to join the

Circular Cities Declaration and was selected as one of the 100 European Cities aiming to achieve Climate Neutrality by 2030. Guimarães ranks top three EU-cities with lowest mortality rates linked to insufficient green spaces and boasts higher values of green areas and Normalized Difference Vegetation Index (NDVI) compared to World Health Organization (WHO) recommendations. Between 2010-2021, Guimarães expanded its green infrastructure by 195.1 ha, approximately 20.9%. The Tree Management Office supervises green infrastructure's upkeep, and the urban tree management regulation strengthens its protective role. Guimarães' urban tree cover encompasses 1130 ha. In addition, the Municipality pledged to the 3 Billion Trees initiative subscribing EU-Forest Strategy. The Municipal strategy aims to plant 2,000 trees per year. This includes one native tree for every newborn and contributions from the private sector, which has planted 6,978 trees since 2016. Land use Area of 24,099.97ha is predominantly dominated by forests (43.9%) and agricultural areas (29.2%) (Figure 4).

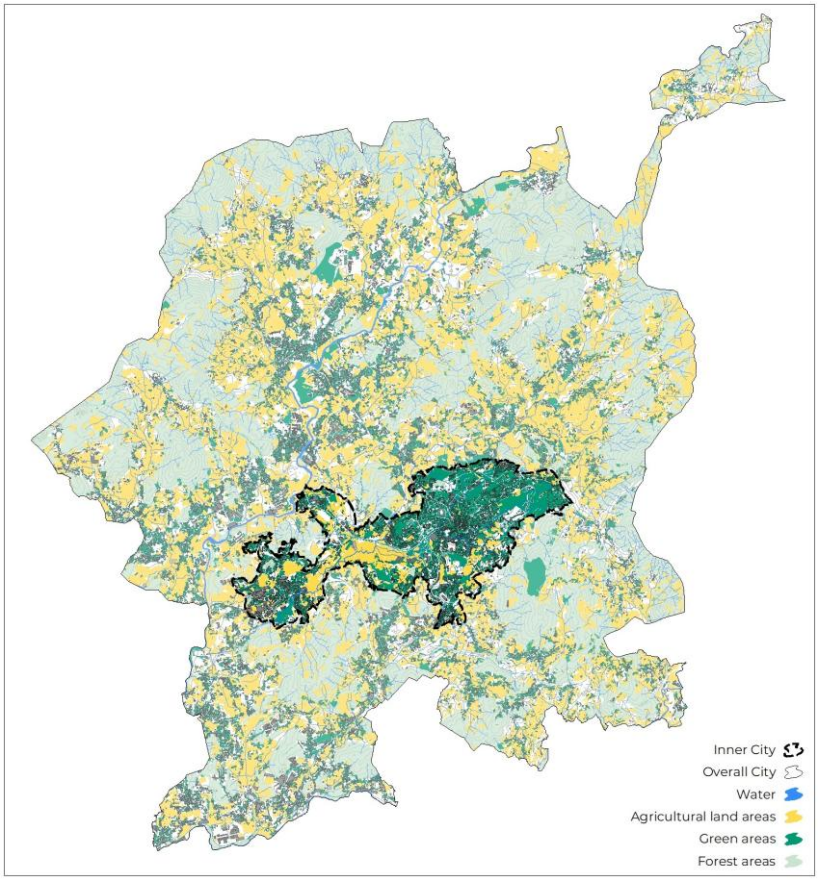


***Fig.4**-Guimarães Land Use (2023). Source: EGC2026 application.*

Guimarães implements an operational urban biodiversity agenda, which, in addition to annual tree planting, also encompasses pesticide reduction through the 'Municipalities Without Glyphosate' initiative. The "BioGO!" citizen science app has logged >1,300 species, strengthening ecological literacy and monitoring. Habitat restoration replaces eucalyptus with native assemblages to boost structural diversity and resilience (Figure 5). Roughly 21% of municipal territory has ecological value or protection status, anchoring connectivity efforts. These actions frame priority topics around urban greening, riparian recovery, and nature-positive public space (Figure 6). All these efforts culminated in Guimarães being awarded the title of European Green Capital 2026 by the European Commission.

Fig.5- *Guimarães is committed to citizens' empowerment and awareness to enhance local biodiversity.*

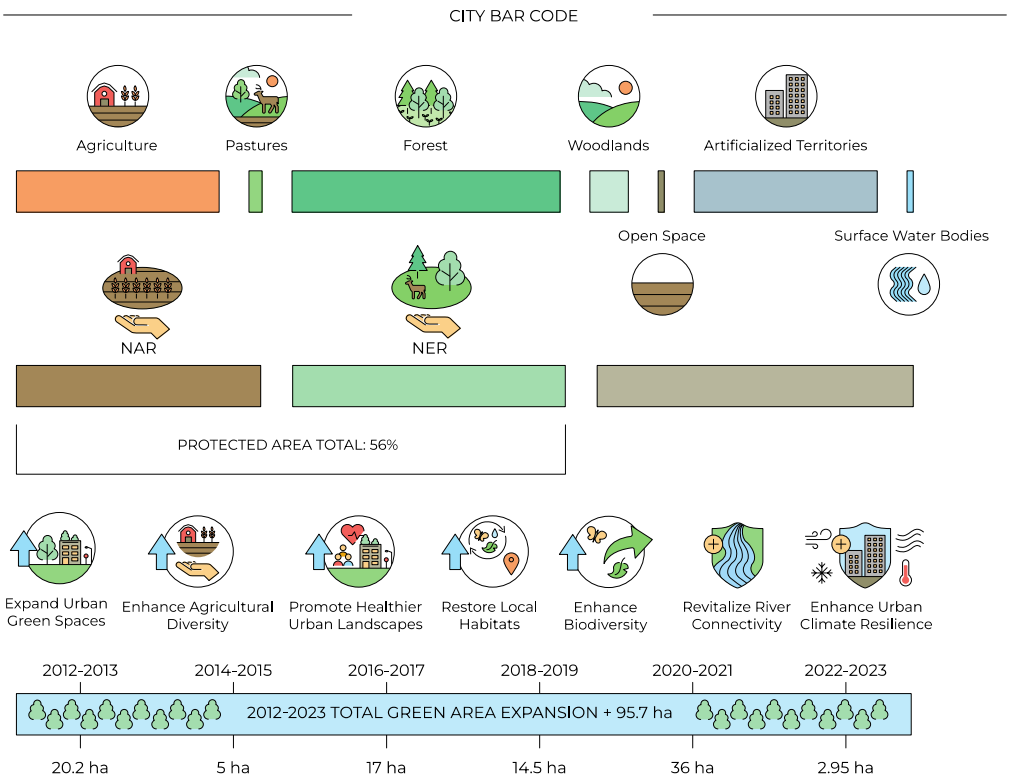


***Fig.6**-Over the years, Guimarães is increasing the protected area (NER and NAR) and green areas.*

1.3. Definition of the initial problem/policy challenge

The specific challenge that Guimarães seeks to address through this IAP is the decline of urban biodiversity, driven by increasing urbanization and the resulting fragmentation of ecosystems, which compromises ecological connectivity and diminishes the effectiveness of conservation efforts. This challenge is rooted in both historical and ongoing pressures on the city's natural environment. Guimarães' territory has been strongly shaped by industrialisation in the Ave Valley, particularly in textiles, footwear, and metallurgy, which expanded rapidly during the 19th and 20th centuries. Industrial activity concentrated along the Ave River and its tributaries, such as the Vizela and Selho, placing heavy pressure on aquatic ecosystems through untreated effluents and extensive water abstraction. Population growth, linked to rural-to-urban migration and industrial employment opportunities, accelerated the expansion of the built environment, with new residential areas, transport corridors, and industrial estates intensifying land consumption and soil sealing. Pollution from factories, quarries, and domestic sources further degraded water quality in the Ave and its tributaries, compounding the decline in biodiversity

and ecosystem functions. More recently, ongoing urban densification, expansion of industrial areas, and mobility infrastructure continue to threaten remaining natural habitats, making the fragmentation of green spaces and the loss of connectivity between ecological corridors a critical concern for the sustainable development of the city (Figure 7).

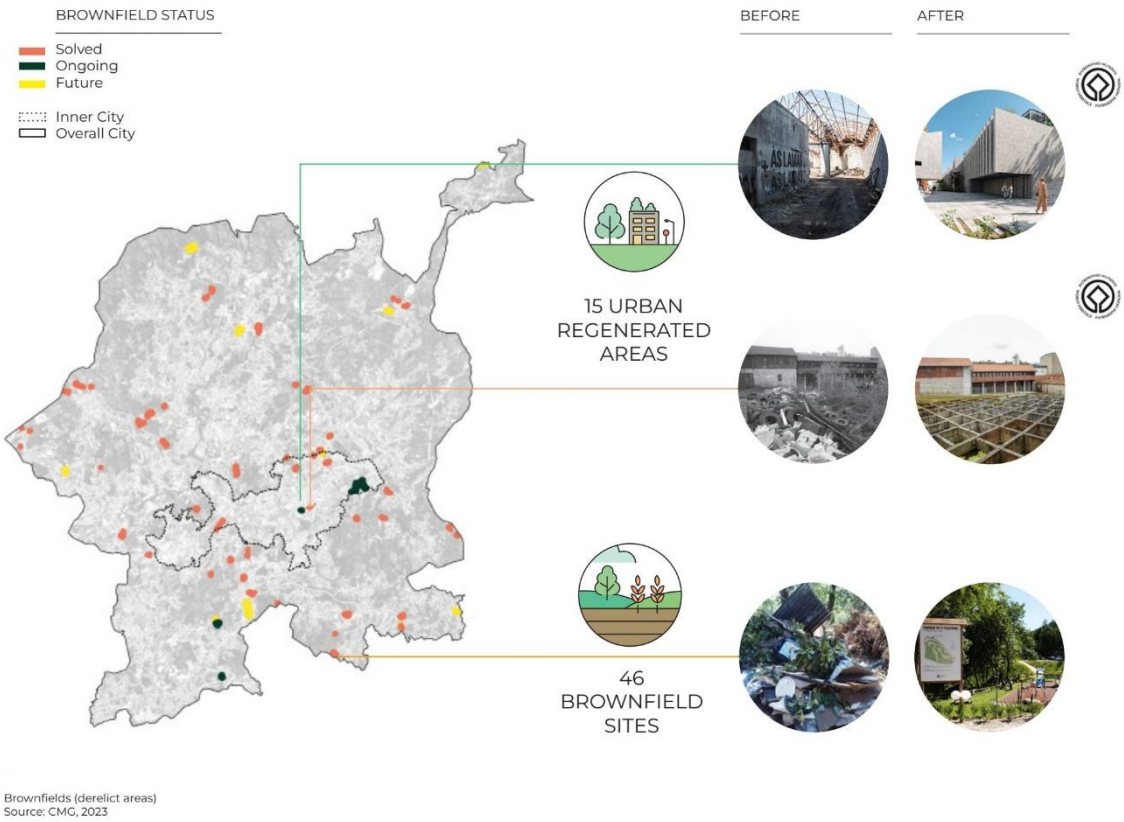


Fig.7-*Guimarães has been regenerating brownfield sites in the past 10 years.*

The evidence base confirms this diagnosis. The City Biodiversity Index (CBI) shows the peri-urban belt scoring 1/4 for connectivity, with inner city having only 12% of green areas functionally connected. This persists despite gains between 2013–2023 in other indicators: proportion of natural areas (16%→25%), native bird richness in built-up areas (22%→31%), inner-city tree canopy (15%→18%), and a decline in invasive alien species (33%→28.9%). Physical barriers such as arterial roads, industrial estates, and continuous urban fabric split habitat links, creating smaller and more isolated patches and constricting riparian corridors. This reduces landscape permeability, limits species movement and gene flow, increases edge effects, and weakens ecosystem functions such as urban cooling and flood attenuation (Figure 8).

The **City Biodiversity Index**—also known as the **Singapore Index on Cities' Biodiversity**—is a self-assessment framework that helps cities measure and track their urban biodiversity. It uses 28 indicators grouped into three components:

1. **Native biodiversity** (e.g., richness of native species, extent/quality of natural habitats)
2. **Ecosystem services** (e.g., carbon storage, cooling, flood mitigation, access to nature)
3. **Governance & management** (e.g., policies, budgets, partnerships, monitoring)

Cities collect locally available data for each indicator, score themselves, and repeat the assessment over time to see progress and gaps. Results help integrate nature into planning and funding. It's for comparing a city with itself, not ranking cities.

Greener, but still fragmented...

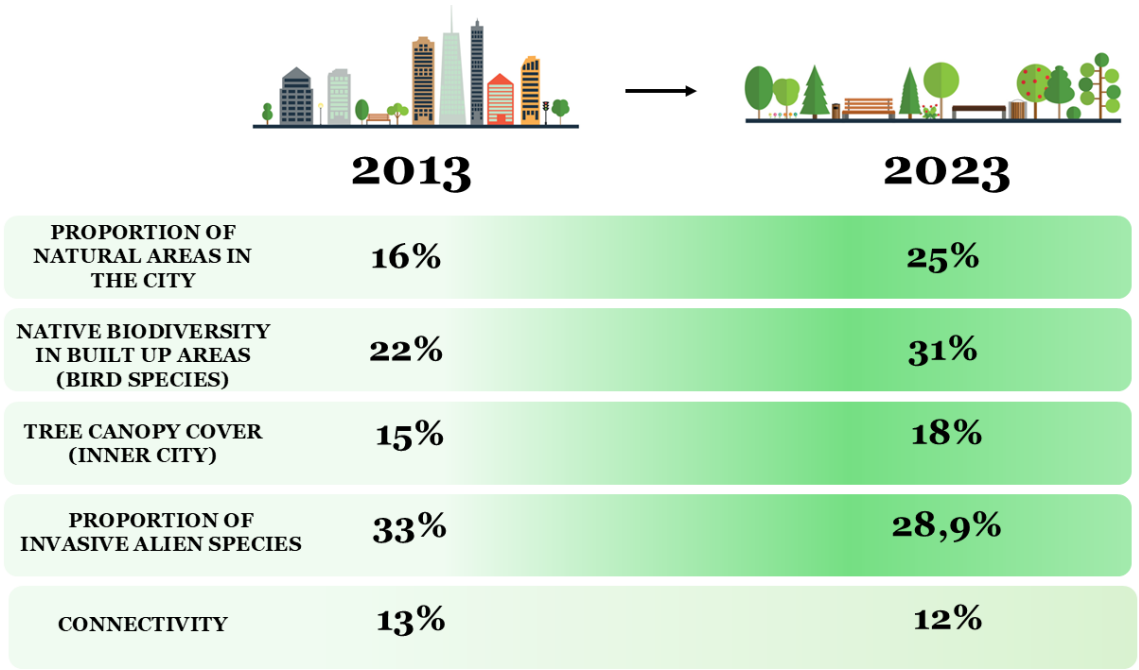


Fig.8- *Evolution of key ecological indicators in Guimarães from 2013 to 2023.*

These findings justify the IAP priority to restore ecological connectivity by linking parks and forest patches, mitigating barriers, and strengthening riparian and street-tree corridors, with the explicit objective of increasing functional connectivity above 12% and improving the CBI connectivity score.

To better frame the challenge, a SWOT analysis (Figure 9) highlights the internal and external factors influencing Guimarães' path toward becoming a nature-positive city by 2030.

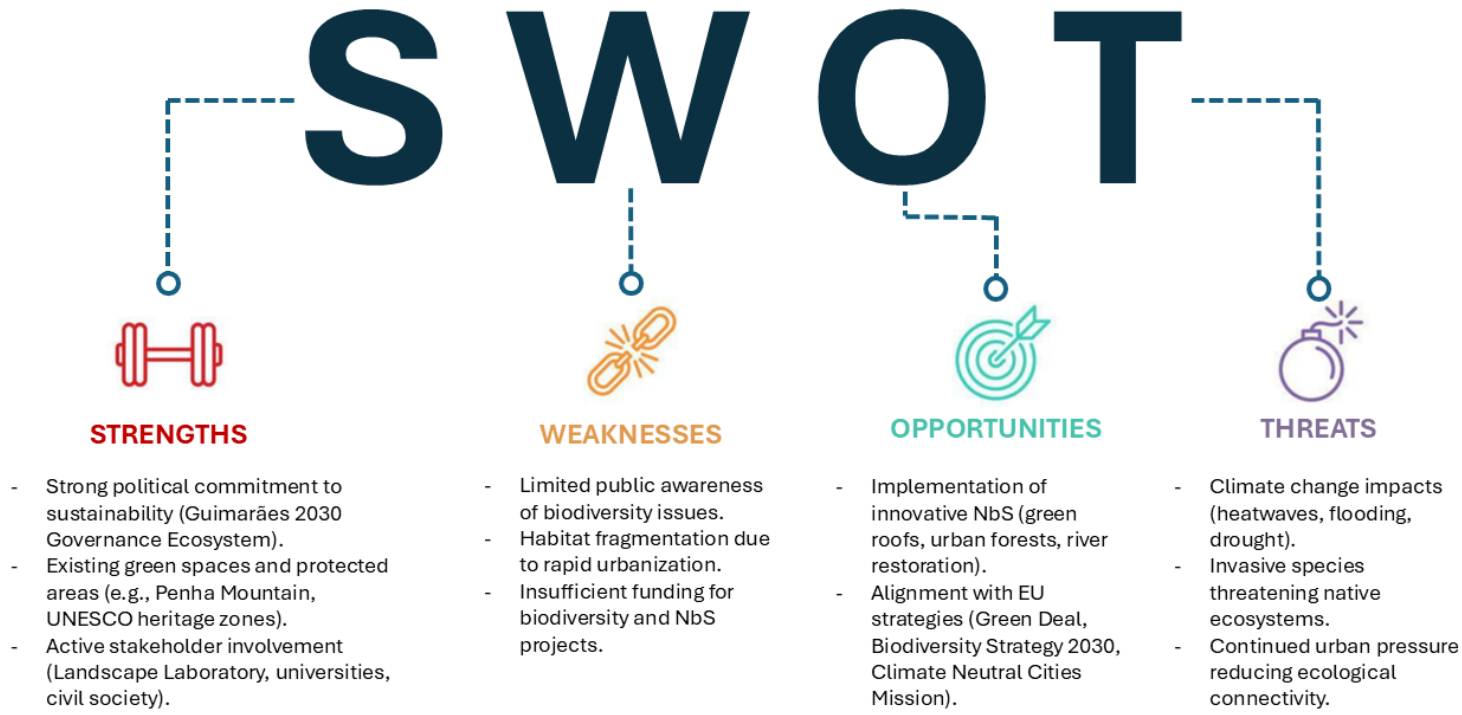


Fig.9- *The SWOT analysis evaluates the Strengths and Weaknesses (internal factors) and the Opportunities and Threats (external factors) of the IAP.*

On the strengths side, Guimarães demonstrates a solid commitment to sustainability, with existing green spaces, protected areas such as Penha Mountain, and strong stakeholder engagement through structures like the Landscape Laboratory. However, weaknesses remain, notably limited public awareness of biodiversity loss, habitat fragmentation driven by urban development, and constrained financial resources for biodiversity-focused projects. Looking ahead, significant opportunities arise from the integration of innovative NbS, growing alignment with European strategies (e.g., the EU Green Deal, EU Biodiversity Strategy 2030), and strong

support from both local communities and regional institutions. At the same time, threats include the escalating impacts of climate change, such as heatwaves and floods, along with the spread of invasive species that jeopardize native ecosystems.

2. Vision

"To Promote a resilient urban ecosystem by strengthening connectivity and improving habitats within a radial area around the urban core."

Ecological connectivity is a key element in the preservation and regeneration of biodiversity, particularly in the face of environmental degradation and landscape fragmentation. It refers to the networks of habitats and ecological flows that enable species to move, interact, and adapt, ensuring the continuity of essential natural processes.

"Ecological connectivity' is the unimpeded movement of species and the flow of natural processes that sustain life on Earth."— Convention on the Conservation of Migratory Species of Wild Animals, 2019

While this definition emphasizes the biophysical dimension, connectivity also encompasses socioecological relationships. Human well-being depends on the integrity of these networks. When connectivity is disrupted, both ecosystems and cultural resilience are compromised. Restoring requires technical measures combined with cultural shifts that strengthen ecological solidarity. Connectivity is also a matter of ethical responsibility. Territory goes beyond its geographical dimension, carrying historical and symbolic values that shape identity. Conservation must therefore move from isolated actions to a relational approach, where humans act as stewards of the land.

"Conservation is a state of harmony between men and land."— Aldo Leopold, 1949

Achieving this harmony requires translating the vision into integrated territorial action, combining ecological expertise with participatory frameworks that engage communities, institutions, and authorities. Biodiversity must not only be preserved but actively integrated and regenerated as a foundation of territorial cohesion and resilience. In this context, the IAP for Guimarães envisions a future where ecological integrity, cultural identity, and institutional collaboration form a dynamic network of co-responsibility. The ambition is to reconnect people with their territory through initiatives that strengthen ecological connectivity and shared

responsibility. This vision aligns with Guimarães' strategic commitment to becoming a more sustainable and biodiverse territory, within the principles of the *One Planet City* framework.

3. Methodological framework

The development of the IAP followed a structured and collaborative methodology, in accordance with URBACT programme guidelines. A central element of this approach was the engagement of the ULG, which brought together local stakeholders to provide expertise, data, and perspectives necessary for the formulation of a strategy grounded in the local context. Transnational exchange and learning were integrated throughout the process. Guimarães gained knowledge from all the BiodiverCity network meetings, both in-person and online, which enabled systematic transfer of experience from partner cities and guidance from the Lead Expert. Information obtained from these interactions was incorporated into ULG discussions, allowing members to evaluate, adapt, and validate practices according to the specific context of Guimarães (Figure 10).

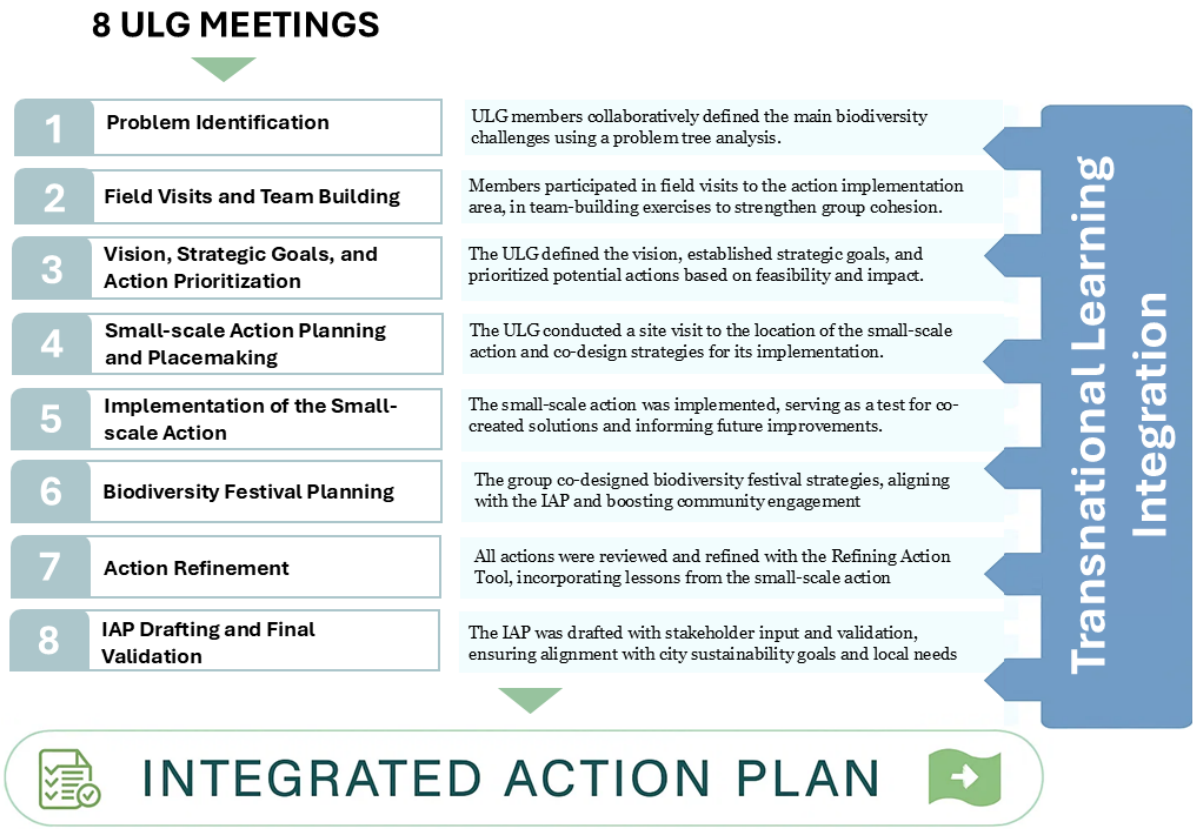


Fig.10- *Methodological workflow of the Urban Local Group (ULG) leading to the IAP.*

3.1 Composition and role of the URBACT Local Group (ULG)

The stakeholder mapping for the IAP has been categorized into several distinct groups (Figure 11) to guarantee comprehensive representation across various sectors. In accordance with URBACT's recommendations, this stakeholder mapping reflects various levels of integration that are crucial for successful urban planning and implementation. The role of the ULG was to collaboratively co-create the IAP, ensuring that priorities, actions, and interventions were informed by diverse expertise and perspectives. Members contributed with scientific expertise, operational know-how, policy guidance, community insights, and practical experience in conservation and sustainability initiatives. The Landscape Laboratory served as the coordination hub, overseeing collaboration and integrating technical knowledge in urban green infrastructure, research and development, and sustainability education.

Key stakeholders and areas of activity:

- **Coordination Team – Landscape Laboratory**
  Core team aligning stakeholders, setting priorities, and monitoring progress.
  Representatives: Francisco Carvalho, Ana Pinheira, Daniel Ferreira

- **Landscape Laboratory**
  Research and innovation center for urban ecology, sustainability, and territorial enhancement. Leads biodiversity monitoring (CBI), NbS, and citizen science.
  Representatives: Carlos Ribeiro, Susana Poças Falcão, Viriato Oliveira, Sara Terroso, Guilherme Braga, Carolina Rodrigues, Andreia Ribeiro and João Miranda

- **Guimarães 2030 Mission Structure**
  Responsible for implementing the city's long-term sustainability agenda, aligned with the SDGs and climate neutrality goals.
  Representative: Isabel Loureiro

- **Municipality of Guimarães**
  Responsible for land use planning, green infrastructure, and citizen engagement.
  Representatives: Rita Salgado, Pedro Moreira and Crisália Alves

- **SEPNA (National Republican Guard – Environmental Unit)**

  Environmental enforcement and wildlife protection.

  Representative: Paulo Pinto

- **UTAD – University of Trás-os-Montes e Alto Douro**

  Expertise in ecology, habitat monitoring, and applied environmental research.

  Representatives: João Cabral, Joaquim Jesus, Paulo Travassos

- **University of Minho**

  Research and innovation in biodiversity, ecosystem management, and sustainable development.

  Representative: Isabel Fernandes

- **Vitrus Ambiente**

  Municipal company for waste, urban cleaning, and green space management. Runs the *Guarda-Rios* project for river monitoring and restoration.

  Representative: Ricardo Castro

- **Vimágua**

  Intermunicipal water and sanitation company. Supports biodiversity by promoting sustainable water resource management.

  Representative: Armindo Silva

- **Environmental NGO – AVE (Guimarães Ecology Association)**

  NGO working on conservation, environmental education, and sustainable land practices.

  Representatives: Paulo Gomes, José Cunha

- **Community Members & Green Brigade Volunteers**

  Active citizens engaged in habitat restoration, environmental clean-ups, and awareness campaigns.

  Representatives: Luís Machado, Luís Pliteiro, José Fonseca, Manuel Fernandes

- **Private Stakeholders & Property Owners**

  Owners of farmland, woodlands, historic estates, and representatives of private companies, engaged in sustainable land use and biodiversity protection.

  Representatives: João Sottomayor (Paço de S. Cipriano), Sofia Moura (Quinta de Castelões), Ricardo Ferreira (Leroy Merlin Portugal)

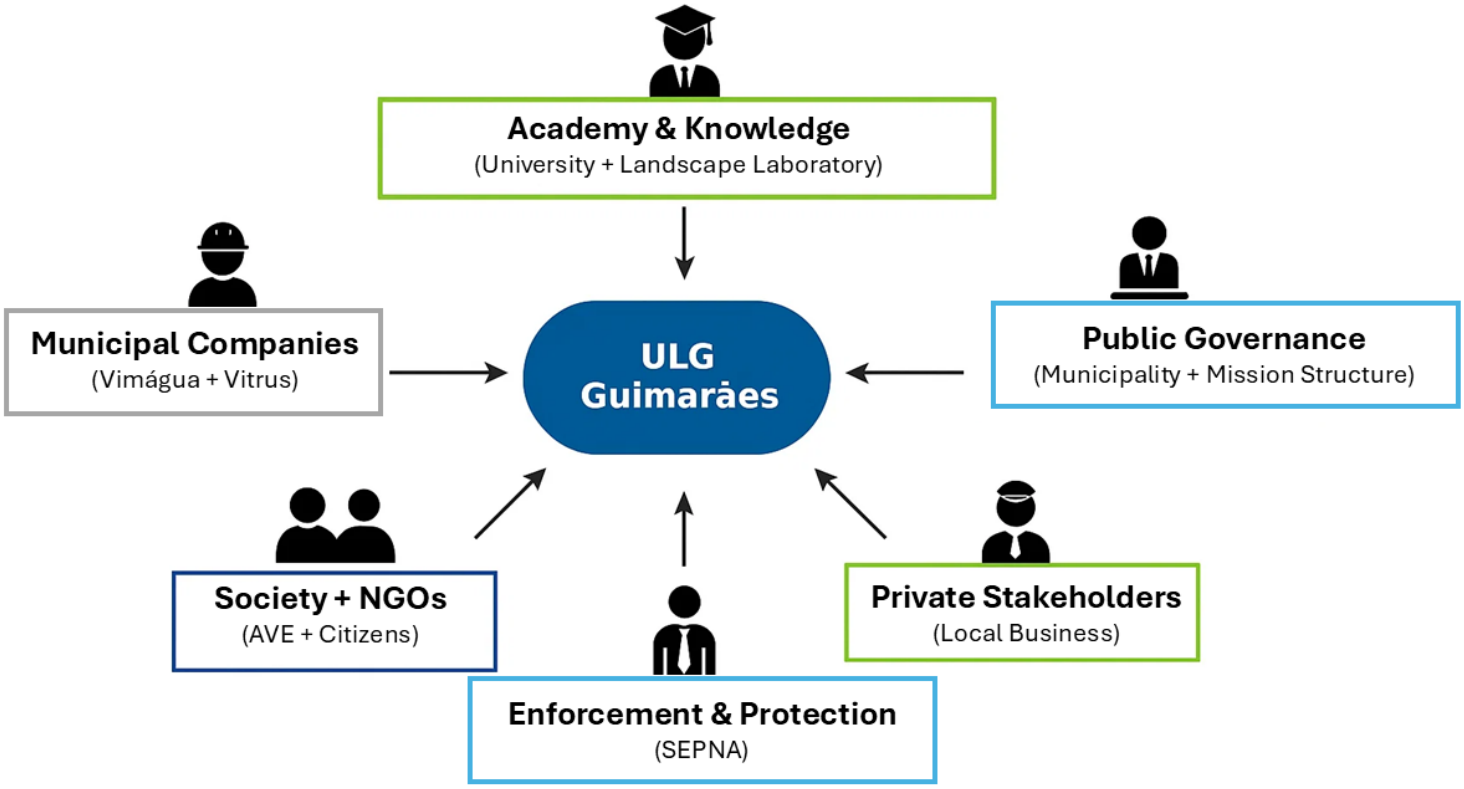


Fig.11- *Stakeholder mapping.*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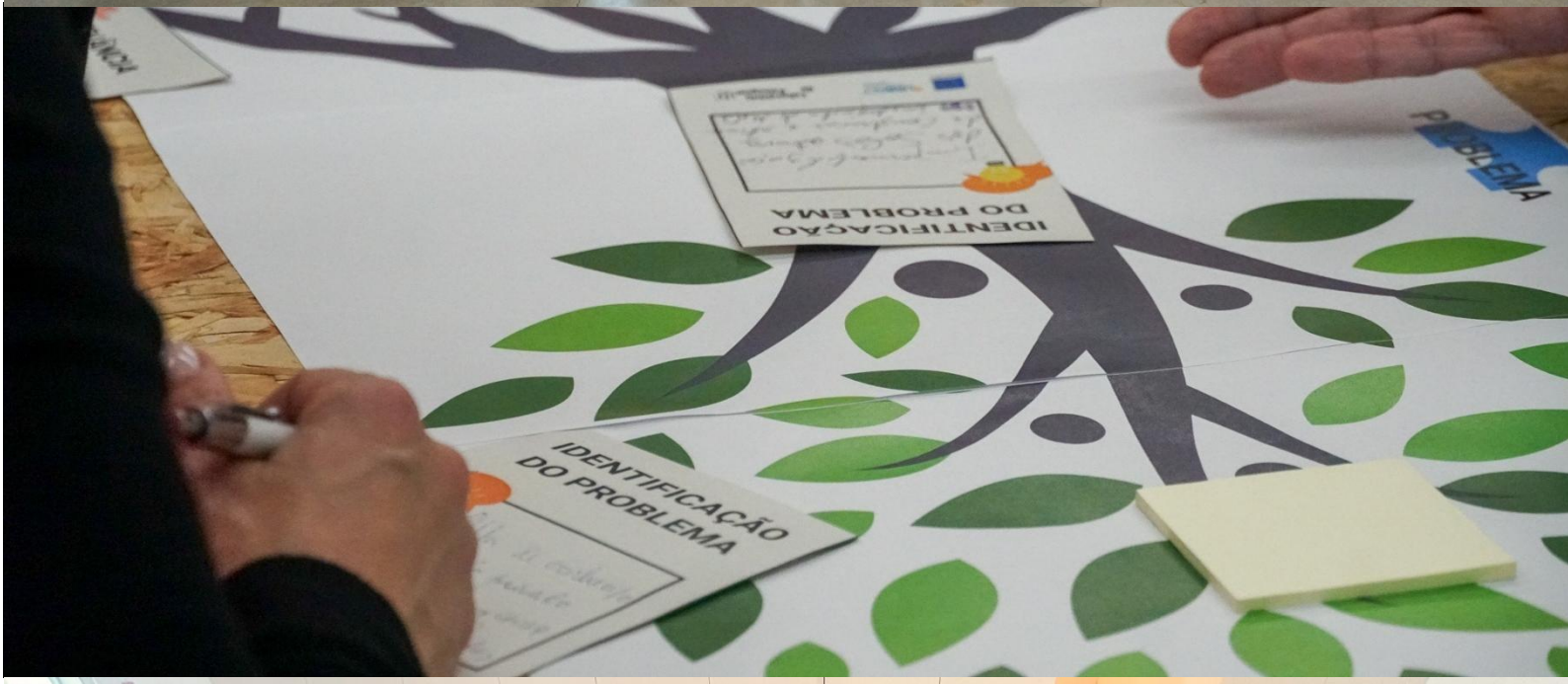
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3.2 Role/impact of transnational exchange and learning

The transnational learning process (Figure 12) has been pivotal in shaping the action planning process:

- From Poljčane (Slovenia), Guimarães drew inspiration for riparian habitat restoration, applying lessons to projects along the Costa/Couros river.
- From Limerick (Ireland), the city adopted insights from the Green and Blue Infrastructure Strategy, which reinforced the importance of systemic connectivity between natural and urban environments.
- From Dunaújváros (Hungary) practical lessons on biodiversity-driven park maintenance and urban forestry management helped Guimarães strengthen strategies for enhancing native vegetation in public spaces and integrating community participation in green area stewardship.
- From Veszprém (Hungary) the revitalisation of the Séd stream and approaches to climate-adaptive grassland management provided inspiration for Guimarães to better link water management, ecological restoration, and cultural heritage in the Costa/Couros river actions.
- In Cieza (Spain), practical knowledge on urban tree management highlighted the need for robust regulations and maintenance strategies, which were incorporated into Guimarães' plans.
- From Sarajevo (Bosnia and Herzegovina), lessons from the Urban Garden and Sensory Park, the Trebević protected area, and preserved public green spaces highlight strategies for strengthening green corridors and promoting civic engagement.
- The meeting in 's-Hertogenbosch (Netherlands) showcased how flood management can be combined with NbS in wetland-rich urban areas, inspiring Guimarães to strengthen its own climate adaptation strategies.
- Building on the discussions during the Core Network Meeting 6, Guimarães also benefited from Siena's approach to community engagement through urban gardens

and the creation of green corridors. The Italian example showcased how ecological networks can simultaneously deliver environmental, cultural, and social benefits, offering valuable inspiration for Guimarães' future planning.

- The BiodiverCity Café sessions provided informal but crucial exchanges on themes such as pollinators, green roofs, and community engagement, which directly influenced the integrated design of actions.

Fig.12- *Locations of international partners in Europe, illustrating transnational meetings.*


Fekvő gőzgép

PART II: Overall logic and integrated approach

4. Context and target area

At the core of Guimarães' IAP lies a territorial strategy fully aligned with the municipality's broader ecological vision – the greening radial strategy (EGC2026 ref link) The geographical focus selected for the implementation of actions is the area within the Green Belt 1, the first concentric ring of the Guimarães Green Radial Strategy (Figure 13) encompassing 365.79 ha. This strategic framework envisions three ecological belts radiating from the historic city centre, each designed to strengthen ecological connectivity, reinforce climate resilience, and integrate green and blue infrastructure into the urban area. The choice of the target area is both deliberate and strategic. Located at the interface between the dense urban core and the wider territory, this area combines high ecological potential with accessibility and visibility. Within the radial connectivity system, it plays a pivotal role in linking existing ecological corridors, such as the Ave and Selho Green Corridors and the Veiga de Creixomil Green Corridor, thereby ensuring continuity of ecological flows across the municipality. Its proximity to the urban centre makes it particularly suitable for actions that couple ecological restoration and biodiversity monitoring with participatory and educational initiatives, fostering a stronger connection between communities and their surrounding landscapes. This focus also ensures full synergy with other ongoing municipal projects and regulatory instruments. The IAP is conceived not as an isolated plan, but as a complementary layer within the city's ecological governance, reinforcing the objectives of the Municipal Ecological Structure (EEM), the Climate Action Plan (PMAC), the Guimarães 2030 Biodiversity Action Plan (PAB), and the Urban Tree Management Regulation (RGAU). In this way, the IAP contributes at the governance level to the municipality's integrated vision for territorial cohesion and ecological regeneration, while leveraging investments supported by municipal, national and European structural funds. By concentrating efforts in the target area, the IAP operationalises a macro-to-micro planning approach, translating the city's high-level strategies into concrete, site-specific actions that are transversal to the stakeholders integrated in the ULG. This guarantees a top-down and bottom-up strategy in the plan. Considering the complexity of building an ecological approach to the existing and new green areas this plan includes the integration of multiple community-based approaches to valorise and measure biodiversity and related ecosystem services, enabling communities to plan robust

nature-based solutions and foster pro-environmental behaviours, also contributing to the achievement of the EU Biodiversity Strategy.

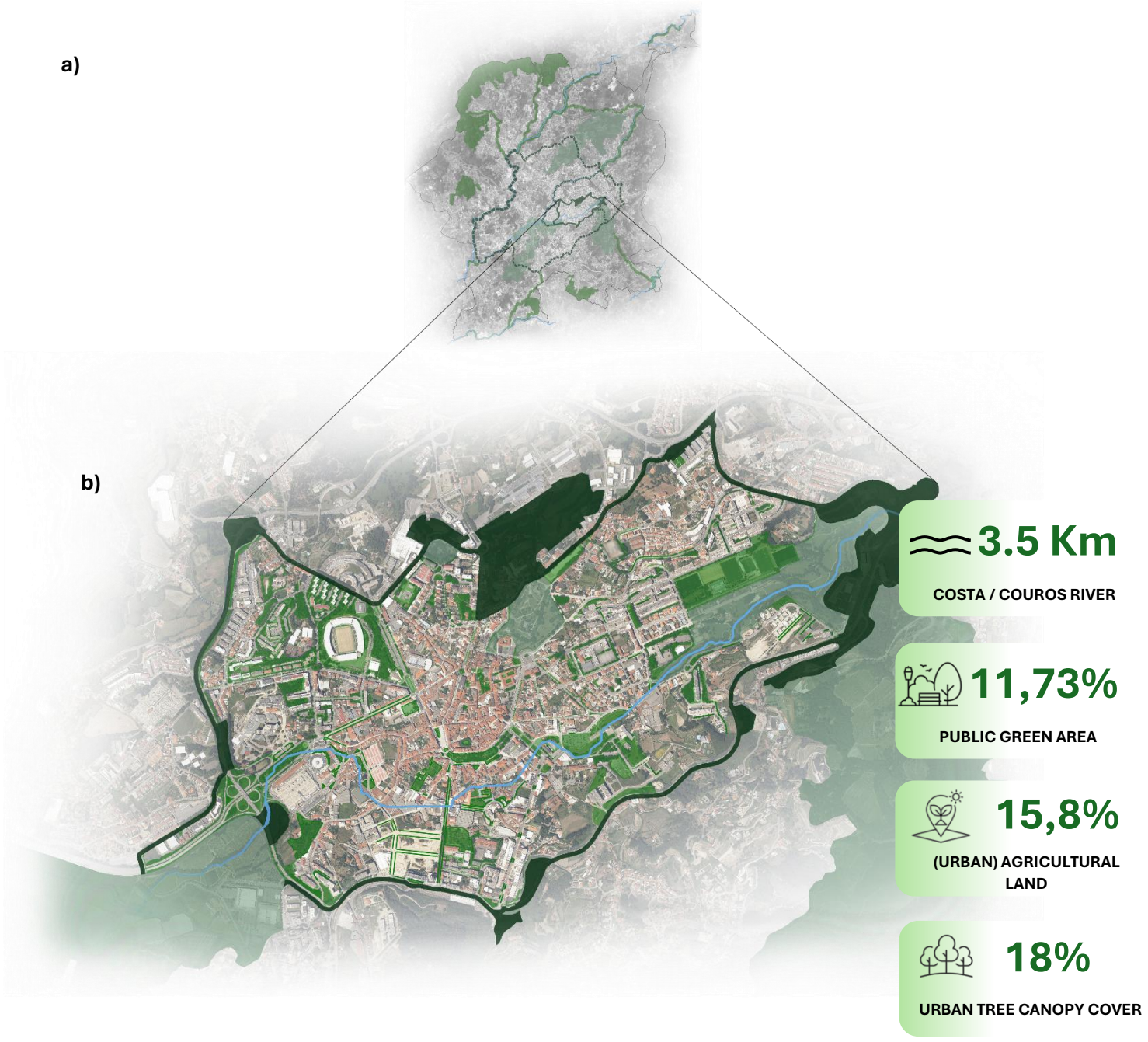


Fig.13- Target area. a) Three belts of the Green Radial Strategy; b) Detail of the Green Belt 1.

5. Strategic objectives of the IAP

Strategic Objective 1: Restoring key habitats and controlling invasive species to improve urban ecosystem health

The first strategic objective of the IAP focuses on restoring degraded habitats and controlling the spread of invasive alien species within the target area. These actions aim to regenerate ecological functions, improve habitat quality, and support native biodiversity. Priority measures include the removal of invasive plant species such as *Cortaderia selloana* and *Pennisetum villosum*, and the restoration of riparian zones along the Costa/Couros river. By improving habitat conditions and reducing ecological pressures, this objective contributes to healthier urban ecosystems and strengthens the foundation for long-term biodiversity recovery.

Strategic Objective 2: Expanding and connecting urban green and blue infrastructure to support biodiversity

This objective aims to reinforce ecological connectivity across the target area by expanding and linking green and blue spaces through a network of urban ecological corridors. The development of micro-habitats, pollinator gardens and Miyawaki forests will enhance species mobility and increase the diversity of local flora and fauna. These nature-based interventions also contribute to climate resilience by mitigating urban heat islands, improving stormwater management, and creating cooler, healthier urban environments. Strengthening green infrastructure within the Green Belt interventions will ensure that biodiversity is integrated into the city's spatial planning and territorial cohesion strategies.

Strategic Objective 3: Promoting sustainable land management in urban and peri-urban areas

This objective aims to mitigate the negative impacts of soil sealing and enhance urban and peri-urban ecological performance through nature-based solutions. By promoting rainwater infiltration, multifunctional green areas, and biodiversity-friendly agricultural practices across strategic areas of Green Belt 1, the initiative seeks to improve soil health, strengthen ecosystem services, and increase ecological connectivity. Regulatory measures, demonstration projects, and community engagement will support sustainable land management, foster habitat creation,

and empower citizens to actively participate in biodiversity conservation and climate-resilient urban development.

Strategic Objective 4: **Establishing an integrated system for biodiversity monitoring and citizen science**

This objective aims to create a robust and standardized biodiversity monitoring system across Green Belt 1, combining scientific rigor with community engagement. By reinforcing the BioGo! app and expanding citizen science initiatives, local communities, schools, and volunteers will actively contribute observations of flora, fauna, and water quality. Standardized protocols, permanent sampling plots, and regular monitoring campaigns will ensure data reliability, feeding into periodic updates of the CBI and supporting open, transparent reporting. The system will identify priority areas for conservation and ecological management, inform evidence-based decision-making, and strengthen ecological and social resilience.

Strategic Objective 5: **Raising public awareness and ecological literacy through education and communication**

The final strategic objective emphasizes the importance of engaging citizens in biodiversity conservation through education, outreach, and communication. Environmental education programs will be developed for schools and community groups, fostering a deeper understanding of local ecosystems and the services they provide. Public campaigns, workshops, and publications will promote ecological literacy and encourage active participation in conservation efforts.

6. Intervention areas

To operationalize the strategic objectives of Guimarães' IAP within the Green Belt 1, the objectives are organised into three thematic areas of intervention (Figure 14).

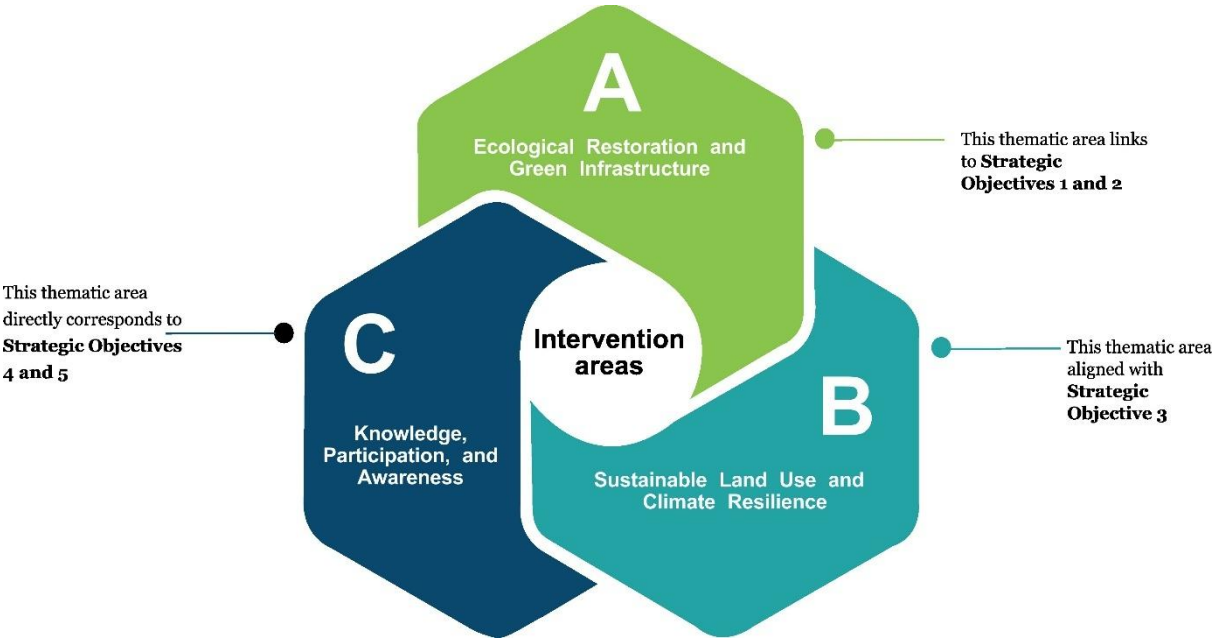


Fig.14- *Intervention areas mapped against aligned strategic objectives.*

7. Integration

What do we mean by "integration"?

In the IAP, integration is the coordinated alignment of policies, places, people, timeframes, finance, rules and evidence so that actions reinforce one another instead of working in silos. In line with URBACT guidance, the IAP considers 12 aspects of integration (Figure 15).

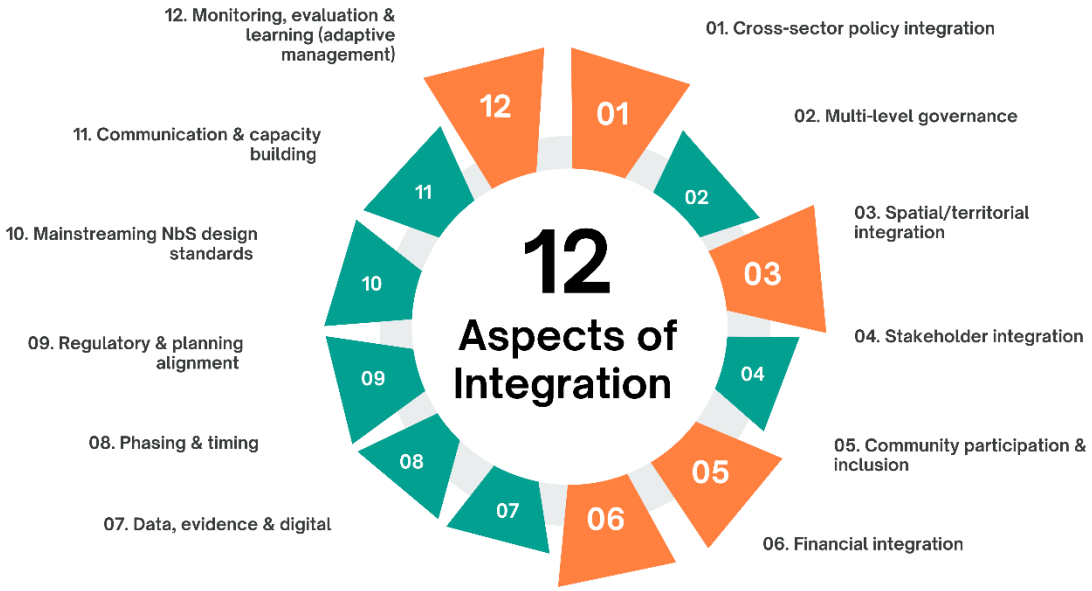


Fig.15- *Schematic representation of the 12 aspects of integration considered in the IAP.*

Given the baseline on ecological connectivity, our top priorities are:

- **(1) Cross-sector integration** — synchronising planning, water, mobility, education and health so NbS deliver multiple co-benefits.
- **(3) Spatial/territorial integration** — linking isolated greenspaces in Green Belt 1 and stitching the urban core to citywide corridors.
- **(5) Participation & inclusion** — keeping the ULG active and representative; embedding schools and community groups in co-delivery.
- **(6) Financial integration** — blending municipal, Norte 2030/ERDF, LIFE/Horizon/Interreg, Environmental Fund and CSR streams.
- **(12) Monitoring & learning** — using CBI, BioGO! and GIS to steer adaptive management.

Our integration architecture which coordinates policy, territory, participation, finance, rules and evidence over time turns the IAP vision into coherent, measurable action. This systemic approach ensures that each intervention in ecological connectivity, NbS and collaborative governance also advances global commitments. Concretely, we align with SDG 11 by making the city more inclusive and resilient through accessible green–blue networks; with SDG 13 by using NbS for climate adaptation and risk reduction; with SDG 14 by restoring urban waterways and improving water quality; and with SDG 15 by reconnecting habitats, managing invasive species and strengthening monitoring. We also advance SDG 17 by mobilising partnerships through the ULG, academia, civic groups, and private sector and leveraging EU and national programmes to co-finance and co-deliver actions. In doing so, the IAP localises the targets of the Kunming-Montreal Global Biodiversity Framework (GBF) and the Paris Agreement, ensuring verifiable outcomes and enabling access to funding and collaborative networks (Figure 16).

Fig.16- *Key Sustainable Development Goals (SDGs) aligned with the actions of the IAP.*

A defining feature of the IAP is its integrated approach, built around three cross-cutting dimensions:

GREEN

The central priority, embedded in all actions—from riparian habitat restoration and creation of micro-habitats to the development of green corridors and soil permeability measures.

DIGITAL

Tools such as the upgraded BioGO! app and a digital biodiversity monitoring system enabled citizen science, real-time data collection, and the production of educational resources, strengthening both governance and community engagement.

GENDER

Inclusiveness was ensured through balanced representation in the ULG with inclusive governance and participatory design. Educational programmes, citizen-science activities, and accessible green areas were proposed to engage all community members and support equitable involvement in capacity-building and decision-making.

8. Summary of actions

10 priority actions were carefully selected and co-developed with the ULG to address urban biodiversity loss and enhance residents' quality of life. These actions are structured around the five Strategic Objectives defined in the IAP, ensuring a holistic and integrated approach that embraces the environmental, social, and economic dimensions of sustainable development.

The actions are as follows:

Strategic Objective 1 - Restore key habitats and control invasive species to improve urban ecosystem health

- **Action 1.1 – Control and reduce Invasive Alien Species (IAS) *Cortaderia selloana* e *Pennisetum villosum*:**
  Targeted removal and containment of *Cortaderia selloana* and *Pennisetum villosum* to prevent their spread and restore native vegetation.
- **Action 1.2 – Restore riparian habitats along the Costa/Couros river:**
  Rehabilitate degraded riverbanks to improve ecological function, enhance biodiversity, and strengthen climate resilience.

Strategic Objective 2 – Expand and connect urban green and blue infrastructure to support biodiversity

- **Action 2.1 – Create and enhance urban micro-habitats:**
  Develop diverse habitats such as meadows, wetlands, pollinator gardens, and pocket parks to increase urban biodiversity.
- **Action 2.2 – Develop urban green corridors to enhance ecological connectivity:**
  Establish continuous ecological pathways linking fragmented habitats, improving species movement and urban ecosystem connectivity.

Strategic Objective 3 – Promote sustainable land management in urban and peri-urban areas

- **Action 3.1 – Increase permeability of urban soils:**
  The action seeks to curb further soil sealing and use regulatory, demonstrative, and

incentive-based measures to improve soil performance and enhance water management.

- **Action 3.2 – Promote biodiversity-friendly agricultural practices:**
  Support agroecological methods in peri-urban areas that conserve biodiversity, strengthen ecosystem services, and reduce environmental impacts.

Strategic Objective 4 – Establish an integrated system for biodiversity monitoring and citizen science

- **Action 4.1 – Promote citizen-science project for biodiversity monitoring:**
  Engage the local community in biodiversity observation and monitoring, strengthening awareness and knowledge-sharing.
- **Action 4.2 – Develop and implement biodiversity monitoring systems:**
  Create robust protocols and tools to track ecological trends and inform urban planning.

Strategic Objective 5 – Raise public awareness and ecological literacy through education and communication

- **Action 5.1 – Develop biodiversity-focused environmental education programs:**
  Provide innovative learning opportunities in schools and communities to foster ecological literacy.
- **Action 5.2 – Produce publications on biodiversity:**
  Create accessible communication materials, including guides.

Together, these actions aim to restore and strengthen ecological connectivity, implement NbS, foster community engagement, and reinforce governance mechanisms for biodiversity protection (Figure 17).

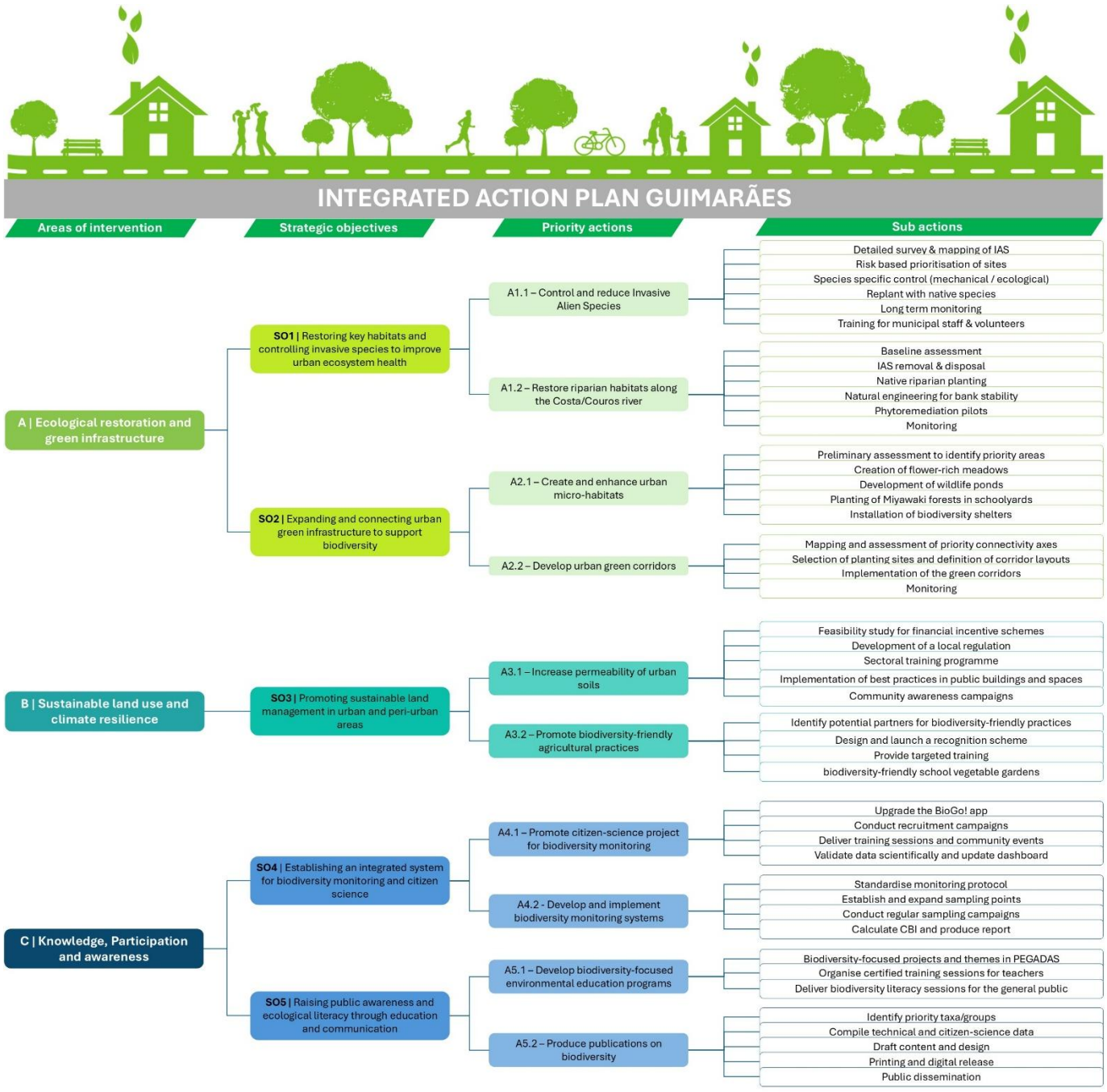


Fig.17- *Overview of the IAP structure, summarizing intervention areas, strategic objectives, actions, and sub-actions.*

9. Small-scale actions

9.1 Guimarães Community Gardens

The Small-Scale Action in Guimarães focused on the Guimarães Community Gardens, a key urban agricultural space serving more than 500 users and traversed by the Costa/Couros river (Figure 18). The SSA aimed to strengthen ecological connectivity and foster a more sustainable and biodiverse environment through the implementation of NbS and active community engagement, thereby contributing to the broader urban greening strategy.

Fig.17- *Target area for the pilot action.*

This SSA, implemented under the city's Urban Greening Strategy, followed four main steps:

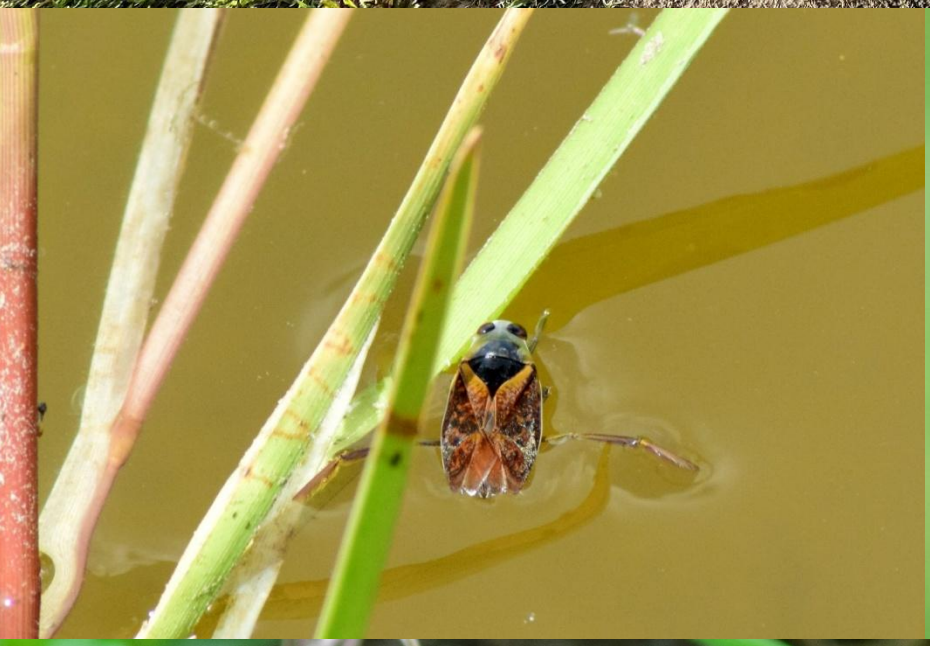
- Conducting an initial ecological survey to establish a biodiversity baseline.
- Implementing direct interventions such as the creation of a wildlife pond, installation of bird and bat nesting boxes, and the development of micro-habitats.
- Organizing a workshop to engage ULG members, garden users, and local volunteers, fostering a strong sense of ownership.
- Carrying out systematic monitoring over nine months (starting in October 2024) of biodiversity indicators and community participation metrics.

This action was driven by the decline of biodiversity within the gardens, which had negatively impacted essential ecosystem services such as pollination. Preliminary results were promising: a measurable increase in native species diversity, strong community participation in workshops and events, and validation of the technical feasibility of integrating NBS into urban agricultural contexts. The SSA served as a proof of concept, demonstrating that targeted interventions can inform and strengthen wider ecological restoration and connectivity actions.

HYPOTHESIS

"What if we can enhance biodiversity in the Guimarães Community Gardens through the implementation of NbS and active community engagement?"

AFTER 1 YEAR



9.2 BiodiverCity Festival

The Guimarães Spring Festival 2025 took place throughout the weekend of 29–30 March on the Penha Mountain, a vital ecological and cultural site in Guimarães that harbors 10 conservation-worthy habitats and over 320 vascular plant species and 120 terrestrial vertebrate species. As a key node in the city's biocultural corridor and connected by the Biodiversity Route, the Penha Mountain enhances ecological connectivity between natural and urban areas, while offering an inspiring venue for community engagement. The event was designed as a large-scale, nature-based celebration aiming to promote awareness of biodiversity and reinforce the link between environmental sustainability and cultural identity.

Overview of Implemented Activities:

1. Participatory program design with the ULG. This collaborative planning ensured that the festival reflected local values, creativity, and environmental priorities.
2. A wide array of family-friendly activities was hosted, including creative workshops for building birdhouses, insect hotels, bat shelters, and terrariums. These hands-on experiences provided environmental education and direct support to local biodiversity.
3. Visitors were invited to engage in artistic and traditional crafts, such as botanical drawing, clay modelling, and straw work. These activities blended environmental themes with cultural expression and intergenerational learning.
4. A series of guided nature walks were led by biodiversity experts, offering participants the opportunity to explore and better understand the unique ecosystems of the Penha Mountain. Interactive exhibitions and educational installations highlighted the region's natural wealth.
5. An eco-market featured local products, handmade crafts, and sustainable initiatives, reinforcing the connection between ecological responsibility and community-based economies.
6. A key moment of the festival was the public presentation of the Mammals of Guimarães Field Guide, a new publication developed through citizen science and technical monitoring.
7. In the lead-up to the main festival, the first edition of the Spring Run was held on 22–23 March, featuring a 10-km race, a 5-km walk, and an interpretive hike along the

Biodiversity Route. This sporting event combined physical activity with environmental engagement, promoting healthy lifestyles while drawing attention to the ecological value of the Penha landscape.


Biodiversidade
do Mosteiro de Pombeiro


Primavera
CONCURSO
DÁ ASAS À TUA T-SHIRT!
Vota na tua t-shirt favorita!

Key Takeaways:

- High community engagement with more than 2,000 visitors attending.
- Strong participation in hands-on workshops and nature walks.
- Over 500 participants in the Spring Run and guided biodiversity hike.
- Launch of the *Mammals of Guimarães Field Guide* as a lasting educational tool.
- Festival model considered replicable in other Green Belt 1 locations

Mammals guide presentation

As part of the BiodiverCity project, Landscape Laboratory developed a dedicated field guide on mammals (Figure 18), a taxonomic group that is particularly vulnerable to habitat fragmentation and landscape disruption. The guide was conceived as both a scientific and civic tool, aiming to raise awareness about local biodiversity while fostering a stronger connection between citizens and the species that share their territory.

The publication highlights the diversity of mammals present in Guimarães, combining accessible descriptions, ecological information, and high-quality images to make it an engaging resource for all audiences. Designed with a strong educational focus, the guide builds on previous publications developed by the Landscape Laboratory, further expanding its collection of environmental literacy materials.

The official launch took place during the BiodiverCity Festival on Penha Mountain, reinforcing the symbolic and ecological importance of the site. The event allowed visitors to explore the guide first-hand and understand its role as a practical tool for citizen science, environmental education, and conservation advocacy.

The guide is freely available to the population, ensuring open access to knowledge and encouraging citizens to actively participate in monitoring and protecting local wildlife. By combining scientific rigor with public outreach, it has the potential to inspire a new generation of nature stewards and to contribute to the long-term sustainability of Guimarães' ecological network.

AWARENESS

TO KNOW IS TO KEEP!

Fig.18- *Excerpt from the Guide to Mammals of Guimarães.*

PART III: Action planning details

10. Detailed presentation of the actions and sub actions

SO 1 - Restore key habitats and control invasive species to improve urban ecosystem health

Action 1.1 - Control and reduce the presence of Invasive Alien Species (IAS) *Cortaderia selloana* e *Pennisetum villosum*

Action

Cortaderia selloana and *Pennisetum villosum* are among the most aggressive invasive alien plants in Iberian landscapes, forming dense monocultures that displace native flora, alter soil dynamics, and reduce habitat quality for wildlife. In specific areas within the Green Belt 1, their proliferation undermines local ecosystem resilience and threatens ongoing restoration efforts. This action contributes to municipal guidelines on invasive species management, combining scientific and community-based approaches to reduce their ecological pressure. By progressively restoring invaded areas with native vegetation, it supports the recovery of habitats and enhances biodiversity. Although the action is species specific the methodology can be replicated in further invasion scenarios.

ACTION READINESS LEVEL

LOW	MEDIUM	HIGH
		■

LEAD AGENCY	Landscape Laboratory
KEY PARTNERS	Municipality of Guimarães NGOs Citizens Vitrus
TIMESCALE	2026-2030
RESULT	Reduced IAS pressure and increased native vegetation cover across priority sites.
ROUGH COST ESTIMATION	€60 000
FUNDING	Portuguese Environmental Fund Municipal budget LIFE Programme ERDF / Norte 2030 European Urban Initiative
RISK	- Recolonisation - Narrow phenological windows

	- Drought - Public acceptance
HARD INVESTMENT	**SOFT INVESTMENT**
- Tools. - Native plants. - Biomass logistics.	- Capacity building. - Local communication. - Citizen-science support. - Monitoring.
RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS	
EU Biodiversity Strategy for 2030	IAS control and native replanting help halt biodiversity loss and restore ecosystems.
European Green Deal	Risk-based control and long-term monitoring promote sustainable land and climate resilience.
National Strategy for Nature Conservation and Biodiversity 2030 (ENCNB 2030) & National Strategy on IAS	Actions reduce IAS threats identified as key pressures on national biodiversity.
Guimarães 2030 Biodiversity Action Plan (PABG 2030)	Local IAS control and replanting deliver municipal biodiversity targets.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Detailed survey & mapping of IAS	2026	Landscape Laboratory	- No. of hectares surveyed (target: 90 ha)
2. Risk-based prioritisation of sites	2026	Landscape Laboratory	- No. of sites assessed and prioritised (target: ≥ 3 sites)
3. Species-specific control (mechanical / ecological)	2027-2030	Landscape Laboratory / Municipality/ Vitrus/NGOs/ Citizens	- % Reduction in IAS cover per site (target: 100% reduction) - No. of control interventions (target: 3 interventions/year)
4. Replant with native species	2027-2030	Landscape Laboratory / Municipality/ Vitrus	- No. of native species planted (target: ≥ 10 species)
5. Long-term monitoring	2027-2030	Landscape Laboratory	- No. of annual monitoring campaigns (target: 2 campaigns)
6. Training for municipal staff & volunteers	2026-2030	Landscape Laboratory	- No. of training sessions (target: ≥5 training sessions) - No. of participants (target: 100 participants)

Action 1.2 - Restore riparian habitats along the Costa/Couros river

Action

The Costa/Couros river, which crosses the area within Green Belt 1, is a highly artificialised watercourse that has been under intense human pressure for centuries, particularly due to the historical tannery and textile industries. These activities have left significant ecological impacts, including degraded water quality, altered habitats, and reduced natural resilience of the river system. The action aims to restore riparian habitats and re-establish the ecological functions of this urban river corridor. Efforts will focus on improving riverbank stability through nature-based solutions, enhancing biodiversity by reintroducing native vegetation, and testing innovative approaches such as phytoremediation to address water pollution. Monitoring and community involvement will support the long-term success and social value of the restoration.

ACTION READINESS LEVEL

LOW	MEDIUM	HIGH
	■	

LEAD AGENCY	Municipality of Guimarães Landscape Laboratory
KEY PARTNERS	NGOs Universities Vitrus Private companies Citizens
TIMESCALE	2026-2030
RESULT	Improved riparian corridor.
ROUGH COST ESTIMATION	€300 000
FUNDING	LIFE Programme ERDF / Norte 2030 European Urban Initiative Portuguese Environmental Fund Municipal budget
RISK	- Floods/drought - IAS regrowth - Permit delays - Coordination complexity

HARD INVESTMENT	SOFT INVESTMENT
- IAS removal. - Native planting. - Erosion control/bioengineering.	- Community workshops. - Citizen-science training. - Biodiversity monitoring.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS	
EU Biodiversity Strategy for 2030	Riparian restoration and native planting enhance biodiversity and ecosystem services.
EU Nature Restoration Law	Habitat recovery, IAS removal and bank stabilisation meet restoration targets.
European Green Deal	NbS and phytoremediation contribute to climate resilience and water quality.
National Strategy for Nature Conservation and Biodiversity 2030 (ENCNB 2030)	River restoration addresses key priorities for ecosystem recovery and IAS control.
Guimarães 2030 Biodiversity Action Plan	Local riparian restoration delivers municipal goals for resilient urban ecosystems.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Baseline assessment (habitat & water)	2026	Landscape Laboratory	- No. of km of river surveyed (target: 3.5 km) Baseline assessment completed (target: 1 report with baseline habitat and water quality)
2. IAS removal & disposal	2027-2030	Landscape Laboratory / Municipality / Vitrus/ Citizens	- No. of hectares cleared of IAS (target: 5 ha)
3. Native riparian planting	2027-2030	Landscape Laboratory / Municipality / Citizens/ Private companies	- No. of native species planted (target: ≥ 3 native tree species) - No. of hectares restored with native riparian vegetation (target: 5 ha)
4. Natural engineering for bank stability	2027-2030	Landscape Laboratory / Municipality /Vitrus/ Universities	- No. of Km of stabilised riverbank (target: 3.5 km)

5. Phytoremediation pilots	2026–2027	Landscape Laboratory / Municipality / Universities	- No. of pilot sites implemented (target: ≥ 2 pilot sites)
6. Monitoring	2027-2030	Landscape Laboratory	- No. of monitoring campaigns conducted annually (target: 1 campaign)

SO 2 - Expand and connect urban green infrastructure to support biodiversity and climate resilience

Action 2.1 - Create and enhance urban micro-habitats

Action

This action aims to design and implement a network of specific urban habitats within the defined area of Green Belt 1 to enhance ecological quality, increase structural diversity, and provide suitable habitats for native species. The intervention includes the establishment of flower-rich meadows to support pollinators such as bees, butterflies, and other beneficial insects; the creation of seasonal ponds (temporary wetlands) to sustain amphibians and promote aquatic biodiversity; and the planting of Miyawaki mini-forests to encourage native vegetation cover and enhance carbon sequestration. Additionally, biodiversity shelters will be installed to support various faunal groups: dry stone walls will serve as refuges for reptiles and invertebrates; nest boxes will provide breeding sites for cavity-nesting bird species; bat boxes will offer roosting habitats for local chiropteran species; and deadwood habitats such as woodpiles or sheltered decomposition zones will support saproxylic organism's dependent on decaying wood.

ACTION READINESS LEVEL

LOW **MEDIUM** **HIGH**

LEAD AGENCY	Landscape Laboratory
KEY PARTNERS	Municipality of Guimarães NGOs Citizens Schools
TIMESCALE	2026–2030
RESULT	A network of diverse and ecologically functional micro-habitats.
ROUGH COST ESTIMATION	€100,000
FUNDING	Portuguese Environmental Fund Municipal budget Interreg Europe Programme ERDF / Norte 2030 Horizon Europe

	Corporate Partnerships
RISK	- Lack of long-term maintenance - Low community engagement - Vandalism of biodiversity structures

HARD INVESTMENT	SOFT INVESTMENT
- Materials for habitat creation. - Monitoring equipment.	- Community engagement workshops. - Citizen science training. - Biodiversity monitoring initiatives.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS

EU Biodiversity Strategy for 2030	Flower-rich meadows, ponds, and Miyawaki forests increase species diversity in urban areas.
EU Pollinators Initiative	Supports pollinator conservation through the establishment of flower-rich meadows.
EU Nature Restoration Law	Creation of new habitats in the Green Belt contributes to EU restoration obligations.
National Strategy for Nature Conservation and Biodiversity 2030	Habitat creation addresses national targets for biodiversity conservation in human-dominated landscapes.
Guimarães 2030 Biodiversity Action Plan	Meadows, ponds, and biodiversity shelters directly implement local commitments for urban ecosystem restoration.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Preliminary assessment to identify priority areas for habitat creation	2026	Landscape Laboratory	- No. of identified sites (target: ≥10 sites)
2. Creation of flower-rich meadows in the defined areas within the Green Belt	2026 - 2030	Landscape Laboratory / Municipality	- Area (m^2) of wildflower meadow created (target: 1,000 m^2) - Reduction in mowing frequency in selected sites (target: from 5 to 2 cuts/year)
3. Development of wildlife ponds in the defined areas within the Green Belt	2026-2030	Landscape Laboratory / Municipality / Schools	- No. of wildlife ponds created (target: ≥5)

4. Planting of Miyawaki forests in schoolyards within the Green Belt	2026	Landscape Laboratory / Municipality / Schools	- No. of Miyawaki forests (target: 3) - Area (m^2) afforested (target: 60 m^2)
5. Installation of biodiversity shelters (dry stone walls, nest boxes, bat boxes, deadwood habitats) across Green Belt sites	2026-2030	Landscape Laboratory/ NGOs/ Schools/ Citizens	- No. of biodiversity shelters installed (target: ≥40)

Action 2.2 - Develop urban green corridors to enhance ecological connectivity

Action

This action aims to improve ecological connectivity within the defined area of Green Belt 1, through the targeted planting of native trees and shrubs. By linking fragmented green areas, it will support species movement and strengthen the urban ecological network. Interventions will focus on key connectivity axes in underused or transitional spaces, reinforcing existing vegetation and ensuring continuity through the green infrastructure.

ACTION READINESS LEVEL

LOW	MEDIUM	HIGH

LEAD AGENCY	Municipality of Guimarães Landscape Laboratory
KEY PARTNERS	NGOs Universities Private companies Citizens
TIMESCALE	2026-2030
RESULT	Functional network of corridors linking major green spaces.
ROUGH COST ESTIMATION	€120,000
FUNDING	ERDF / Norte 2030 LIFE Programme European Urban Initiative Municipal budget Interreg Europe Programme Corporate Partnerships
RISK	Lack of funding Private land constraints Maintenance costs Urban pressure

HARD INVESTMENT	SOFT INVESTMENT
- Landscaping and planting of native vegetation. - Green infrastructure retrofitting.	- Community awareness campaigns. - Workshops on urban connectivity and green planning.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS

EU Biodiversity Strategy for 2030	Green corridors reconnect fragmented habitats and support species movement.
EU Nature Restoration Law	Corridor planting contributes to restoring ecological networks and degraded areas.
EU Cities Mission	Green infrastructure within the city improves climate resilience and urban well-being.
National Strategy for Nature Conservation and Biodiversity 2030	Enhancing connectivity addresses national priorities for ecosystem resilience and adaptation.
Guimarães 2030 Biodiversity Action Plan	Corridor implementation delivers local goals for integrated Green Belt connectivity.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Mapping and assessment of priority connectivity axes	2026	Landscape Laboratory/ Universities	- No. of connectivity assessment reports produced (target: 1)
2. Selection of planting sites and definition of corridor layouts	2026	Landscape Laboratory / Municipality	- No. of linear sites selected and documented (target: ≥3)
3. Implementation of the green corridors	2027-2030	Landscape Laboratory / Municipality / Private companies	- Length (km) of green corridors planted (target: ≥1 km).
4. Monitoring	2027-2030	Landscape Laboratory	- No. of monitoring campaigns conducted annually (target: 1 campaign)

SO 3 - Promote sustainable land management in urban and peri-urban areas

Action 3.1 - Increase permeability of urban soils

Action

This action aims to mitigate the negative impacts of increasing soil sealing by promoting nature-based solutions that enhance rainwater infiltration across strategic areas within Green Belt 1. The action focuses on limiting further sealing and improving the ecological performance of existing built-up areas. Through a combination of regulatory instruments, demonstration projects and fiscal incentives, the action aims to slow down the trend of soil sealing, mitigate its environmental consequences, and strengthen the urban green infrastructure's capacity to manage water, improve soil health and enhance climate resilience.

ACTION READINESS LEVEL

LOW **MEDIUM** **HIGH**

LEAD AGENCY	Municipality of Guimarães
KEY PARTNERS	Landscape Laboratory University Vimágua NGOs Private landowners
TIMESCALE	2026–2030
RESULT	Increased soil permeability and rainwater infiltration across key public and private areas.
ROUGH COST ESTIMATION	€150,000
FUNDING	ERDF / Norte 2030 Norte 2030 Operational Programme European Urban Initiative Portuguese Environmental Fund Municipal budget Corporate Partnerships
RISK	- Legal and regulatory barriers - Low municipal prioritization - Insufficient funding - Resistance from private landowners

HARD INVESTMENT	**SOFT INVESTMENT**
- Infrastructure retrofitting in public buildings.	- Sectorial training and capacity building.

- Permeable paving materials, soil decompaction and vegetation planting.	- Legal and regulatory development. - Feasibility studies and awareness campaigns.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS

EU Soil Strategy for 2030	Permeable pavements, green roofs, and rain gardens improve soil health and water retention.
EU Cities Mission	Local regulations and incentives for permeabilization strengthen climate-resilient urban planning.
European Green Deal	NbS for rainwater infiltration contribute to climate adaptation and sustainability.
National Strategy for Adaptation to Climate Change (ENAAC 2020)	Training and implementation measures reduce flood risks and increase resilience to climate impacts.
Guimarães Municipal Climate Action Plan (PMAC)	Public projects and awareness campaigns deliver local commitments for sustainable water and soil management.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Feasibility study for financial incentive schemes on private permeabilization	2026-2027	Municipality of Guimarães/ Landscape Laboratory/ Vimágua	- No. of reports produced and validated (target: 1)
2. Development of a local regulation requiring permeable solutions in new public constructions and renovations	2027	Municipality of Guimarães/ Landscape Laboratory/ Vimágua	- No. of regulations approved and published (target: 1)
3. Sectoral training programme for architects, engineers, and contractors	2027-2030	Landscape Laboratory	- No. of training sessions held (target: ≥2) - No. of professionals involved in training sessions (target: ≥30)
4. Implementation of best practices in public buildings and spaces (e.g., permeable pavements, green roofs, rain gardens)	2027-2030	Municipality of Guimarães/ Landscape Laboratory	- No. of public buildings/spaces retrofitted (target: ≥3)

5. Community awareness campaigns on benefits of soil permeability and incentives	2027-2030	Landscape Laboratory / NGOs / Private landowners	- No. of public awareness events held (target: ≥3)

Action 3.2 - Promote biodiversity-friendly agricultural practices

Action

This action promotes biodiversity-friendly agricultural practices in urban and peri-urban areas within the Green Belt 1, integrating sustainable food production with broader urban biodiversity and ecosystem enhancement goals. By supporting community gardens, local producers, and agroecological practices in household and shared spaces, the action fosters multifunctional green areas that provide habitat, food, and shelter for a wide range of species, including insects, birds, reptiles, amphibians, small mammals, and soil organisms. These practices help regenerate soil health, increase ecological connectivity, and strengthen ecosystem services such as nutrient cycling, water regulation, and climate resilience. At the same time, the action empowers citizens to engage with nature-based solutions, reinforcing a culture of sustainability.

ACTION READINESS LEVEL

LOW	MEDIUM	HIGH
		■

LEAD AGENCY	Landscape Laboratory
KEY PARTNERS	Municipality of Guimarães Schools NGOs Citizens Private companies
TIMESCALE	2026–2030
RESULT	Improved urban biodiversity and long-term behavioural change through biodiversity-friendly agroecological practices.
ROUGH COST ESTIMATION	€25,000
FUNDING	Portuguese Environmental Fund ERDF / Norte 2030 Municipal budget Interreg Europe Programme Horizon Europe Corporate Partnerships
RISK	Low interest from landowners; drought; pests

HARD INVESTMENT	SOFT INVESTMENT
- Infrastructure for gardens.	- Training workshops and knowledge exchange.

- Tools and materials for agroecological practices.	- Awareness campaigns. - Technical support for local producers.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS

EU Biodiversity Strategy for 2030	Agroecology and biodiversity-friendly gardens increase farmland and urban biodiversity.
EU Soil Strategy for 2030	Sustainable practices improve soil fertility and reduce degradation
European Green Deal	Local producer schemes and training foster sustainable food systems.
National Strategy for Nature Conservation and Biodiversity 2030	Biodiversity-friendly agriculture responds to national goals for ecosystem protection.
PEGADAS Municipal Environmental Education Programme	Training and school gardens build community awareness and skills for biodiversity.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Use the existing local producers' database to identify potential partners for biodiversity-friendly practices	2026	Landscape Laboratory	- No. of producers contacted (target: ≥30)
2. Design and launch a recognition scheme for local producers applying biodiversity-enhancing practices	2026	Municipality of Guimarães/ Landscape Laboratory	- No. of recognition schemes (target: 1)
3. Provide targeted training sessions for users of existing community gardens (>500 users) and public	2026-2030	Landscape Laboratory / Universities / Municipality of Guimarães	- No. of training sessions (target: 1 per year)
4. Support the creation and maintenance of biodiversity-friendly school vegetable gardens	2026-2030	Landscape Laboratory / Schools/ Municipality of Guimarães	- No. of schools supported (target: ≥5)

SO 4 - Establish an integrated system for biodiversity monitoring and citizen science

Action 4.1 - Promote citizen-science project for biodiversity monitoring

Action

This action aims to strengthen the role of citizens as active contributors to biodiversity knowledge and conservation in Guimarães, through the reinforcement of the BioGo! app. The app serves as a key tool for recording observations of local fauna and flora, generating valuable data that complements scientific surveys. By upgrading its functionalities and ensuring data quality, the project will enhance user experience and scientific reliability. Recruitment campaigns, training sessions, and community events will foster wider participation in biodiversity monitoring. The contributions collected through BioGo! will feed into a centralized database and dashboard, allowing the identification of priority areas for conservation and management within the Green Belt area.

ACTION READINESS LEVEL

LOW	MEDIUM	HIGH

LEAD AGENCY	Landscape Laboratory
KEY PARTNERS	Schools NGOs Citizens
TIMESCALE	2026–2030
RESULT	Greater ecological literacy and richer biodiversity datasets for planning.
ROUGH COST ESTIMATION	€100,000
FUNDING	ERDF / Norte 2030 Horizon Europe Portuguese Environmental Fund Municipal budget
RISK	Data quality Lack of engagement

HARD INVESTMENT	SOFT INVESTMENT
- App development and upgrades. - Servers/licences. - Tablets for field activities.	- Recruitment campaigns. - Training sessions. - User engagement activities. - Data validation and quality assurance.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS

EU Biodiversity Strategy for 2030	Citizen monitoring improves biodiversity knowledge and supports EU targets.
EU Cities Mission	Digital tools and citizen engagement strengthen sustainable urban governance.
European Green Deal	Citizen science fosters awareness and participation in the ecological transition.
National Strategy for Nature Conservation and Biodiversity 2030	Data from BioGO! supports national biodiversity monitoring and reporting.
PEGADAS Municipal Environmental Education Programme	Campaigns, training, and BioBlitzes enhance environmental education and community involvement.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Upgrade the BioGo! app	2026-2027	Landscape Laboratory	- No. of new functionalities implemented in the app (target: ≥5 features)
2. Conduct recruitment campaigns	2026-2030	Landscape Laboratory	- No. of participants recruited (target: ≥100 new active users per year)
3. Deliver training sessions and community events	2026-2030	Landscape Laboratory	- No. of training & events delivered (target: ≥5 sessions/events per year)
4. Validate data scientifically and update dashboard	2027–2030	Landscape Laboratory	No. of species recorded in the database (target: ≥300 species) - No. of new species added to the database (target: ≥50 species/year) - No. of dashboard updated (target: 1 update per month)

Action 4.2 - Develop and implement biodiversity monitoring systems

Action

This action aims to establish a robust and standardized biodiversity monitoring system across the area within the Green Belt 1, combining scientific rigor with community participation. It will standardize monitoring protocols and expand the network of permanent plots and sampling campaigns covering flora, fauna, and water quality. Data collected will feed into periodic CBI updates, with results published through public reports to ensure transparency and accessibility. Implemented with active community involvement, the system will support evidence-based conservation, inform priority areas for ecological management and improved access to green spaces.

ACTION READINESS LEVEL

LOW **MEDIUM** **HIGH**

LEAD AGENCY	Landscape Laboratory
KEY PARTNERS	Municipality of Guimarães Schools NGOs Citizens
TIMESCALE	2026–2030
RESULT	Robust evidence base to steer adaptive management and policy.
ROUGH COST ESTIMATION	€40,000
FUNDING	Horizon Europe LIFE Programme Portuguese Environmental Fund ERDF / Norte 2030 Municipal budget
RISK	- Lack of long-term funding - Limited technical capacity - Low community engagement - Data quality issues

HARD INVESTMENT	**SOFT INVESTMENT**
- Field equipment (sensors, camera traps). - GIS & data tools.	- Training of staff and volunteers. - Community engagement activities.

	- Data analysis and reporting.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS

EU Biodiversity Strategy for 2030	Standardised protocols and open data improve biodiversity tracking across the EU.
EU Nature Restoration Law	Monitoring permanent plots supports assessment of habitat recovery and restoration progress.
European Green Deal	Annual CBI updates link biodiversity to climate resilience and carbon goals.
National Strategy for Nature Conservation and Biodiversity 2030	Monitoring flora, fauna, and water aligns with national biodiversity reporting needs.
Guimarães 2030 Biodiversity Action Plan	Local monitoring network ensures progress tracking on municipal biodiversity targets.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Standardise monitoring protocol	2026	Landscape Laboratory	- Monitoring protocol (target: 1 protocol)
2. Establish and expand sampling points	2026	Landscape Laboratory	- No. of active sampling points (target: ≥10 points)
3. Conduct regular sampling campaigns	2026-2030	Landscape Laboratory	- No. of sampling campaigns (target: ≥2 campaigns per year)
4. Calculate CBI and produce report	2028 /2030	Landscape Laboratory	- No. of CBI calculations completed (target: 2 calculations – one in 2028, one in 2030)

SO 5 - Raise public awareness and ecological literacy through education and communication

5.1 - Develop biodiversity-focused environmental education programs

Action

This action promotes biodiversity awareness and long-term behavioural change through formal and non-formal environmental education. It leverages key anchor initiatives such as the PEGADAS - municipal programme for environmental education and aligns with the objectives of the Guimarães Biodiversity Action Plan (PAB 2030), by integrating biodiversity topics into school activities, providing training for teachers, and offering biodiversity education sessions for the wider community. The action aims to foster a shared culture of care for nature by increasing ecological literacy and encouraging citizen involvement in biodiversity protection.

ACTION READINESS LEVEL

LOW	MEDIUM	HIGH
		■

LEAD AGENCY	Landscape Laboratory
KEY PARTNERS	Municipality of Guimarães Schools NGOs Citizens
TIMESCALE	2025–2030
RESULT	Increased ecological literacy and long-term behaviour change in support of urban biodiversity conservation and nature-based solutions.
ROUGH COST ESTIMATION	€20,000
FUNDING	Municipal budget Portuguese Environmental Fund ERDF / Norte 2030 Interreg Europe Programme Horizon Europe
RISK	Low public engagement

HARD INVESTMENT	SOFT INVESTMENT
- Materials for learning activities or interpretive installations in schools or public spaces.	- Programme coordination. - Development of educational content. - Training facilitation, and community outreach.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS	
EU Biodiversity Strategy for 2030	Education on native species and ecosystems supports EU biodiversity awareness goals.
EU Pollinators Initiative	Training and public literacy on key species groups raise awareness of pollinator decline.
European Green Deal	Biodiversity literacy fosters citizen engagement in the ecological transition.
National Strategy for Nature Conservation and Biodiversity 2030	Education and training build societal capacity for national biodiversity conservation.
PEGADAS Municipal Environmental Education Programme	Integrating biodiversity themes into PEGADAS delivers local education commitments.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Include biodiversity-focused projects and themes in the PEGADAS annual programme (e.g. native Miyawaki forests, common flora and fauna groups, and lesser-studied groups such as freshwater fish)	2026	Landscape Laboratory	- No. of biodiversity-focused activities (target: ≥50 activities/year) - No. of participating schools (target: ≥10) - No. of students involved (target: ≥200)
2. Organise certified training sessions for teachers	2026	Landscape Laboratory / Training Centre / Universities	- No. of sessions delivered (target: ≥3) - No. of teachers trained (target: ≥60)
3. Deliver biodiversity literacy sessions for the general public, each focused on specific groups of fungi, plants, or animals	2026	Landscape Laboratory / Universities / Citizens/ NGOs	- No. of sessions delivered (target: ≥6) - No. of participants (target: ≥120)

Action 5.2 - Produce publications on biodiversity

Action

This action aims to publish books and guides on specific groups of living organisms for which no comprehensive information currently exists at the local scale. The content will combine technical work with data collected through citizen science initiatives, ensuring scientific accuracy and community relevance. These publications will serve as practical tools for citizens, supporting education, awareness, and environmental literacy about lesser-known groups, and contributing to stronger local biodiversity conservation.

ACTION READINESS LEVEL

LOW	MEDIUM	HIGH

LEAD AGENCY	Landscape Laboratory
KEY PARTNERS	Municipality of Guimarães Schools NGOs Citizens
TIMESCALE	2026–2030
RESULT	Locally tailored biodiversity books and guides providing accessible knowledge on specific groups of organisms.
ROUGH COST ESTIMATION	€30,000
FUNDING	Municipal budget Portuguese Environmental Fund ERDF / Norte 2030 Interreg Europe Programme Horizon Europe
RISK	- Low engagement from target audiences - Limited funding for multiple editions - Ensuring scientific validation and accessibility of content

HARD INVESTMENT	**SOFT INVESTMENT**
- Printing and distribution costs.	- Technical content production. - Citizen-science data processing. - Design and educational outreach.

RELEVANT STRATEGIES, POLICIES, DEVELOPMENT PROGRAMS

EU Biodiversity Strategy for 2030	Publications raise awareness and share knowledge to support EU biodiversity targets.
European Green Deal	Communication materials foster public engagement in the ecological transition.
National Strategy for Nature Conservation and Biodiversity 2030	Dissemination of biodiversity knowledge strengthens national conservation efforts.
Guimarães 2030 Biodiversity Action Plan	Local publications track and promote municipal biodiversity initiatives.
PEGADAS Municipal Environmental Education Programme	Educational resources enhance community literacy on biodiversity themes.

SUB ACTIONS	DATE	RESPONSIBILITIES	OUTPUT INDICATORS
1. Identify priority taxa/groups	2026	Landscape Laboratory	- No. of priority taxa/groups identified (target: 4 groups)
2. Compile technical and citizen-science data	2026-2030	Landscape Laboratory / Universities / Citizens / NGOs	- No. of complete species lists compiled for each priority group (target: 4 lists)
3. Draft content and design	2026-2030	Landscape Laboratory / Universities	- No. of drafts completed (target: 4 drafts)
4. Printing and digital release	2026-2030	Landscape Laboratory	- No. of printed copies produced (target: ≥400 per guide)
5. Public dissemination	2026-2030	Landscape Laboratory	- No. of launch events held (target: 4 events)

PART IV: Framework for delivery

The successful delivery of the Integrated Action Plan (IAP) for Guimarães relies on a governance model that is collaborative and accountable, ensuring that actions move beyond planning and into measurable, long-lasting impact. This framework outlines the structures, responsibilities, and mechanisms that will guide implementation and guarantee its sustainability over time.

11. Governance Structure and Roles

Implementation will be coordinated through a multi-level governance system that combines technical expertise, political leadership, and community engagement:

- **Lead Coordinator – Landscape Laboratory**

  Responsible for overall coordination, technical guidance, scientific monitoring, and integration with international best practices. The Laboratory also ensures cross-sectoral coherence and provides methodological support for NbS.

- **Municipality of Guimarães**

  Provides political leadership, embeds IAP objectives in municipal planning instruments, mobilises internal departments (urbanism, environment, education, culture), and secures part of the financial and administrative resources.

- **ULG**

  Functions as a participatory advisory body, ensuring plural representation from academia, local NGO, private stakeholders, and community groups. The ULG supports co-design, co-implementation, and monitoring, keeping citizens at the centre of the process.

12. Participatory Mechanisms and Stakeholder Engagement

The delivery of the IAP will actively involve citizens and stakeholders through multiple mechanisms:

- Citizen science initiatives like the BioGO! app, biodiversity monitoring campaigns, and BioBlitz events.
- Community engagement with workshops, school programmes, and voluntary environmental actions (e.g., invasive species removal, habitat creation).
- Consultation and co-design through regular ULG meetings and thematic working groups to refine implementation pathways.

13. Monitoring, Evaluation, and Adaptive Management

A robust monitoring and evaluation system will ensure that the IAP remains effective, transparent, and adaptable. The City Biodiversity Index (CBI) will serve as a central framework, linking actions to measurable outcomes in native biodiversity, ecosystem services, and governance.

Monitoring will combine scientific accuracy with participatory approaches by:

- Applying the CBI methodology, with data collected through GIS-based tools and standardized ecological protocols for habitats, fauna, and water quality, which will be used to calculate the CBI.
- Open platform for integrated biodiversity related data information.
- Publishing a mid-term report in 2028 and a final report in 2030, with results accessible to the public.
- Conducting periodic reviews by the ULG and engaging universities and external experts to validate data and provide independent oversight.

The following table presents a selection of the most relevant CBI indicators, specifically those that are expected to show the greatest improvement through the proposed actions. From the full set of 28 CBI indicators, 9 were selected. For each of these indicators, the directly related

actions have been identified together with the corresponding result indicators, including defined baseline and target values. The corresponding output indicators for each action are detailed in the IAP Action Tables (Part III, Section 10).

			Result indicator (CBI Score)	
	CBI Indicator	**IAP actions**	**Baseline 2023**	**Target 2030**
Native Biodiversity in the city	**Indicator 1:** Proportion of Natural Areas in the City	1.1; 1.2; 2.1; 2.2	4 (25%)	4 (≥ 25 %)
	Indicator 2: Connectivity Measures or Ecological Networks to Counter Fragmentation	2.2; 2.1; 3.2	0 (12%)	1 (20.0%)
	Indicator 7: Habitat Restoration	1.2; 2.1; 2.2	0 (2%)	1 (20.0%)
	Indicator 9: Proportion of Invasive Alien Species	1.1; 1.2	0 (42%)	1 (20.0%)
Ecosystem Services provided by Biodiversity	**Indicator 10:** Regulation of Quantity of Water	1.2; 3.1	4 (82%)	4 (≥ 82%)
	Indicator 11: Climate Regulation – Benefits of Trees and Greenery	2.1; 2.2; 3.1	1 (18%)	2 (≥ 25%)
	Indicator 14: Food Security Resilience – Urban Agriculture	3.2	4 (Policy, plan and guidelines on urban agriculture)	4 (Policy, plan and guidelines on urban agriculture)
Governance and Management of Biodiversity	**Indicator 24:** Participation and Partnership	4.1; 5.1; 5.2	4 (City in partnership with 20 or more other private companies/NGOs/academic institutions/international organisations)	4 (City in partnership with 30 or more other private companies/NGOs/academic institutions/international organisations)
	Indicator 28: Community Science	4.1; 4.2	4 (300 citizens/year)	4 (≥ 300 citizens/year)

14. Resourcing

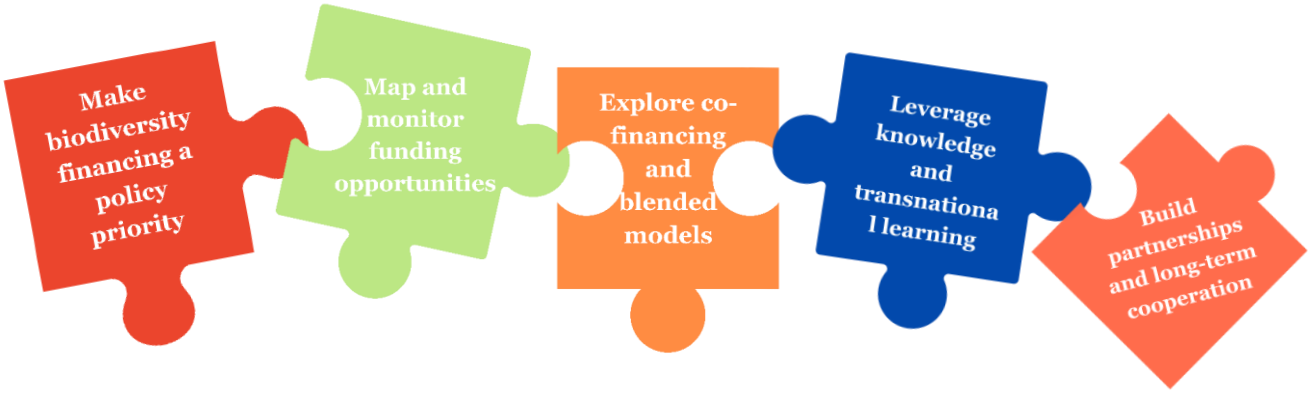
The full implementation of the IAP relies on a diversified and well-structured financial framework that combines European, national, regional, and municipal resources, complemented by private-sector partnerships and community-driven initiatives. The Landscape Laboratory will oversee financial planning and expenditure monitoring. To ensure long-term sustainability, the Municipal Budget will continue to include SDG's budget specific alignment, alongside with the study for the potential use of innovative instruments such as green bonds and environmental compensation schemes. Initial funding for priority actions has already been secured. This also includes the alignment with the Guimarães Climate City Contract Developed under the NetZeroCities Mission towards climate neutrality 2030. This is aligned with the Investment Plan that has a specific budget dedicated to green areas and includes biodiversity.

EU Funds – A significant share of funding will be drawn from European programs such as *Horizon Europe* (research and innovation in sustainable urban planning and NbS), the *European Regional Development Fund (ERDF)* (green infrastructure). Potential financing through the *LIFE Programme* (biodiversity restoration projects) depends on the final decision of the EU Commission in keeping this funding opportunity under the pluriannual framework. Additional opportunities will be explored through the *Interreg Europe Programme* (cross-border biodiversity and ecosystem restoration) and the *European Urban Initiative (EUI)* (innovative urban biodiversity projects.

- **National and Local Funds** – At the national level, potential sources include the National Strategy for the Conservation of Nature and Biodiversity 2030 (ENCNB 2030) and the Portuguese Environmental Fund, which may support habitat restoration, invasive species management, and biodiversity monitoring. At the regional level, the NORTE 2030 Operational Programme may provide support for ERDF measures on urban green infrastructure, ecological connectivity, and sustainable land use planning, aligning with IAP actions such as riparian restoration, green corridors, and urban micro-habitats. Potential funding opportunities are linked to the priority "2A – Greener and Low-Carbon North". Guimarães has embedded biodiversity protection and NbS into its local Guimarães Sustainable Energy and Climate Action Plan Climate Action Plan, Municipal

Master Plan (PDM), and the Guimarães 2030 Biodiversity Action Plan (PAB 2030), integrating ecological connectivity, green infrastructure, and sustainable land use planning.

- **Corporate Partnerships** – Mobilizing investment through Corporate Social Responsibility (CSR) programs. Companies may contribute by funding specific actions, such as the purchase of native trees for planting or the support of targeted biodiversity initiatives.



15. Implementation Roadmap and Timeline

The Guimarães IAP includes an implementation map and timeline in table format, detailing the distribution of the 10 key actions over a five-year period (2026–2030). This timeline considers the varying levels of complexity and impact of each action, enabling phased and progressive management.

SO1. Restore key habitats and control invasive species to improve urban ecosystem health							
Action 1.1.	Control and reduce the presence of Invasive Alien Species (IAS) *Cortaderia selloana* e *Pennisetum villosum*	IAP					
	Sub actions	2025	2026	2027	2028	2029	2030
	Detailed survey & mapping of IAS						
	Risk based prioritisation of sites						
	Species specific control (mechanical/ecological)						
	Replant with native species						
	Long term monitoring						
	Training for municipal staff & volunteers						
Action 1.2.	Restore riparian habitats along the Costa/Couros river						
	Sub actions		2026	2027	2028	2029	2030
	Baseline assessment (habitat & water)						
	IAS removal & disposal						
	Native riparian planting						
	Natural engineering for bank stability						
	Phytoremediation pilots						
	Monitoring						

SO2. Expand and connect urban green and blue infrastructure to support biodiversity							
Action 2.1.	Create and enhance urban micro-habitats	IAP					
	Sub actions	2025	2026	2027	2028	2029	2030
	Preliminary assessment to identify priority areas for habitat creation						
	Creation of flower-rich meadows in the defined areas within the Green Belt						
	Development of wildlife ponds in the defined areas within the Green Belt						
	Planting of Miyawaki forests in schoolyards within the Green Belt						
	Installation of biodiversity shelters across Green Belt sites						
Action 2.2.	Develop urban green corridors to enhance ecological connectivity						
	Sub actions		2026	2027	2028	2029	2030
	Mapping and assessment of priority connectivity axes						
	Selection of planting sites and definition of corridor layouts						

	Implementation of green corridors						
	Monitoring						

SO3. Promote sustainable land management in urban and peri urban areas							
Action 3.1.	Increase permeability of urban soils and enhance rainwater infiltration	IAP					
	Sub actions	2025	2026	2027	2028	2029	2030
	Feasibility study for financial incentive schemes on private permeabilization						
	Development of local regulations requiring permeable solutions in new public constructions and renovations						
	Sectoral training programme for architects, engineers, and contractors						
	Implementation of best practices in public buildings and spaces						
	Community awareness campaigns on benefits of soil permeability and incentives						
Action 3.2.	Promote biodiversity-friendly agricultural practices						
	Sub actions		2026	2027	2028	2029	2030
	Use the existing local producers' database to identify potential partners for biodiversity-friendly practices						
	Design and launch a recognition scheme for local producers applying biodiversity-enhancing practices						
	Provide targeted training sessions for users of existing community gardens and public						
	Support the creation and maintenance of biodiversity-friendly school vegetable gardens						

SO4. Establish an integrated system for biodiversity monitoring and citizen science							
Action 4.1.	Promote citizen-science project for biodiversity monitoring	IAP					
	Sub actions	2025	2026	2027	2028	2029	2030
	Upgrade the BioGo! app						
	Conduct recruitment campaigns						
	Deliver training sessions and community events						
	Validate data scientifically and update dashboard						
Action 4.2.	Develop and implement biodiversity monitoring systems						
	Sub actions		2026	2027	2028	2029	2030
	Standardise monitoring protocols						
	Establish and expand sampling points						
	Conduct regular sampling campaigns						
	Calculate CBI and produce report						

SO5. Raise public awareness and ecological literacy via education and communication							
Action 5.1.	Develop Biodiversity-Focused Environmental Education Programs	IAP					
	Sub actions	2025	2026	2027	2028	2029	2030
	Include biodiversity-focused projects and themes in the PEGADAS annual programme						
	Organise certified training sessions for teachers						
	Deliver biodiversity literacy sessions for the general public						
Action 5.2.	Produce publications on biodiversity						
	Sub actions		2026	2027	2028	2029	2030
	Identify priority taxa/groups						
	Compile technical and citizen-science data						
	Draft content and design						
	Printing and digital release						
	Public dissemination						

16. Risk mitigation plan

To ensure the successful implementation of the IAP, a structured risk management strategy has been developed. This framework identifies potential risks, assesses their likelihood, and defines mitigation measures to minimize negative impacts on biodiversity restoration, community engagement, and urban planning efforts.

The risk analysis table provides a detailed overview of each key risk identified, its probability, and the corresponding mitigation plan.

Risk	Action	Type	Probability	Mitigation plan
Stakeholder disengagement	1.1, 2.1, 4.1, 5.1, 5.2	Social	**Medium**	Maintain regular stakeholder engagement through workshops, newsletters, and participatory decision-making. Provide incentives for continued involvement.
Low uptake of the BioGO! app	4.1	Technological	**Medium**	Launch awareness campaigns, integrate gamification elements, and partner with schools and community groups to encourage participation.
Data quality	4.1, 4.2	Scientific	**Low**	Provide training for app users, implement data validation processes, and establish expert review mechanisms to ensure data reliability.
Urban development pressures and spatial constraints	2.2, 2.1, 3.1	Urban Planning	**Medium**	Mitigated by advocating biodiversity-friendly urban planning policies and integrating green infrastructure.
Insufficient funding for implementation and maintenance	1.2, 2.1, 2.2, 3.1, 3.2, 4.2, 5.1, 5.2	Financial	**High**	Seek diverse funding sources, including municipal, national, and EU funds, and establish long-term financial sustainability plans.
Restricted access to private land	1.2, 2.2, 3.1, 3.2	Legal/Ownership	**Medium**	Negotiate land access agreements, establish partnerships with private landowners, and explore incentive programs for land conservation.
Soil degradation or erosion	1.2, 2.1, 3.1, 3.2	Environmental	**High**	Implement soil restoration projects, promote sustainable land management practices, and monitor soil health through regular assessments.
Challenges in enforcing regulations	3.1, 1.1	Governance	**Medium**	Strengthen enforcement mechanisms, provide training for municipal staff, and engage legal entities to ensure compliance with biodiversity policies.
Narrow phenological windows for IAS control	1.1	Ecological/ Operational	**Medium**	Species-specific calendars; pre-flowering removals; flexible contract windows.
Drought/heatwaves reducing planting survival	1.1, 1.2	Environmental	**High**	Drought-tolerant natives; autumn/winter planting; mulch & establishment watering; survival warranties.

Floods/low flows affecting riparian works	1.2	Environmental	**Medium**	Seasonal phasing; bioengineering; post-flood inspections; 2-year Operations & Maintenance (O&M).
Permit/authorisation delays (riparian works)	1.2	Legal/Regulatory	**Medium**	Early regulator engagement; phased submissions; clear method statements; NbS alternatives.
Multi-actor coordination complexity	1.2	Governance	**Medium**	Monthly coordination; RACI roles.
Vandalism/theft of biodiversity structures (nest boxes, signage, sensors)	2.1	Social/Operational	**Medium**	Anti-tamper fixtures; discreet siting; rapid-replace budget; co-ownership
Medium/long-term maintenance gap for restored habitats & corridors	2.1, 2.2	Operational	**High**	O&M plans with budgets; performance-based maintenance; local stewards.
Low municipal prioritisation of permeabilization	3.1	Governance	**Medium**	Annual targets/KPIs; visible pilots; embed in sector plans.
Monitoring capacity/continuity limitations	4.2	Governance/Operational	**Medium**	Multi-year schedule; internships/fellowships; university partnerships.
Data gaps in the monitoring network	4.2	Scientific	**Low**	Standardised/versioned protocols; expand permanent plots; seasonal campaigns.
Scientific validation & accessible formats for publications	5.2	Scientific/Comms	**Medium**	Peer review; clear language; inclusive design.

17. Overall lessons learned and recommendations

On the IAP

The development of the IAP demonstrated the importance of aligning biodiversity planning with existing instruments (EEM, PMAC, PABG 2030). A key lesson is that territorial plans are more effective when designed as complementary layers, avoiding duplication and maximizing synergies. Future processes should continue this cross-sectoral integration to increase effectiveness and funding opportunities. By using the IAP framework, we were able to prepare

problem identification, align real actions across multiple actors and establish a timeline of implementation plan.

On governance and the ULG

The multi-level governance model, built on the Municipality, the Landscape Laboratory, and the ULG, provided a solid basis for co-creation. However, not all stakeholders were able to sustain the same level of engagement throughout the process. It is recommended to ensure flexibility in participation formats and to create clear incentives to strengthen long-term commitment.

On Small Scale Action (SSA)

The Small-Scale Action in the Guimarães Community Gardens underscored the significance of integrating ecological restoration with active community engagement. In addition to the technical outcomes, such as enhanced habitat diversity and measurable improvements in ecological indicators, the initiative demonstrated that citizen participation plays a pivotal role in cultivating a sense of responsibility and securing the sustained maintenance of interventions. The experience further revealed that modest, low-cost measures, including ponds, nesting boxes, and micro-habitats, can yield substantial ecological and social benefits when accompanied by systematic monitoring and consistent user involvement. Future efforts should build upon this approach by embedding participatory design and structured oversight from the outset, thereby ensuring the continuity and resilience of ecological interventions.

On Transnational Exchanges

Exchange with other BiodiverCity partner cities provided useful references in river restoration, IAS management, urban forestry, and NbS for climate adaptation. The ability to adapt external best practices to the local context was decisive. It is recommended to continue investing in international exchanges, ensuring systematic transfer, local adaptation, and monitoring of results.

18. Communicating and disseminating the IAP locally

To ensure transparency, public engagement, and widespread awareness, the IAP will be communicated through a multi-channel dissemination strategy tailored to reach different

segments of the community. This approach will foster greater understanding and active participation in biodiversity conservation efforts.

» **Public Events & Workshops:** Community sessions, citizen science activities, and interactive workshops will be organized to present the IAP, explain its objectives, and encourage community involvement in biodiversity initiatives.

» **Online Platforms & Digital Outreach:** Regular updates will be provided through the municipality's official website, social media channels, and the BioGO! app, ensuring easy access to project developments, biodiversity monitoring results, and ways for citizens to engage.

» **Educational Materials & Awareness Campaigns:** Biodiversity guides, newsletters, reports, and other learning resources will be distributed in schools, local institutions, and public spaces to promote environmental education and community stewardship.

» **Media & Press Engagement:** Local media outlets will be involved to disseminate key milestones, highlight success stories, and increase visibility of the IAP's impact.

19. Contact details

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