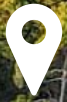
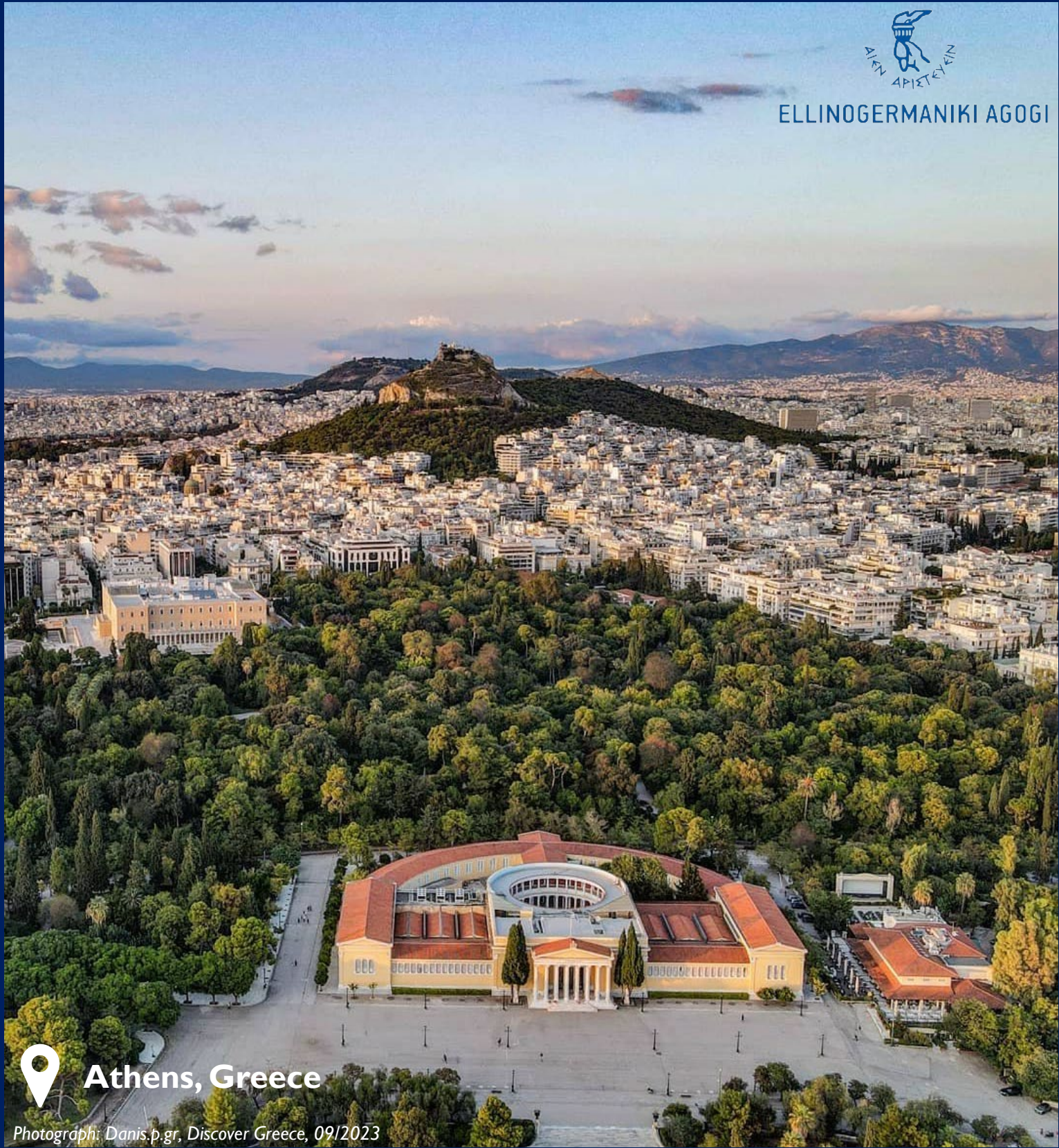




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Athens, Greece

Photograph: Danis.p.gr, Discover Greece, 09/2023

Integrating Nature-Based Solutions (NBS) for climate action



**NBS
EduWORLD**



Funded by
the European Union

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Welcome, young innovators!

Get ready for an exciting challenge that will put your problem-solving and critical-thinking skills to the test!

In this project, you'll dive into the world of Nature-Based Solutions (NBS) to transform the vibrant city of your choice into a resilient and sustainable hub. Armed with NBS cards showcasing various challenges and solutions, your mission is to strategically select and integrate these solutions into the city's urban landscape.

You won't be alone in this endeavor. Your task involves choosing NBS experts, researchers and professionals, as external societal actors with specialized knowledge, to aid in the implementation of these solutions. These experts will act as invaluable guides, offering their expertise and insights into the feasibility, effectiveness, and potential challenges associated with each NBS strategy. However, remember, your budget constraints extend to these experts as well. Selecting the right team of experts while staying within financial limits will be a crucial part of your mission.

You'll need to think critically, consider the city's unique needs, and potential and balance your choices wisely to maximize impact while staying within budget constraints.

Are you ready to tackle this real-world challenge and pioneer a greener, more sustainable, resilient and accessible future for your city?

Let the journey begin!



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Nature – Based Solutions



Forested green areas

Installation cost (EUR/m²)

1.32

Maintenance cost (EUR/m²)

2.49

Average Annual Cost by 2030 (EUR/m²)

0.47

**Effectiveness against
Flood Risk: 1.9**

**Heat Island Effect
Reduction: 3**

**Environmental
Co-Benefits: 2.3**



Urban parks, forests and other green spaces in cities.

They constitute green corridors that provide many benefits to mitigate the climatic risks. The most effective concepts involve the planting of trees and a large surface.



Rain Gardens

Installation cost (EUR/m²)
1.08

Maintenance cost (EUR/m²)
0.3

Average Annual Cost by 2030 (EUR/m²)
0.43

**Effectiveness against
Flood Risk: 1.6**

**Heat Island Effect
Reduction: 1.5**

**Environmental
Co-Benefits: 1.7**



Small gardens used for storage and infiltration. Typically, they are implemented at the level of a single property, near buildings to collect water infiltrating from the roofs. They are formed by strips of filtering meadow, small stagnation basins, areas of constructed wetlands, sand beds, vegetation. In the case of intense events, it can be connected to a Sustainable Drainage System (SuDS).



Urban Gardens

Installation cost (EUR/m²)
3.85

Maintenance cost (EUR/m²)
3.85

Average Annual Cost by 2030 (EUR/m²)
4.3

**Effectiveness against
Flood Risk: 1.2**

**Heat Island Effect
Reduction: 2**

**Environmental
Co-Benefits: 1.6**



Urban and community gardens are used for agriculture and urban gardening with a positive contribution to adaptation to climate change. These green areas can be further adapted for climate impacts by introducing vegetation and crops.



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Green Roofs

Installation cost (EUR/m²)
77.5

Maintenance cost (EUR/m²)
55

Average Annual Cost by 2030 (EUR/m²)
64.09

**Effectiveness against
Flood Risk: I**

**Heat Island Effect
Reduction: 1.5**

**Environmental
Co-Benefits: I**



Intensive: Also called roof gardens or terraces, they are composed of lush vegetation and are based on a relatively deep and nutrient-rich substrate.

Extensive: Characterized by little growing medium deep and self-sufficient and low planting maintenance covering the entire roof.



Green Facades

Installation cost (EUR/m²)

100

Maintenance cost (EUR/m²)

3.5

Average Annual Cost by 2030 (EUR/m²)

15.22

**Effectiveness against
Flood Risk: 0.1**

**Heat Island Effect
Reduction: 1**

**Environmental
Co-Benefits: 0.7**



Traditional: Woody climbing or herbaceous plants at the base of a wall.

“Double skin”: Support structures engineered for the creeper vegetation and an insulating air layer between the foliage and the wall of the building.

Green walls: More complex than green facades, they are based on a supporting structure, such as panels or planters, on which vegetation grows.



Roadside trees / Green Paths

Installation cost (EUR/m²)
33.7

Maintenance cost (EUR/m²)
34.22

Average Annual Cost by 2030 (EUR/m²)
10.5

**Effectiveness against
Flood Risk: 1.6**

**Heat Island Effect
Reduction: 3**

**Environmental
Co-Benefits: 2.2**



Planting greenery next to infrastructure, including high-rise infrastructure capabilities such as highways and railways.



Green Rails

Installation cost (EUR/m²)
210

Maintenance cost (EUR/m²)
2.4

Average Annual Cost by 2030 (EUR/m²)
27.05

**Effectiveness against
Flood Risk: 1**

**Heat Island Effect
Reduction: 2**

**Environmental
Co-Benefits: 1**



Simple! Grassing of tram traffic areas.



Green Urban Furniture

Installation cost (EUR/m²)
80

Maintenance cost (EUR/m²)
NA

Average Annual Cost by 2030 (EUR/m²)
9.38

**Effectiveness against
Flood Risk: 1**

**Heat Island Effect
Reduction: 2**

**Environmental
Co-Benefits: 1**



**Outdoor furniture made of natural materials,
such as bus shelters, benches, etc.**



Permeable Surfaces

Installation cost (EUR/m²)

65

Maintenance cost (EUR/m²)

10

Average Annual Cost by 2030 (EUR/m²)

3.62

**Effectiveness against
Flood Risk: 0.7**

**Heat Island Effect
Reduction: 0**

**Environmental
Co-Benefits: 0.7**



Permeable surfaces allow rainwater to through the surface into the underlying layers. They are placed at the beginning of a train of Sustainable Drainage System (SuDS), unless it is in an area with permeable subsoil.



Rainwater Harvesting

Installation cost (EUR/m²)
32.

Maintenance cost (EUR/m²)
0.63

Average Annual Cost by 2030 (EUR/m²)
4.44

**Effectiveness against
Flood Risk: 0.1**

**Heat Island Effect
Reduction: 0**

**Environmental
Co-Benefits: 0.5**



Collecting and storing rainwater for later use. It is collected from roofs but can also be retained by all other impermeable surfaces, such as industrial buildings or car parks. It is stored in individual barrels, in underground cisterns or large storage tanks. It can be placed at the head of a Sustainable Drainage System (SuDS) train or deliver water for irrigation or other purposes.



Infiltration Basins

Installation cost (EUR/m²)
26.25

Maintenance cost (EUR/m²)
2.83

Average Annual Cost by 2030 (EUR/m²)
5.9

**Effectiveness against
Flood Risk: 1.6**

**Heat Island Effect
Reduction: 1.5**

**Environmental
Co-Benefits: 2**



Infiltration basins are vegetated depressions designed to retain runoff from waterproof surfaces, allow sediment and pollutants to settle, and allow the water to infiltrate the underlying soils. Infiltration basins are dry, except in periods of heavy rain. They provide storage and control of the outflow as part of a Sustainable Drainage System (SuDS).



Infiltration Trenches

Installation cost (EUR/m²)
80

Maintenance cost (EUR/m²)
2.12

Average Annual Cost by 2030 (EUR/m²)
11.5

**Effectiveness against
Flood Risk: 1**

**Heat Island Effect
Reduction: 0**

**Environmental
Co-Benefits: 1.2**



Shallow excavations filled with debris or stones allowing water to infiltrate from adjacent impermeable surfaces. They reduce runoff through infiltration and contribute to the recharge of the aquifer. They purify the runoff through filtration in strata and soil. They work best as part of a Sustainable Drainage System (SuDS).



Retention Ponds

Installation cost (EUR/m²)
14

Maintenance cost (EUR/m²)
3

Average Annual Cost by 2030 (EUR/m²)
3.64

**Effectiveness against
Flood Risk: 1.6**

**Heat Island Effect
Reduction: 1.5**

**Environmental
Co-Benefits: 2.1**



Ponds designed with additional storage capacity to provide washout mitigation during rain events and slowly release the runoff. They consist of a permanent pond area with natural banks.



Restoration of rivers for the control of infiltrations

Installation cost (EUR/m²)
3.8

Maintenance cost (EUR/m²)
1.7

Average Annual Cost by 2030 (EUR/m²)
2.16

**Effectiveness against
Flood Risk: 1.2**

**Heat Island Effect
Reduction: 0**

**Environmental
Co-Benefits: 1.6**



Measures to restore the natural state and function of rivers: renaturalization of the riverbed; renaturalization of the riverbed material; removal of embankments protection.



Creation of floodplains and riparian forests

Installation cost (EUR/m²)
0.75

Maintenance cost (EUR/m²)
0.05

Average Annual Cost by 2030 (EUR/m²)
0.14

**Effectiveness against
Flood Risk: 2.8**

**Heat Island Effect
Reduction: 2**

**Environmental
Co-Benefits: 2.3**



**Restoring/creating connections and transitioning
between terrestrial and aquatic ecosystems, including
lowlands alluvial and adjacent terraces.**



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Proposed activities for action



An outdoor activity

Identify areas to integrate Nature-Based Solutions (NBS) projects.

Track NBS projects implemented in different parts of the city/town.





A survey

You can conduct a survey to assess the awareness and attitudes of your school or local community towards Nature-Based Solutions (NBS).





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A community meeting

Present your Nature-Based Solutions school project findings, share insights, and engage community members to collectively brainstorm.





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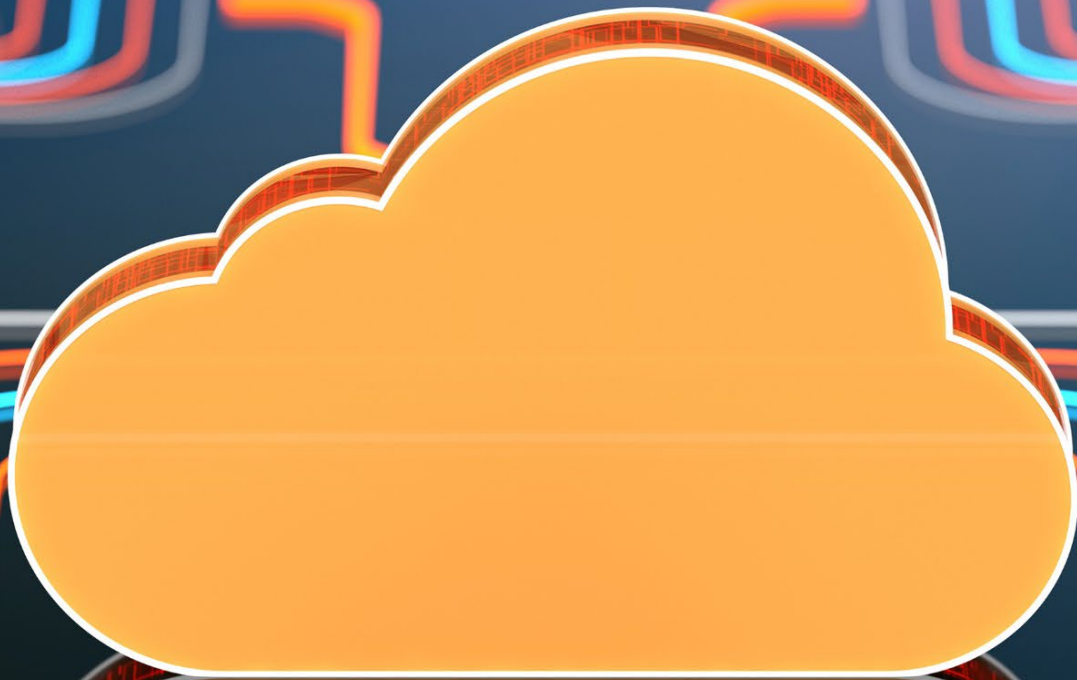
A poster campaign

Design eye-catching posters highlighting the importance of Nature-Based Solutions (NBS), showcasing NBS projects, and advocating for NBS practices



A website

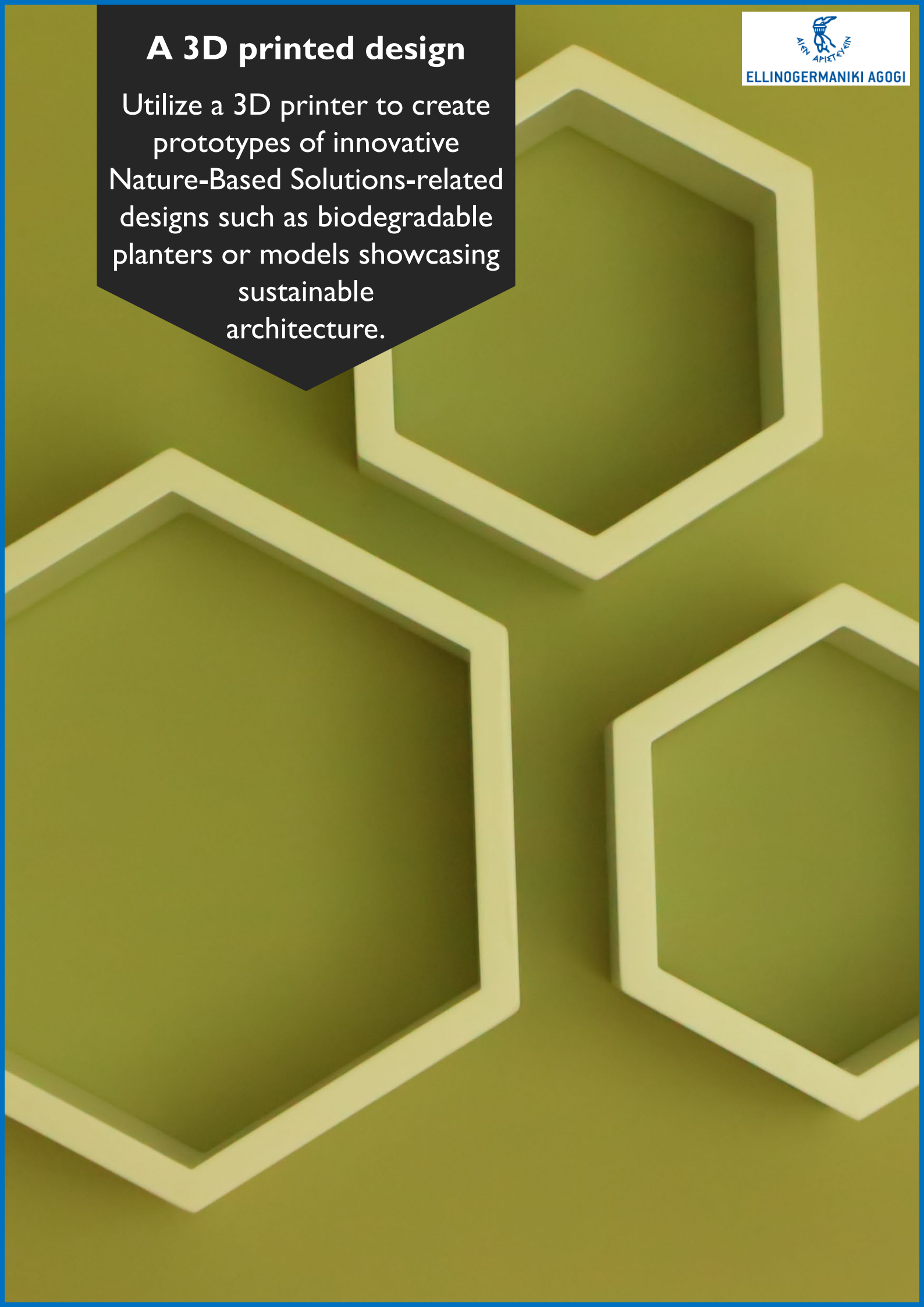
Create a website featuring informative content about Nature-Based Solutions (NBS), success stories, practical tips for sustainable living, and interactive elements to engage the audience.





A 3D printed design

Utilize a 3D printer to create prototypes of innovative Nature-Based Solutions-related designs such as biodegradable planters or models showcasing sustainable architecture.





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A hands-on prototype

Create a rain garden, a vertical wall, plant native species, or construct compost bins within the school premises.



An interview

Conduct interviews with Nature-Based Solutions (NBS) experts, community leaders, or individuals involved in NBS initiatives. You can write a report on your findings.



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Collect data

Collect data related to biodiversity, such as species diversity and abundance, soil health indicators like pH levels, and environmental factors like temperature in a chosen area.

1 756.2 ▲

1 747.5 ▲

300 756 ▲

2,000 756 ▲

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100 135 ▲

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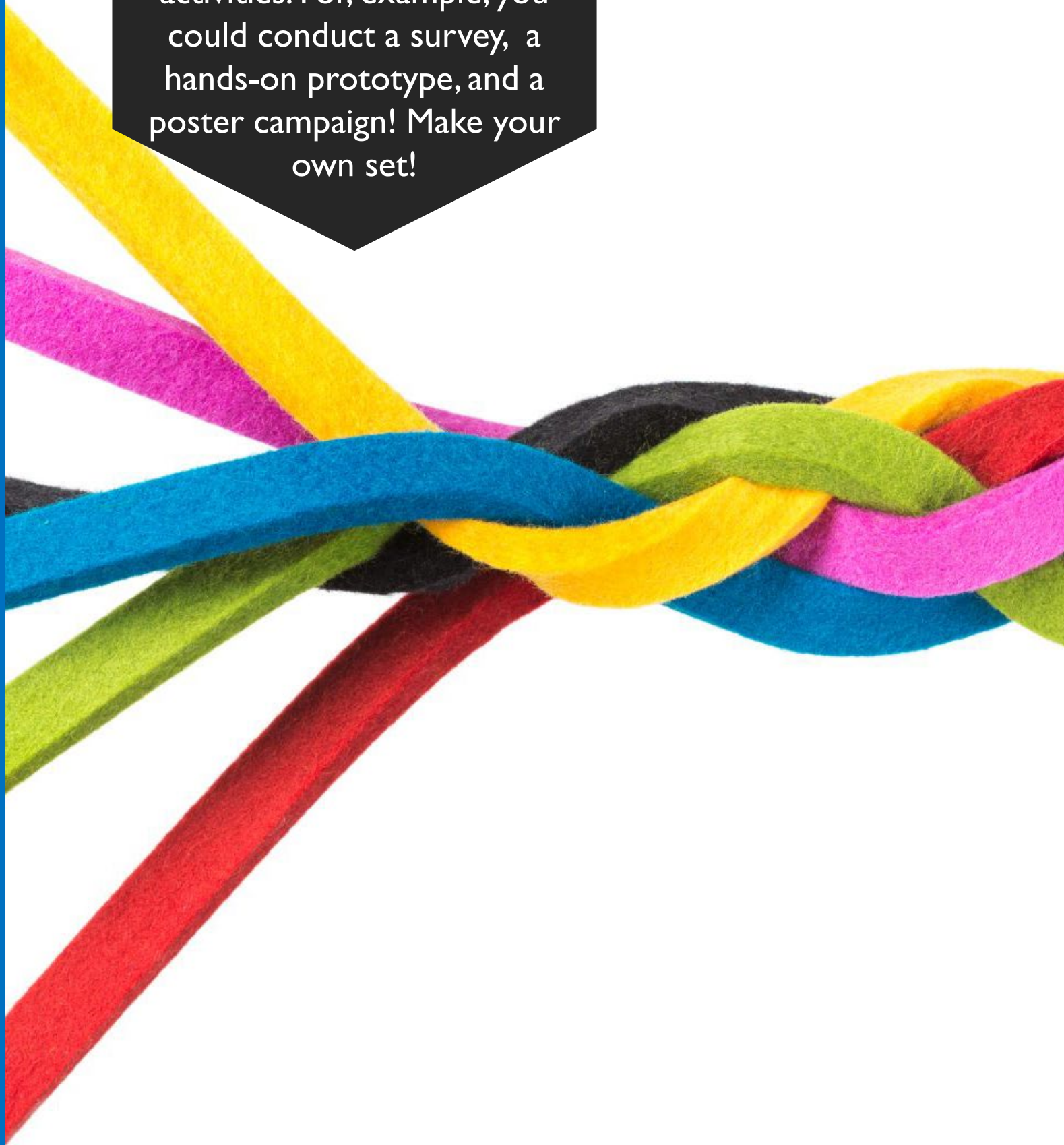
20 ▲

32 ▲



A set of challenge ideas

A set of challenging ideas could be a set of prototyping activities. For, example, you could conduct a survey, a hands-on prototype, and a poster campaign! Make your own set!





Potential Societal Actors

A farmer

Farmers can help with Nature-Based Solutions and soil health, biodiversity, and the significance of diverse plant and animal species in maintaining a balanced ecosystem, Water Conservation and water-saving methods such as drip irrigation, rainwater harvesting, Natural Pest Control, and Climate Change and the impact on crops.

A soil expert

Soil experts can help with Nature-Based Solutions and Urban Soil Management and improvement of soil quality, Soil Conservation and Restoration, Microorganisms and Soil Life and Soil Composition and Health.

An urban planner / designer

Urban planners can help with Nature-Based Solutions and green infrastructure through the integration of natural elements like parks, green roofs, and permeable surfaces, urban design including pedestrian-friendly spaces, bike lanes, and green corridors, community engagement, and how to involve citizens in NBS projects.

An architect / landscape architect

Architects and landscape designers can help with Nature-Based Solutions and how to incorporate natural elements into building designs, like daylight, natural ventilation, and green spaces or improve indoor air quality. They can also help with eco-friendly building materials and energy-efficient technologies. They can also highlight the significance of designing structures that adapt to climate change.

A civil engineer

Civil engineers can help with Nature-Based Solutions and how to incorporate natural features like bioswales, permeable pavements, and green roofs into urban development to manage stormwater or reduce flooding. They could also explain techniques for restoring natural habitats, such as wetlands and river restoration, to enhance biodiversity, mitigate erosion, and provide ecosystem services.



An ecologist

An ecologist can help with Nature-Based Solutions and the interactions between living organisms and their environment. They can also explain how NBS can restore ecosystems, preserve biodiversity, and enhance natural resilience. Explaining how NBS approaches, such as reforestation, carbon sequestration, and natural land management, contribute to mitigating climate change impacts.



A local artist

An artist can help with Nature-Based Solutions and how to use art to depict environmental issues and solutions creatively, raising awareness and inspiring action towards NBS and sustainability. An artist could also encourage collaborative art projects focused on nature, like mural painting, sculpture installations, or community gardens, fostering a deeper connection and appreciation for NBS.



A nutritionist

A nutritionist can help with Nature-Based Solutions and the benefits of locally sourced, organic foods and the impact of NBS practices like regenerative agriculture on nutrition, health, and the environment. They can also help exploring the connection between diverse diets, including plant-based diets and consuming a variety of fruits and vegetables, with NBS principles that promote biodiversity



A private company / Industry

A private can help on demonstrating real-world examples of company Nature-Based Solutions implementation within their operations, showcasing sustainable practices like reducing carbon emissions, responsible resource management, or eco-friendly production methods. They can also collaborate with you to offer mentorship, or workshops, providing hands-on experiences.



NGO for environmental protection

An NGO can help on organizing educational field trips to natural habitats, conducting workshops, and hands-on activities to demonstrate NBS principles. They can also engage you in advocacy campaigns, raising awareness about environmental issues, and empowering them to take action for NBS through initiatives like tree planting drives or wetland restoration.



A community house

A community house can help with Nature-Based Solutions and how to organize workshops on gardening, composting, or nature conservation using NBS techniques that can be implemented at home or in the community. They can also support partnering with students on local environmental projects like tree planting drives, park clean-ups, or urban greening initiatives.



The municipality

A municipality can help with Nature-Based Solutions and how to initiate or allocate funding for hands-on NBS projects such as community gardens, tree planting programs, or water conservation initiatives. A municipality can also engage you in discussions on local environmental policies, for fostering awareness of how municipal decisions impact NBS implementation.

Students' family

Since your family members could be part of any potential societal actor, they can provide support and guidance on technical issues regarding Nature-Based Solutions, they can help you identify societal actors, or even they can inspire you through brainstorming discussions.

Our family is always the first source for collecting information and communicating our ideas!

Local newspaper / radio station

A local newspaper or radio station can help with publishing articles, our posters or hosting segments focused on Nature-Based Solutions initiatives, highlighting local success stories, or providing information on NBS challenges. They can also help you conduct interviews with NBS experts, environmentalists, or community leaders engaged in NBS projects.

Science Centers

The science centre's personnel or even the administrative staff could support you in developing Nature-Based Solutions prototype ideas. The researchers may guide you on different NBS ideas or reach potential stakeholders. In addition, the administrative staff (i.e. gardeners, building managers) could guide you on the applicability of your ideas.



LIVE

Social Media Expert

A social media expert can help create engaging content for social media campaigns, posts, or videos that showcase Nature-Based Solutions practices. They can also help you organize interactive online sessions or podcasts on social media platforms, inviting experts to discuss different NBS topics. A social media expert may also show you how to facilitate online communities for sharing ideas.

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