MONITORING NATURE: REMOTE SENSING AS A KEY ENABLER OF NATURE-BASED SOLUTIONS

Summary

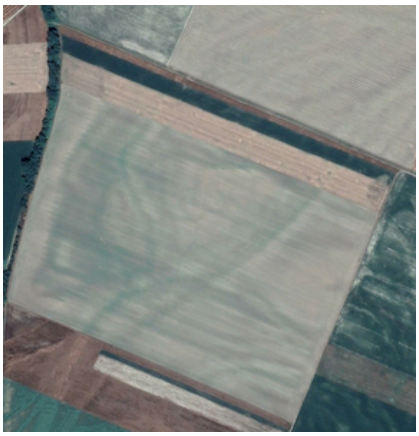
Remote sensing technologies offer a powerful toolkit for supporting the implementation, monitoring, and evaluation of Nature-Based Solutions (NBS). By providing spatially explicit, up-to-date data on land cover, vegetation health, hydrology, and more, remote sensing enables practitioners to design better interventions and measure their impact over time.

The need

Nature-based solutions (NBS) aim to address societal and environmental challenges through the sustainable use of nature. However, their design and implementation require robust, continuous environmental data to guide planning and assess effectiveness. Traditional field-based monitoring is often too costly, time-consuming, or spatially limited to provide the required information at scale.

Remote sensing bridges this gap by offering consistent, spatially explicit, and regularly updated environmental data. It supports the early identification of priority intervention areas, baseline assessments, and long-term impact monitoring. In a changing climate, where adaptive management is crucial, these capabilities are essential to the resilience and success of NBS.

Furthermore, remote sensing facilitates cross-scale analysis and comparison between sites, enabling stakeholders to learn from different contexts and refine their approaches. Its integration with participatory methods and local knowledge can enhance inclusiveness and legitimacy in NBS design and evaluation.



The benefits

Remote sensing supports NBS implementation in a variety of strategic ways:

Scalability: Satellite data enables consistent monitoring across cities, regions, or even entire countries. This allows planners to prioritize interventions based on large-scale ecosystem trends.

Repeatability: Frequent data acquisition supports monitoring of seasonal dynamics, vegetation growth cycles, and the timing of ecological responses to NBS.

Cost-efficiency: Open-access programs such as Copernicus (Sentinel) and Landsat reduce monitoring costs, making remote sensing accessible to a wide range of stakeholders.

Integration potential: When combined with field surveys, IoT sensors, or modeling approaches, remote sensing enhances multi-source environmental assessment.

Transparency and accountability: Publicly available remote sensing data strengthens reporting mechanisms and builds trust through visual, data-driven storytelling.

Indicator support: Enables the tracking of multiple relevant indicators such as vegetation indices (NDVI), land surface temperature, water availability, or urban heat island effects.

Climate resilience: Time-series analyses help assess long-term changes and trends, providing key information for adaptive NBS strategies in the face of climate uncertainty.

Early warning and risk assessment: Remote sensing helps detect early signs of environmental stress, such as drought, flooding, or land degradation, enabling proactive management and timely adaptation of NBS interventions.

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trans4num solution

Within the trans4num project, a dedicated Nature-Based Solutions (NBS) site in Hungary was developed to demonstrate how remote sensing and geospatial data can support sustainable land management and ecological restoration. The site serves as a real-world example of how data-driven approaches can guide and monitor NBS interventions.

The implementation relies on an integrated use of drone-based monitoring, and GIS analysis to capture changes in land cover, vegetation health, and water dynamics. These tools provide timely, spatially detailed information that supports adaptive management and long-term impact assessment.

Drones play a key role in the monitoring strategy, offering high-resolution imagery and flexibility in capturing localized environmental changes. They complement satellite data by filling spatial and temporal gaps, particularly in areas where cloud cover or terrain complexity limits satellite visibility.

The NBS site also emphasizes accessibility and replicability. Using open-source platforms such as QGIS and Google Earth Engine, and leveraging affordable drone technology, the trans4num approach ensures broader adoption, especially by smaller municipalities or civil organizations with limited resources.

Capacity-building is a central element of the initiative. Trainings, workshops, and knowledge exchange activities are organized to equip local stakeholders with the skills needed to operate drones, process spatial data, and interpret results in a meaningful way.

In sum, the NBS site developed within the trans4num project is a living example of how remote sensing, drones, and institutional collaboration can be combined to support scalable, effective, and inclusive Nature-Based Solutions.

What were the challenges / limitations in the implementation process?

- Expert knowledge is required to interpret remote sensing data.
- Cloud cover limits the usability of optical satellite imagery.
- Technical and financial barriers hinder small stakeholders' access.
- Data integration issues affect consistency across different sources.
- Institutional gaps and regulations can delay effective implementation.

What kind of resources do you need to implement the proposed solution?

- Open or commercial satellite imagery for regular environmental monitoring.
- GIS and image processing software like QGIS or GEE.
- Trained personnel with expertise in remote sensing and analysis.
- Sufficient computing infrastructure for data storage and processing.
- Institutional support to integrate results into decision-making processes.

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More information

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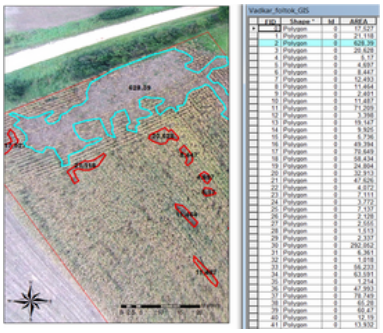

Learn more about the project at https://trans4num.eu/en/

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