URBAN NATURE PLANS +

Short brief on assessment and monitoring for urban nature plans

Assessment and monitoring

This short brief focuses on the use of indicators, including citizen science approaches, biodiversity monitoring methods, and participatory planning & governance evaluation, in urban nature plans.

It outlines a process that includes identifying and selecting appropriate indicators, reflecting on potential impacts, selecting appropriate metrics for each indicator, and developing and implementing a structured data plan.

It emphasises the importance of engaging citizens in data collection, enabling them to act as multipliers and ambassadors of change, and ensuring that the resulting evidence is effectively integrated into urban nature plans.

Key messages:

1. **Integrate Monitoring Early:** Embed robust monitoring and assessment into your Urban Nature Plan (UNP) from initial planning and state of nature evaluation through adaptive management for evidence-based alignment.

2. **Measure Outcomes, Not Just Outputs:** Use core, context-specific indicators to measure actual outcomes (e.g., reduced heat, increased biodiversity), aligning with strategic city goals, rather than just outputs (e.g., green space installed).

3. **Make Use of Emerging High Throughput Technologies:** Adopt emerging technologies (remote sensing, e-DNA, AI) to overcome resource limitations, enabling more extensive, cost-effective, and accurate data collection.

4. **Maximise Citizen Science Involvement:** Engage non-professionals in well-designed citizen science approaches for fine-grained, local data, while simultaneously boosting public awareness and trust in the UNP.

5. **Develop a Robust Data Plan:** Ensure data usability by setting a baseline and defining a clear data plan covering quality, ethics, storage, analysis, and sharing for valid impact conclusions.

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Why monitoring matters?

Monitoring and assessment are critical to successful development and implementation of Urban Nature Plans (UNPs). Their importance relates to several key aspects:

- **Evidence-based planning:** Demonstrates effectiveness and supports planning and investment decisions.

- **Strategic alignment:** Ensures outcomes from UNPs support city-wide goals and objectives and national and international targets.

- **Adaptive management:** Enables real-time learning and refinement of the implementation of nature-based solutions (NBS) and urban nature.

- **Stakeholder engagement:** Builds trust, fosters stronger commitment to the process/outcomes and supports co-production through citizen science.

- **Policy influence:** Strengthens the case for integrating NBS into mainstream policy and funding frameworks.

Why focus on Biodiversity, Citizen Science, and Governance?

While a comprehensive monitoring strategy covers a wide array of metrics, this brief specifically highlights the importance of Biodiversity, Ecosystem Services, Citizen Science, and Participatory Planning & Governance (PP&G) monitoring because they represent the pillars of a successful and inclusive UNP (see Box 1).

Box 1: Glossary

> **Adaptive Management:** A structured, iterative process of learning-by-doing and adapting management strategies based on monitoring results.
>
> **Citizen Science:** Citizen science is an engagement method that actively involves citizens in various stages of the scientific research process.
>
> **Nature-based Solutions (NBS):** Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.
>
> **Theory of Change (ToC):** A comprehensive description and illustration of how and why a desired change is expected to happen in a particular context. It maps causal pathways linking interventions to long-term goals.
>
> **Urban Nature Plans (UNPs):** Strategic frameworks developed by cities to integrate nature into urban planning and development, aiming to enhance biodiversity, ecosystem services, and human well-being.

Biodiversity and Ecosystem Services provide the fundamental evidence base for the current state of nature in a city, nature's recovery, and the value it delivers to society. Citizen Science offers a practical solution to critical data gaps while simultaneously fostering community awareness, engagement, and stewardship. Finally, PP&G indicators are essential for ensuring

that the planning process itself is equitable, inclusive, and responsive to the needs of all citizens, moving beyond simple physical outputs to measure genuine societal impact.

To ensure the success of UNPs, robust monitoring and assessment are essential throughout the planning, implementation, and management phases of the UNPs cycle. The following short brief details some key aspects to consider in relation to successfully implementing assessment and monitoring as part of UNPs.

Step-by-Step Guide

Stage 1: Structured Reflection on Impacts and Goals

- Define strategic city objectives. Link NBS and urban nature to policy goals such as climate resilience, biodiversity, or social inclusion.
- Identify expected outcomes. Distinguish between outputs (e.g. new green roofs installed) and outcomes (e.g. reduced urban heat).
- Map assumptions and trade-offs (see Table 1). Use a Theory of Change to map causal pathways, synergies, and possible negative effects (e.g. gentrification risks).
- Co-produce with local stakeholders (e.g. citizens, business sector, NGOs etc.), technical staff and experts to ensure a holistic assessment and scientific rigour.

Table 1: Example of a Theory of Change

	Description	Indicators	Assumptions	Co-benefits	Trade-offs
Impact / Priority	Increase in biodiversity	Biodiversity score			
Outcome / objective	More butterflies in parks	Number of butterflies seen	Increasing the number of butterflies will increase overall biodiversity	People will enjoy more butterflies in the park (health & wellbeing benefits)	Caterpillars perceived as pests on nearby allotments
Outputs / action	Butterfly friendly habitat created in parks	Area of butterfly-friendly habitat in city	Increasing the amount of habitat will increase the number of butterflies	Creates water storage area (stormwater management benefits)	Less amenity grass areas for people to use

Step 2: Choose Appropriate Indicators

- Select indicators that align with the outcomes and context of the intervention and take account of the co-benefits/trade-offs in the Theory of Change:
  - Consider core indicators that are universally relevant to all Urban Nature Plans (e.g. Greenspace Area).
  - Use additional indicators for more context-specific priorities related to your city (e.g. cultural value).
- Use established resources to help you select the right indicators for your city: Refer to EU NBS Indicator Handbook for a comprehensive list.
- Start with selecting core indicators that align to policy priorities and resource availability.

Step 3: Develop a Data Plan

- Define what data you need for each indicator: baseline, control, spatial scale, and frequency.
- Determine what data is already being collected or if new data needs to be collected.
- Select data sources:
    - Remote sensing and Earth observation
    - Surveys and participatory methods
    - Administrative data
    - Citizen science
- Consider partnerships - who and what expertise is required to help you gather the necessary data.
- Plan for data quality and management: Ensure data accuracy, standardisation, metadata, and ethical handling.
- Establish a risk mitigation plan to identify and effectively manage potential issues such as delays or financing issues (see Figure 1).

Figure 1: Monitoring activities, data collection and storage plan

For the monitoring activities	For the data collection and storage plan
What will be monitored? (includes expected outcomes and chosen indicators)	Which type of data will be collected and what is the target population or type of sample?
Where will monitoring take place? (location of monitoring tools and data collection)	Who will analyse the data? (which stakeholders or partners will perform the analyses)
Who will do the monitoring? (Stakeholders responsible for each type of data collection)	Who will store the data? (stakeholders responsible for the data platform and/or data base)
When will monitoring take place? (Schedule – times and frequency of data collection)	How will data be presented? (how the results of monitoring will be presented to inform policies, citizens and decision-making processes)

Step 4: Implement the Monitoring Plan

- Establish the baseline (or control area): where possible collect data before the UNP or NBS is implemented to provide a benchmark for measuring the project's impact.
- Carry out data collection according to the plan: This can include installing automated sensors, launching biodiversity counts, or implementing social surveys.
- Engage stakeholders: Involve local communities, NGOs, universities, and municipal staff in data collection and evaluation.
- Analyse the data: according to the data collected, analysis could be quantitative or qualitative, use mixed methods (quantitative + qualitative) or multi-criteria analysis where appropriate.

- Compare results with the baseline (or control area): to establish whether the intended outcomes are being achieved, what is working well and what is not, and why.
- Conduct a causality analysis to consider the multi-dimensional impacts (co-benefits/trade-offs and other factors that may impact the expected result) to ensure valid conclusions are drawn.
- Use adaptive management to adjust strategies and optimise performance, and consider timeframes - some outcomes may not be apparent in the short-term.

Step 5: Report, and Integrate Findings

- Evaluate performance: Compare outcomes against baseline and targets.
- Report results: include positive and negative results so lessons are learned and mistakes are not repeated.
- Disseminate the results in a range of formats: scientific articles, accessible reports for internal and public use, talks, webinars and visual, dynamic interactive tools such as data dashboards that display key information (e.g. KPIs) .
- Relate the results to the Theory of Change and its objectives: to enable reflexive monitoring that informs adjustments that can be fed back into policy and planning processes (see Figure 2).
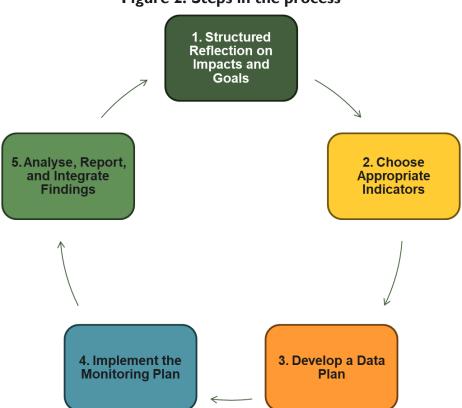- Inform decisions: use the data to inform future evidence-based decision-making.

Figure 2: Steps in the process

Biodiversity Monitoring

Why Monitor Biodiversity?

- **Assess Trends:** Tracks urban species and biodiversity changes over time, provides a platform for understanding ecosystem service provision and provides underpinning evidence for assessing ecosystem services.
- **Inform Policy:** Provides evidence for evaluating UNP delivery and meeting legally binding targets in the Nature Restoration Regulation.
- **Evaluate Impacts:** Measure outcomes of actions to ensure accountability and that biodiversity benefits are being delivered.
- **Understand Links:** Connects UNP delivery to biodiversity results (e.g., greenspace and butterfly populations).
- **Engage the Public:** Promotes involvement, awareness raising, and empowerment through citizen science platforms.
- **Guide Conservation:** generates spatial data to prioritise cost-effective actions.
- **Support Global Goals:** Contributes to SDGs and international biodiversity targets.

Challenges in Biodiversity Monitoring

- **Resource Demands:** Needs time, skills, and technical capacity.
- **Low Priority & Funding Gaps:** Often underfunded, politically sidelined, and/or assumptions made that actions cause intended outcomes.
- **Data Issues:** Lack of centralised, standardised data, and in-house analytical expertise.
- **Methodological Hurdles:** Choosing metrics, limits of citizen science, and baseline setting.
- **Communication Barriers:** Indicators often not policy-friendly.
- **Social Factors:** Low awareness and participation.
- **Tech Access:** High cost and complexity of advanced tools (e.g., drones, LiDAR).

Opportunities in Biodiversity Monitoring

- **New Tech for Data Collection:** eDNA, drones, remote sensing, bioacoustics, and camera traps, can gather larger datasets and become more cost-effective.
- **Advanced Analysis:** AI, machine learning, GIS, and new biodiversity indices.
- **Boosted Citizen Science:** Apps, BioBlitz events, and AI tools drive engagement and data quality.
- **Improved Standards:** Shared indicators, standardised approaches, and integrated sources enhance comparability.
- **Open Data:** Platforms like GBIF offer open access biodiversity records.

Ecosystem Service Monitoring

Why Monitor Ecosystem Services?

- **Reveal Nature's Value**: Quantifies benefits like cooling, air purification, flood regulation, and recreation.
- **Guide Planning**: Identifies priority areas for nature restoration, conservation or enhancement to maximise benefits and demonstrates delivery against a broad range of planning priorities
- **Show Impact**: Demonstrates how urban nature contributes to health, climate resilience, and urban goals.
- **Support Decision-Making**: Enables cost-benefit analysis and builds evidence for nature-positive urban strategies and EU targets.
- **Engage the Public**: Makes benefits of nature restoration visible to citizens and builds support for nature-positive action.
- **Strengthen Monitoring**: Connects nature's functions with human wellbeing in policy-relevant ways.

Challenges in Ecosystem Services Monitoring

- **Complex and Multi-Dimensional**: Ecosystem services are linked across ecological, social, and economic domains.
- **Data Gaps**: Limited access to fine-scale data or modelling tools.
- **Valuation Limits**: Cultural or social values are hard to monetise.
- **Equity and Trade-offs**: Measuring who benefits, and that social justice is delivered, can be challenging
- **Scale and Integration**: Services vary across time and space, and are often excluded from planning systems or do not align with short-term political/budgetary cycles.

Opportunities in Ecosystem Services Monitoring

- **Mapping and Modelling**: Use tools like ESTIMAP, InVEST, and GIS to assess services.
- **Remote Sensing**: Track vegetation, land use, and temperature with drones or satellites.
- **Integrated Indicators**: Link services to wellbeing, such as access to greenspace or cooling.
- **Citizen Science**: Engage communities through participatory mapping, apps, and local knowledge.
- **Smart Tech**: Sensors measure services like activity, air quality or stormwater in real time.
- **Shared Frameworks**: Use standardised indicators across EU projects to ensure comparability.

Citizen Science

Why Citizen Science?

- **Citizen Science Definition:** Citizen science actively involves non-professional volunteers in data collection and environmental monitoring.
- **Assessment and Tracking Tool:** It's a powerful tool for assessing and tracking progress in Urban Nature Projects (UNPs).
- **Community Engagement:** Cities can foster a community of citizen scientists to support Nature-Based Solutions (NBS) and urban nature.
- **Data Collection Efficiency:** It allows cities to gather fine-grained, place-based data that would otherwise be too resource-intensive to collect professionally.
- **Public Understanding and Stewardship:** Citizen engagement enhances public understanding of urban biodiversity and fosters stewardship for local green and blue spaces.
- **Inclusive Planning:** In UNPs, citizen science supports inclusive, participatory planning by making the assessment process more transparent, democratic, and socially relevant.
- **Responding to Urban Nature Experiences:** It helps cities respond to real-life experiences of nature in urban environments.
- **Strengthening Community Ties:** It strengthens community ties to local NBS.
- **Driving Pro-Environmental Behaviour:** Active participation connects citizens to nature, often inspiring broader sustainable habits in their daily lives.

Challenges of citizen science

- **Data quality and reliability** may vary, particularly where training or standardized methods are lacking.
- **Engaging and retaining volunteers** can be difficult, especially over long monitoring cycles.
- **Equity and inclusion** essential marginalized or "voiceless" groups may be underrepresented if specific outreach is not undertaken.
- **Integration into formal planning and reporting** can be complex, requiring robust frameworks to ensure data is usable and policy-relevant.

Opportunities of citizen science

- **Filling data gaps** in under-monitored neighbourhoods, target species/groups, or ecosystems.
- **Building local capacity and scientific literacy**, especially among youth and community-based organizations.
- **Co-creating knowledge**, making urban nature planning more socially just and context-sensitive.
- **Increasing legitimacy and public trust** in processes for UNPs through transparency and shared ownership.

Participatory Planning & Governance

Why Participatory Planning and Governance (PP&G)?

- **Integrate Stakeholders:** Include public, private, citizen, and civil society groups in Urban Nature Planning (UNP) beyond citizen science.
- **Benefits:** Legitimizes UNP, identifies needs, fosters shared ownership, reduces conflict, and offers stakeholder opportunities in UNP development, implementation, resourcing, and monitoring.
- **Enhance Support & Trust:** Builds social, political, and financial support for UNP through empowerment, trust in decision-making, and new planning/governance approaches.
- **Include Under-represented Groups:** Ensures no one is left behind.

Challenges of PP&G and its monitoring

- **Organizational silos, internal conflicts, and institutional inertia** hinder cross-departmental and external collaboration.
- **Top-down approaches** are standard, making inclusive methods difficult; high-status professionals may disregard external stakeholders.
- **Lack of expertise, time, and capacity** can prevent adopting new governance forms or involving external groups, due to perceived complexity.
- **Cultural perceptions** lead to varied interpretations of participatory approaches; external stakeholder involvement isn't universally accepted.
- **Monitoring PP&G** is difficult; indicators are often imprecise, open to interpretation, or politically sensitive.

Opportunities of PP&G and its monitoring

- **Share best practices** via inclusive/alternative models.
- **Encourage progression** to higher participation levels.
- **Provide effective training** to professionals lacking knowledge, confidence, or experience in participatory approaches.
- **Develop effective monitoring** for PP&G using NbS indicators.
- **Offer external mentoring** to municipalities or facilitate City-to-City exchanges on PP&G.
- **Explore new funding models** incentivising PP&G activities through external financing (provision/restriction) and in-house mentoring/secondments.

Key Recommendations

To ensure successful creation and implementation of UNPs, cities need to prioritise robust monitoring through these key recommendations:

Integrate Monitoring Early & Continuously: Embed comprehensive monitoring from initial planning through implementation and adaptive management for evidence-based planning and strategic alignment.

Secure Resources & Political Buy-in: Advocate for consistent financial and human resources, alongside strong political commitment, to sustain long-term monitoring.

Enhance Data Management & Interpretation: Develop centralised data repositories and invest in staff training for improved data handling, management, and interpretation to streamline reporting.

Leverage Technology for Efficiency: Adopt emerging technologies like satellite imagery, bioacoustics, e-DNA, and AI or Machine Learning for extensive, cost-effective, and non-invasive data collection.

Maximise Citizen Science Engagement: Involve citizens in well-designed programmes to gather data, foster public awareness, build community capacity, and increase trust in processes behind UNPs.

Foster Strategic Collaborations: Partner with academia, research & environmental organisations, and industry experts for specialised knowledge, advanced tools, and cost-effective support.

Utilise Established Indicators & Frameworks: Adopt or adapt existing core indicators and monitoring frameworks (e.g., EU NBS Indicator Handbook) for a structured starting point, ensuring data consistency.

Invest in Capacity Building: Implement targeted training for municipal staff and citizen scientists to empower them in using tools, managing data, and interpreting results, strengthening overall capabilities.

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