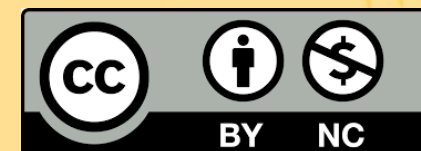


Nature-Based Solutions (NBS) Review

Lecture (online)

Trinity College Dublin

Content created in 2025



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

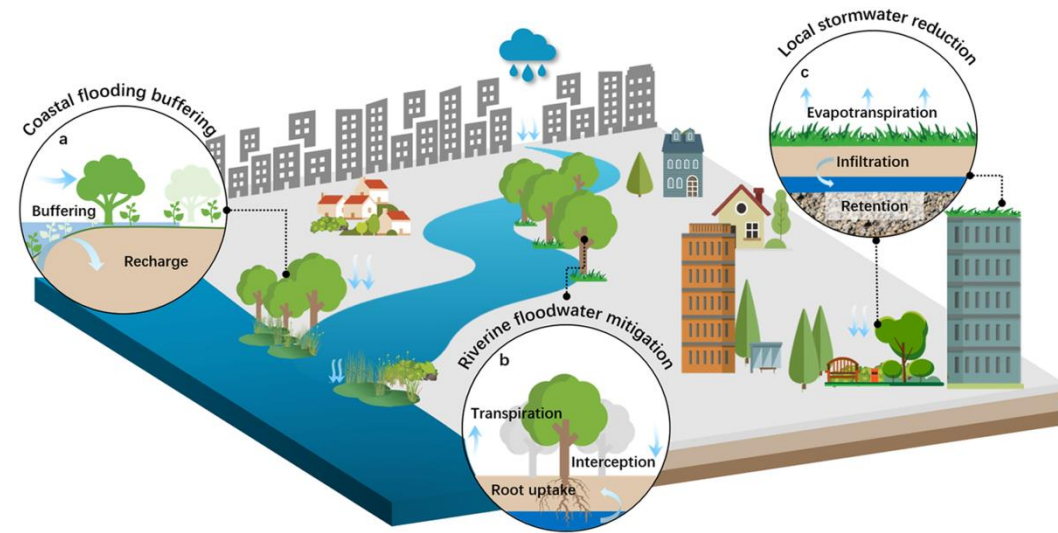
Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.

NBS Definition – EU

Reference: [European Commission](#)

NBS as Tools for Climate Action

- **The Role of NBS in Climate Action**
- NBS help sequester **carbon** through **forestation** and **wetland restoration**.
- Urban green spaces reduce **urban heat islands** and improve **air quality**.
- NBS like **green roofs** and **green corridors** provide **flood management** and **climate adaptation**.



(Zhou et al., 2024)

NBS and the SDGs



■ How NBS Contribute to Global Goals

- NBS align with **SDG 11** (Sustainable Cities) and **SDG 13** (Climate Action), focusing on **urban resilience** and **climate change mitigation**.
- They support **SDG 6** (Clean Water and Sanitation) by improving water management and reducing stormwater runoff.
- NBS contribute to **SDG 15** (Life on Land) by enhancing **biodiversity** and promoting **ecosystem restoration**.

Nature's Benefit



- **The Value of Ecosystem Services in NBS**
 - NBS deliver **ecosystem services** such as **carbon sequestration, water filtration, and flood regulation.**
 - **Green infrastructure** solutions provide **climate resilience** by restoring ecosystem functions.
 - NBS enhance **biodiversity**, leading to healthier ecosystems that can better adapt to climate stress.

Conservation Strategies



- **NBS for Protecting and Restoring Biodiversity**
- NBS contribute to **biodiversity conservation** by restoring **wetlands, forests, and coastal ecosystems**.
- Strategies like **rewilding** and creating **wildlife corridors** help restore native species and habitats.
- By promoting **ecosystem services**, NBS maintain ecological balance and support the natural habitat restoration process.

Enhancing Cities

- **The Role of Green Spaces in Urban Areas**
- **Green infrastructure** like **urban parks**, **green roofs**, and **vegetated swales** provide urban cooling and reduce the heat island effect.
- Green spaces increase **public health**, offering places for recreation and improving **mental well-being**.
- Urban greening initiatives reduce **flooding risks** by improving **stormwater management** and increasing water retention.



Healing Landscapes

- **Restoration Approaches through NBS**
- **Restoration ecology** focuses on repairing ecosystems that have been degraded or damaged, often using NBS like **wetland restoration** and **agroforestry**.
- **Reforestation** helps restore biodiversity, sequester carbon, and enhance **soil fertility**.
- NBS projects like **forest restoration** and **river rehabilitation** provide long-term ecological benefits for both communities and the environment.



In-Class Exercise 1:

TAKE FIVE

Objective: Design a futuristic **nature-based solution** incorporating emerging technology.

Instructions:

- Choose an urban challenge (e.g., flooding, urban heat islands).
- Propose an innovative NBS solution that uses new technologies like AI, IoT sensors, or smart infrastructure.
- Identify community engagement strategies and the expected impacts.

Upscaling NbS – How can it be done?

“Instead of piloting and implementing site specific projects, this approach involves thinking about how you might work within the system to operate at a higher and more leveraged scale. For example, instead of doing wetland restoration yourself, you might work to implement a national policy that will incentivise key landowners to restore wetlands in watersheds that they manage. Or you could develop a market-based strategy and partner with major seafood companies to implement sustainable seafood production.

Activities needed to go to scale under this approach include developing higher level strategies as well as raising the necessary resources and building the program team needed to implement these strategies.” ([Salafsky et al., 2021](#))



Image credits: Sundry Photography/Shutterstock.com, StaticFlickr, CSF Cornell, Adam Gibbon

■ Evaluating and Measuring NBS Impact

- Tools like **GIS**, **remote sensing**, and **data analytics** help assess the effectiveness of NBS in urban environments.
- Real-time monitoring tools, such as **IoT sensors**, provide insights into the performance of green infrastructure.
- The **Ecosystem Services Toolkit** and **NBS Impact Assessment** frameworks help cities quantify the social, environmental, and economic benefits of NBS.

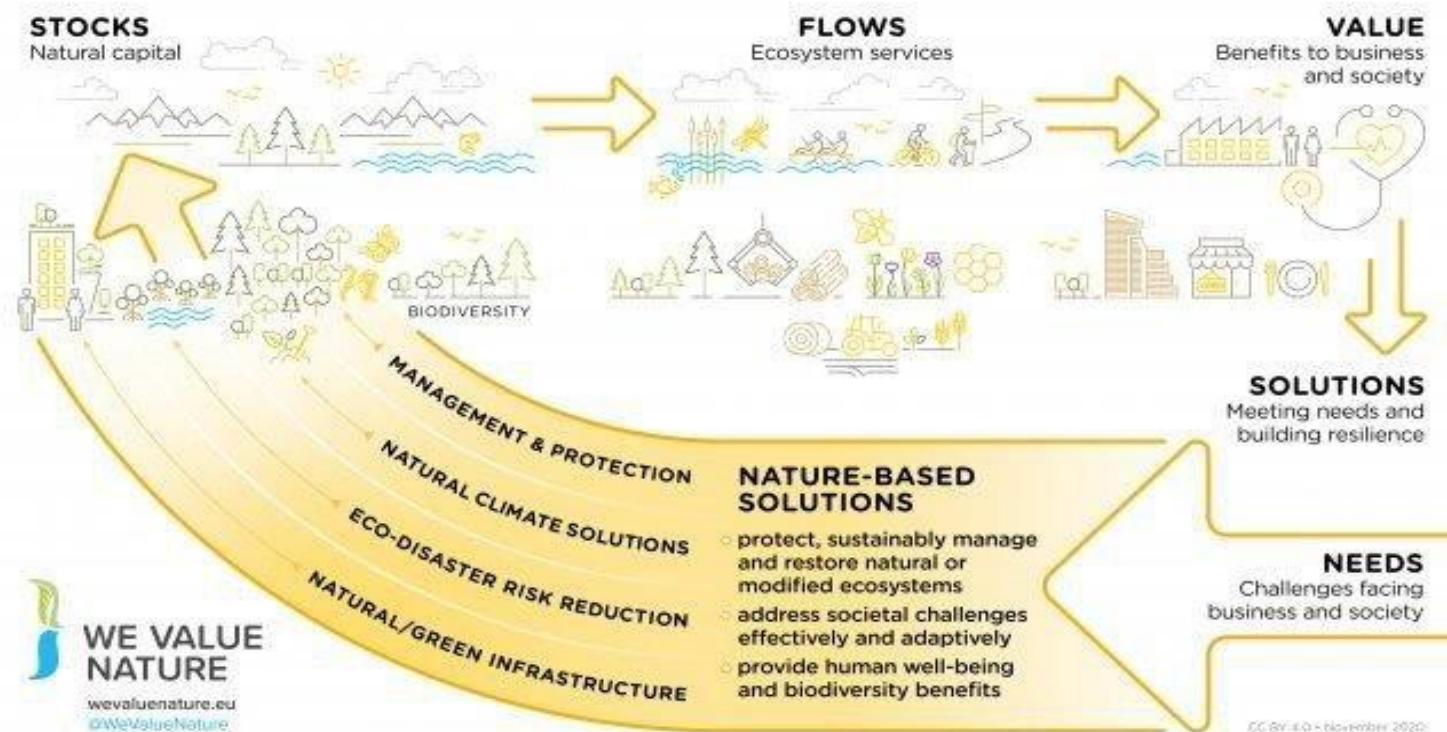




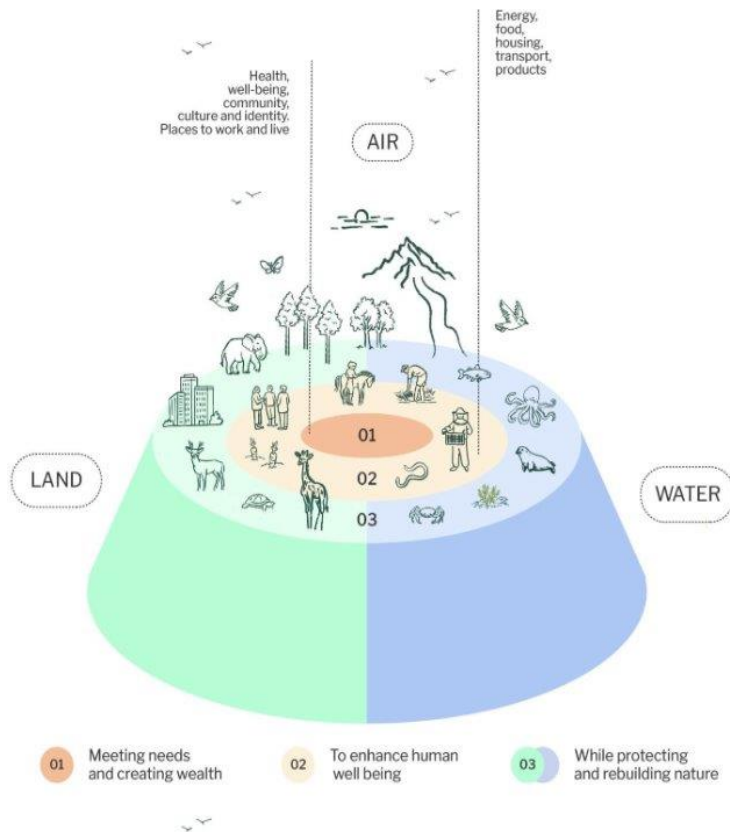
2. Tools for Scaling NBS

FUNDING

Nature-based Solutions and Natural Capital



Benefits



Economic Transformation

- Everyone and everything in society depends on nature: all humans and all businesses need a healthy planet to survive and prosper.
- 55% of global GDP is moderately or highly dependent on nature (PwC 2023). Construction, agriculture, and food and beverages are the largest highly nature-dependent industries. China, the EU and the US have the highest absolute economic value in nature-dependent industries (WEF 2020)
- Transforming our businesses and economic systems towards a Nature-Positive Economy that works with, and for, nature will help to reverse these negative trends. A whole-of-society approach is needed.

■ Incorporating Communities in NBS Design

- **Community involvement** is critical for the success of NBS, especially in **co-designing** solutions that meet local needs.
- Engaging **citizens** in planning and **maintaining** urban green spaces ensures **long-term success** and **stewardship**.
- Successful community engagement boosts **social cohesion**, fosters **ownership**, and empowers local populations to contribute to **sustainability** efforts.



3. Tools for Scaling NBS

COMMUNITY COLLABORATION

■ EU Policies Driving NBS Adoption

- The **EU Green Deal** promotes the integration of **green infrastructure** and **nature-based solutions** into urban planning for climate resilience.
- **Biodiversity Strategy for 2030** encourages the use of NBS for ecosystem restoration and the preservation of **natural habitats**.
- Local and national **governments** are encouraged to adopt policies that support **climate adaptation** and the scaling of NBS in urban spaces.



4. Tools for Scaling NBS

Key challenges within NBS governance

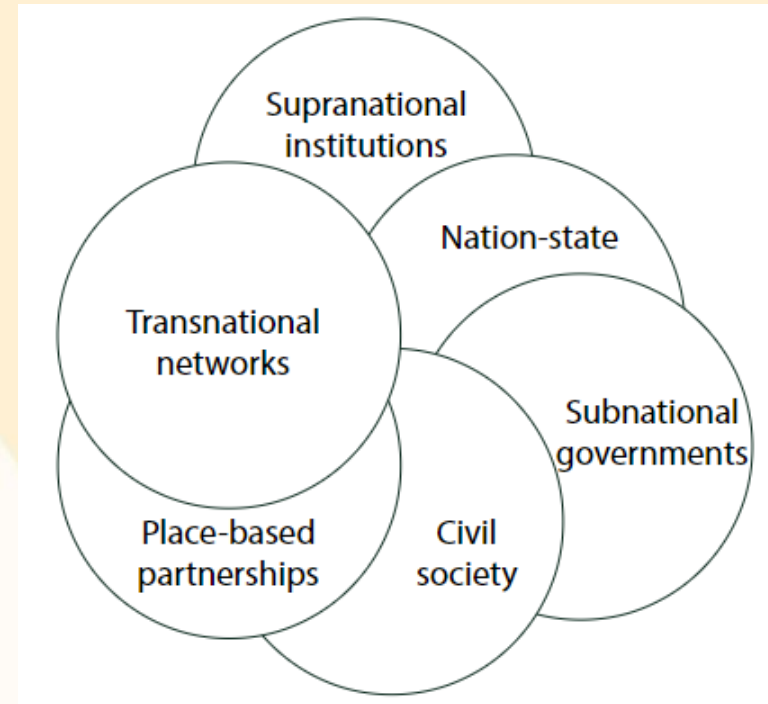
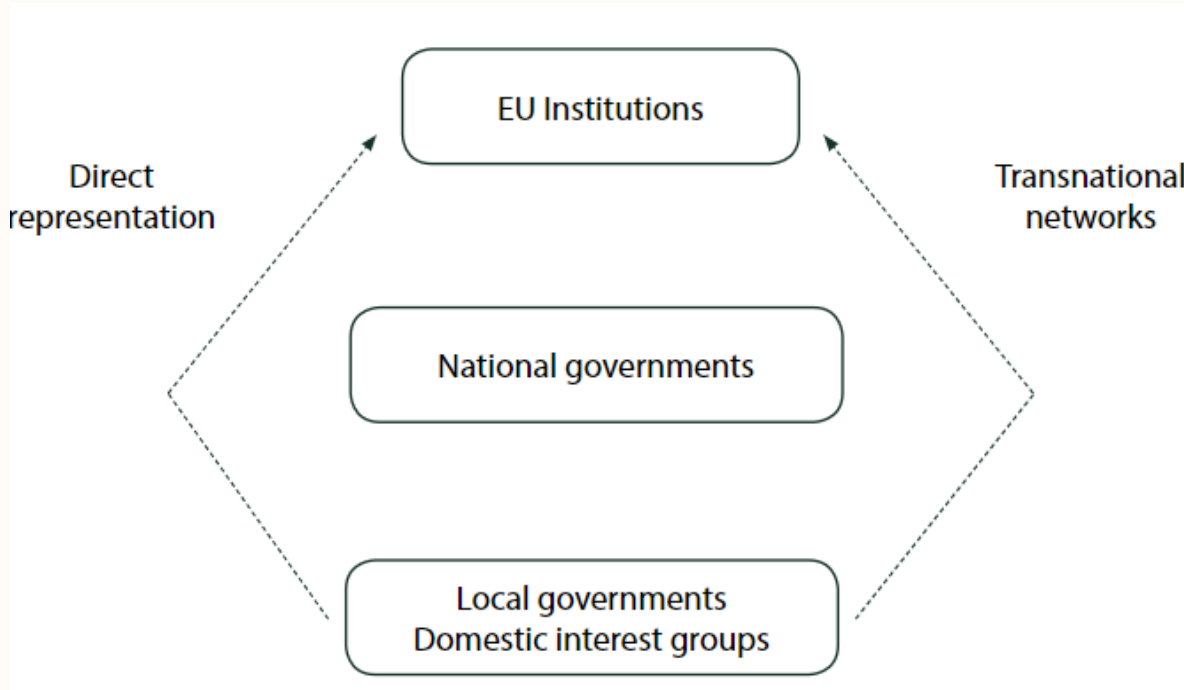
1. Vertical and horizontal dispersion

- Eco-system services beneficiaries and providers are dispersed vertically and at multiple governance levels and across sectors
- There are certain institutional cultural characteristics and logistics that can act as barriers to smooth collaboration and communication
- The governance framework must accommodate participatory, adaptive, and transparent processes to address power imbalances and ensure legitimacy.

2. Diverse actors and values

- Governance efforts often face challenges in aligning policy instruments across different scales and sectors. Policies that work well for one group (e.g., local communities) may conflict with those designed for others (e.g., national economic goals).
- Need to balance the interests of stakeholders with differing values, from local communities to global beneficiaries.
- Differing cultural and ideological perceptions of nature (e.g., intrinsic versus utilitarian values) add complexity to governance negotiations.

Multi Level Governance: nested versus polycentric



Source: Bulkeley, Harriet, Davies, Anna, Evans, Bob, Gibbs, David, Kern Kristine and Kate Theobald (24 June 2010) Environmental Governance and Transnational Municipal Networks in Europe, *Journal of Environmental Policy & Planning*, 5:3, 235-254, DOI: 10.1080/1523908032000154179

■ How to Measure NBS Effectiveness

- **Key metrics** include environmental benefits (e.g., **carbon sequestration, biodiversity improvement**) and **social outcomes** (e.g., **public health and community engagement**).
- **IoT** and **data analytics** tools help monitor the performance of NBS in real-time, optimizing their impact.
- Measuring **cost-benefit analysis** and long-term **sustainability** ensures successful scaling of NBS projects.



5. Tools for Scaling NBS

Benefits

NBS for Rewilding and Ecological Restoration

- **Rewilding** is a key strategy for restoring ecosystems by reintroducing native species and rebuilding **natural processes**.
- NBS like **wildlife corridors**, **wetland restoration**, and **forest expansion** help enhance biodiversity and ecosystem services.
- **Rewilding efforts** contribute to **carbon sequestration**, **biodiversity preservation**, and **climate resilience**.



Benefits

Health Benefits of NBS

- NBS improve **mental health** by providing accessible, natural spaces for recreation, social interaction, and stress reduction.
- Urban green spaces contribute to **physical well-being** by encouraging outdoor activities like walking, cycling, and sports.
- NBS reduce **air pollution** and mitigate **heat island effects**, leading to healthier, more sustainable urban environments.



Benefits

Urban Transformation Through NBS

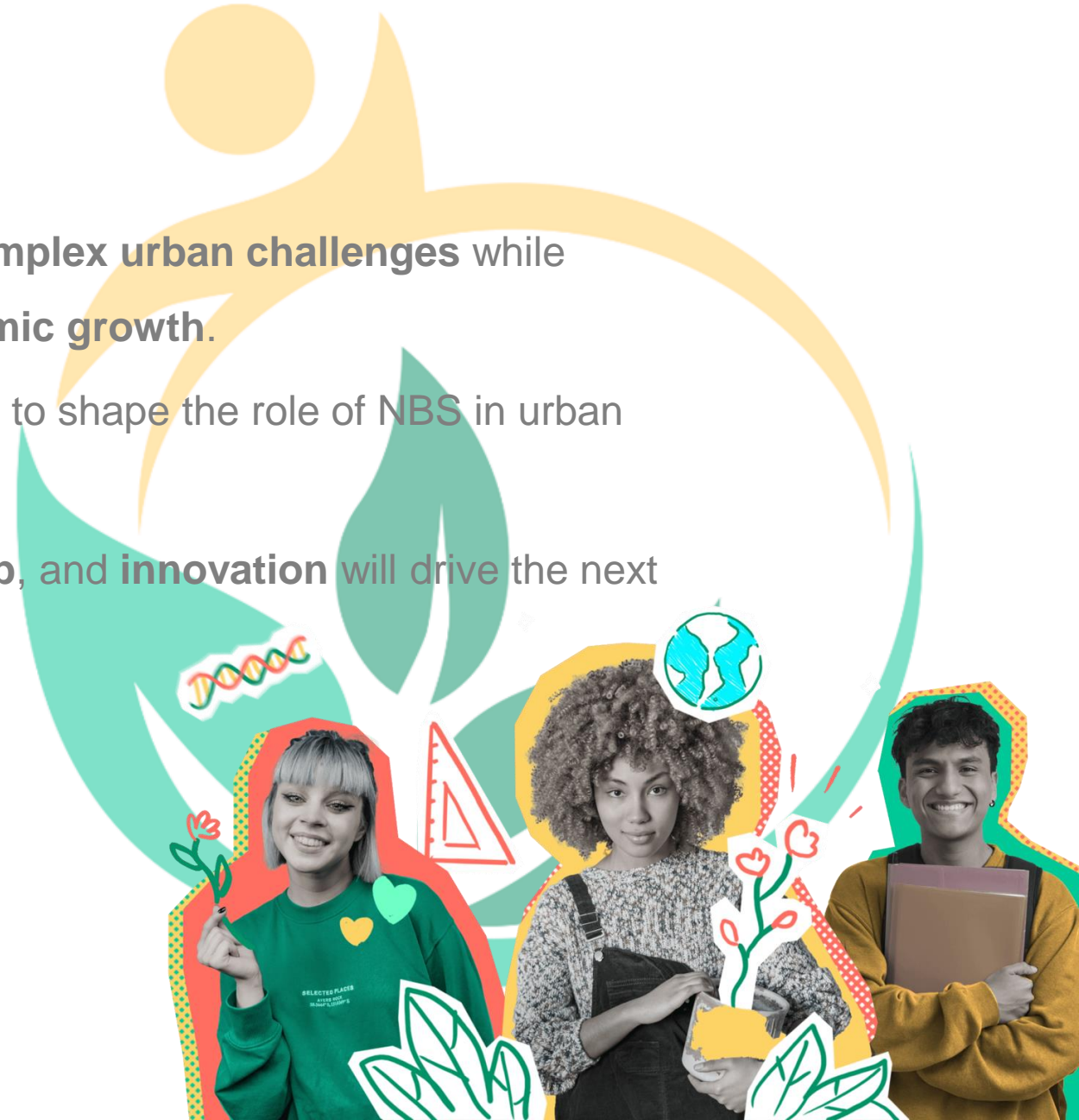
- NBS contribute to making cities **sustainable** and **climate-resilient** by integrating **green infrastructure** into city planning.
- **Smart cities** use data-driven solutions to optimize **green spaces**, **energy use**, and **water management** through technology and NBS.
- **NBS integration** transforms urban spaces into more **livable**, **inclusive**, and **environmentally responsible** areas.



Conclusion

NBS as a Solution for Sustainable Urban Futures

- The future of NBS lies in their ability to address **complex urban challenges** while contributing to **climate action, health, and economic growth**.
- **EU research and policy frameworks** will continue to shape the role of NBS in urban environments.
- The growth of **green industries, entrepreneurship, and innovation** will drive the next wave of **NBS adoption** globally.





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