

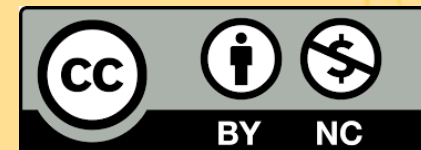
Future of Nature based Cities

Lecture (online)

Learning Unit 17

Credit: Trinity College Dublin

Content created in 2024



Funded by
the European Union

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Introduction

The Future of Cities: Smart, Sustainable, and Nature-Inspired

- Exploring how **nature-based solutions (NBS)** and **smart technologies** are transforming urban environments.
- Focus on **EU-funded projects, smart cities**, and how technologies inspired by nature can make cities more resilient and sustainable.
- Discussing the development process, challenges, and opportunities for implementing NBS and smart tech.

“Solutions that are **inspired** and **supported** by nature, which are cost-effective, simultaneously provide **environmental, social and economic benefits** and help build **resilience.**”

Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.



NBS Definition – EU

Reference: [European Commission](#)

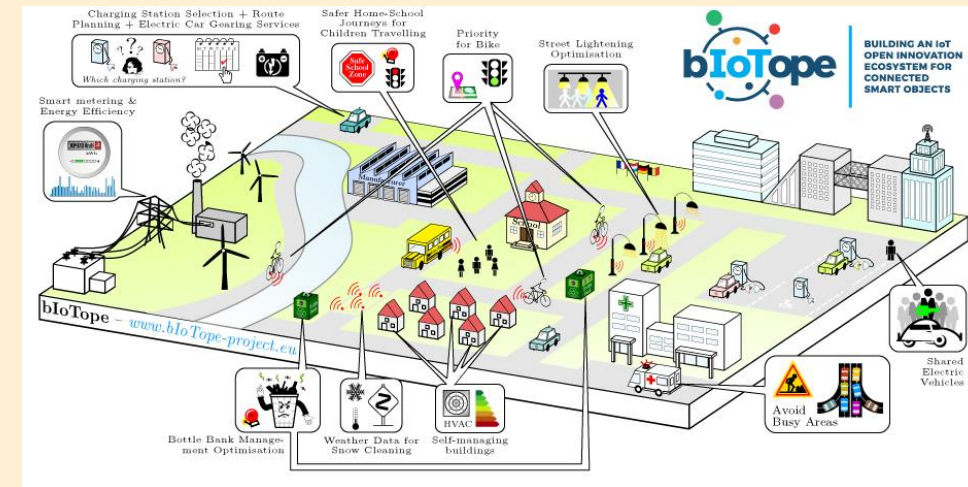
Can nature play a role in smart cities?

Defining Smart Cities

- **Smart cities** are urban areas that use **digital technologies** to enhance performance, well-being, and reduce costs & resource consumption across the city.
- These cities focus on **data-driven decision-making**, **sustainable urban planning**, and **integrating nature** for a more **resilient** and **eco-friendly** urban environment.

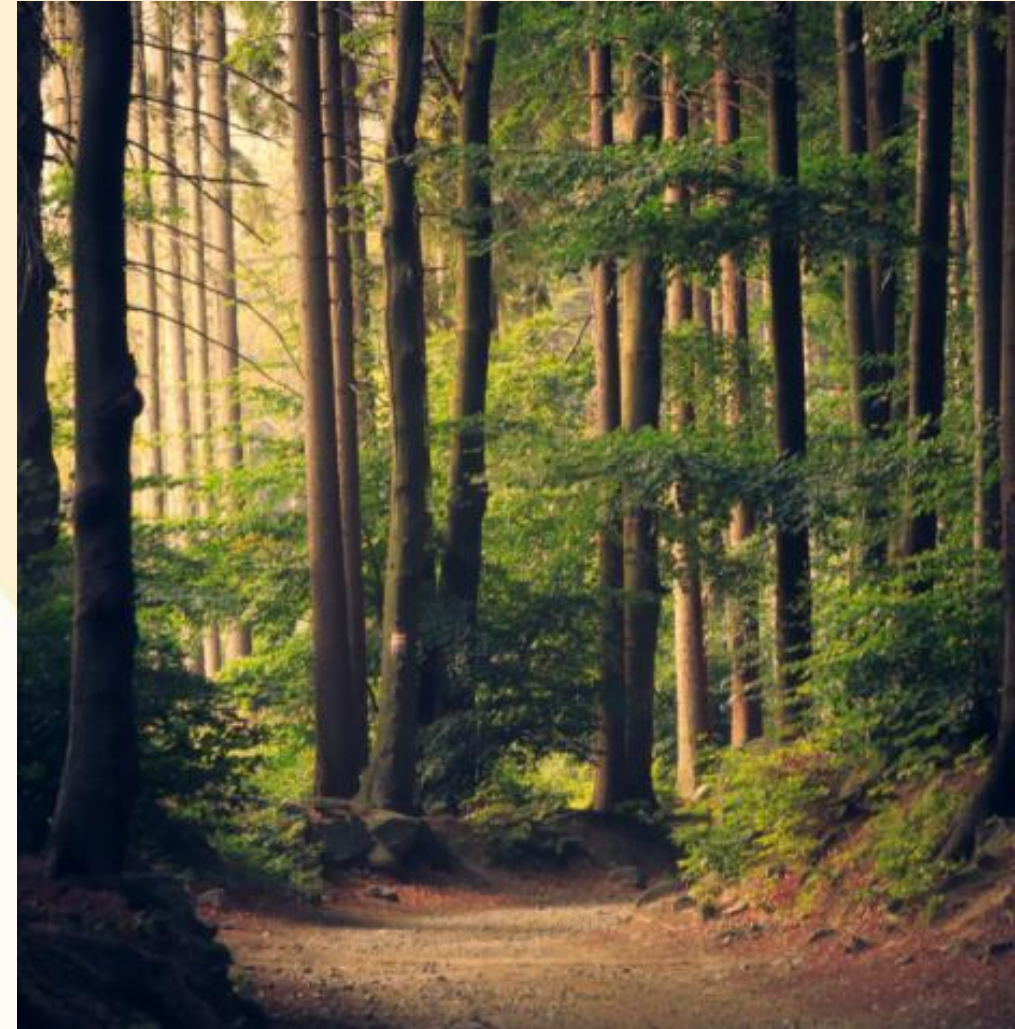
Integrating Nature with Technology for Urban Sustainability

- NBS help address climate change, water management, and urban heat islands by working with nature.
- **Smart cities** use technology to **optimize** and **monitor** these solutions in real-time, ensuring efficiency and sustainability.



Nature Inspired Technologies Urban Innovations

- Biomimicry:** Design solutions inspired by nature (e.g., buildings modelled after termite mounds to naturally cool urban environments).
- **Renewable Energy Solutions:** Using **solar panels**, **wind turbines**, and **vertical gardens** to create self-sustaining, nature-powered cities.
 - **Smart Monitoring:** Sensors and AI track and optimize the use of nature-based systems, improving energy efficiency, reducing waste, and protecting biodiversity.



Key Research Projects on Urban NBS

CIVITAS: Focuses on smart, sustainable transport solutions and green infrastructure in cities.

LIFE-IP UrbanGreening: Enhances urban resilience through NBS for climate adaptation and flood management.

Green4CITIES: Supports the implementation of green urban solutions to improve biodiversity, health, and sustainability.

Smart Cities and Communities (Horizon 2020): Funds projects that integrate **smart mobility**, **energy management**, and **green infrastructure**.



Smart Cities & NBS

How Nature Inspires Smart Cities

- **Data-Driven Nature Integration:** Combining smart technologies (e.g., sensors, IoT) with NBS for efficient urban management and environmental monitoring.
- **Example: Copenhagen's Green Roof Initiative**—uses smart monitoring tools to optimize the performance of green roofs, improving energy efficiency and stormwater management.
- **Climate Resilience:** Cities use nature-based solutions to adapt to climate change, reducing flooding, heat islands, and improving air quality.

Challenges for Cities

Challenges in Scaling NBS and Smart Technologies

1. **Space Constraints:** Cities may have limited room for green infrastructure in densely built environments.
2. **Cost of Implementation:** Initial investment for **green infrastructure** and **smart technologies** can be high, though long-term benefits outweigh the costs.
3. **Regulatory and Policy Barriers:** Zoning laws and regulations may hinder the integration of NBS into urban design.

In-Class Exercise 1:

TAKE FIVE

- **Objective:** Students work in groups to design a sustainable, smart city using nature-inspired technologies.
- **Guiding Questions:**
 - How can **green infrastructure** and **smart tech** be combined to improve air quality and reduce energy consumption?
 - How will **community engagement** play a role in maintaining these solutions?
 - What NBS can be integrated to address climate resilience and biodiversity?

Case Example 1

Conexus: Nature-Inspired Urban Design

Objective: Integrate **ecological design principles** into urban planning, incorporating green spaces and biodiversity into the city fabric.

Example: Barcelona's **NaturaCity** strategy aims to create a **green network** that connects green spaces, supports biodiversity, and improves air quality.

Technology Integration: Using **smart grids** and **sensors** to monitor ecosystem health and optimize green space management.



Case Example 2

CIVITAS: Smart Mobility and Green Infrastructure

Objective: Promote green urban mobility solutions and improve the efficiency of transportation systems through smart technologies.

Example: **CIVITAS** projects in cities like **Munich** and **Vienna** combine smart mobility solutions (electric vehicles, bike-sharing) with NBS like green urban corridors and tree-lined streets to promote sustainable urban living.

Impact: Reducing air pollution, improving mobility, and increasing green spaces for residents.



Case Example 3

LIFE Urban Green: Resilient Cities through Green Solutions

Objective: Enhance urban resilience to climate change by restoring and maintaining green spaces, and implementing NBS for flood and heat mitigation.

Examples: Implementing **green corridors**, **urban wetlands**, and **blue-green infrastructure** to increase resilience to flooding and heatwaves.

Results: Improved air quality, better flood control, and more accessible green spaces in cities like **Rimini, Italy** and **Krakow, Poland**.



BENEFITS

Advantages of Integrating NBS in Smart Cities

1. **Environmental Sustainability:** Improved air quality, reduced urban heat, enhanced water management, and biodiversity conservation.
2. **Economic Benefits:** Long-term cost savings through energy efficiency, flood prevention, and sustainable infrastructure.
3. **Social Well-Being:** Healthier, more resilient communities with accessible green spaces, increased physical activity, and improved mental health.

CHALLENGES

Limitations of NBS in Smart Cities

1. **Management Complexity:** Integrating nature-based and smart technologies requires continuous monitoring, maintenance, and adaptation to local contexts.
2. **Public Perception:** Scepticism regarding the long-term benefits of **NBS**; concerns over potential maintenance costs and aesthetic preferences.
3. **Funding Constraints:** Initial investments for green infrastructure and smart technology may be a challenge, especially in cities with budget constraints.

Overcoming Barriers

Public-Private Partnerships: Engaging businesses, governments, and local communities to share the costs and benefits of implementing NBS and smart technologies.

Policy Support: Governments should create supportive policies and funding mechanisms to incentivize NBS adoption.

Education and Awareness: Raising awareness of the **economic, environmental, and social benefits** of NBS can overcome public scepticism.

In-Class Exercise 2:

Discussing Public Perceptions and Management

- **Objective:** Discuss how public perception of **nature-based solutions** influences their acceptance and implementation in cities.
- **Guiding Questions:**
 - How can cities manage public scepticism about **smart technologies** and **green infrastructure**?
 - What strategies can be used to **increase public engagement** in NBS projects?
 - How do **cost concerns** and **maintenance** play into the public's perception of these projects?

TAKE FIVE

Conclusion

The Future of Smart, Sustainable Cities

- The future of cities will see increasing integration of **nature-based solutions** and **smart technologies** to address pressing urban challenges.
- With EU research projects like **NaturaCity**, **CIVITAS**, and **LIFE UrbanGreen**, cities are moving toward more sustainable, resilient, and nature-inspired solutions for better urban living.
- These integrated approaches will redefine urban environments, making them greener, smarter, and more sustainable.



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