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Opportunities for integration of Decentralized Nature-Based Solutions into Urban Infrastructure

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Outline

1. What do we understand from «Decentralized Nature-Based Solutions» (DBNS)?

2. What are the advangates and disadvantages related to DBNS?

3. What are the oppportunities for integration of DBNS into urban infrastructure?

4. Conclusion

1. What do we understand from «**Decentralized Nature-Based Solutions**» **(DBNS)?**

Nature-based solutions (NBS) are defined as concepts that bring nature into cities and those that are derived from nature. NBS address societal challenges and enable resource recovery, climate mitigation and adaptation challenges, human well-being, ecosystem restoration and/or improved biodiversity status, within the urban ecosystems. As such, within this definition we achieve resource recovery using organisms (e.g. microbes, algae, plants, insects, and worms) as the principal agents (Langergraber, 2020).

NBS can protect, manage and restore natural or modified ecosystems. They are a multidisciplinary, integrated approach to address societal challenges and some natural hazards effectively and adaptively, simultaneously providing human well-being and biodiversity benefits. NBS applications can be easily noticed in circular cities, establishing an urban system that is regenerative and accessible (Oral et al., 2020).

- embrace nature conservation norms (and principles);
- can be implemented alone or in an integrated manner with other solutions to societal challenges (e.g. technological and engineering solutions);
- are determined by site-specific natural and cultural contexts that include traditional, local and scientific knowledge;
- produce societal benefits in a fair and equitable way, in a manner that promotes transparency and broad participation;
- maintain biological and cultural diversity and the ability of ecosystems to evolve over time;
- are applied at a landscape scale;
- recognize and address the trade-offs between the production of a few immediate economic benefits for development, and future options for the production of the full range of ecosystems services;
- are an integral part of the overall design of policies, and measures or actions, to address a specific challenge.

(IUCN, 2020)


NATURE-BASED SOLUTIONS
Restoration
Issue-specific
Infrastructure
Management
Protection
Ecosystem-based approaches
Societal challenges
Human well-being
Biodiversity benefits
©IUCN

(IUCN, 2020)

2. What are the advantages and disadvantages related to DBNS?

Advantages : - sustainable urbanisation

- restorate of degraded ecosystems

- adaptation and mitigation of climate change

- risk management and resilience

(Somakis, et al. 2019)

Disadvantages: - requires specific knowledge and experience

- geographical barriers

- no unique solutions that can be applied in all landscapes

- financial shortages

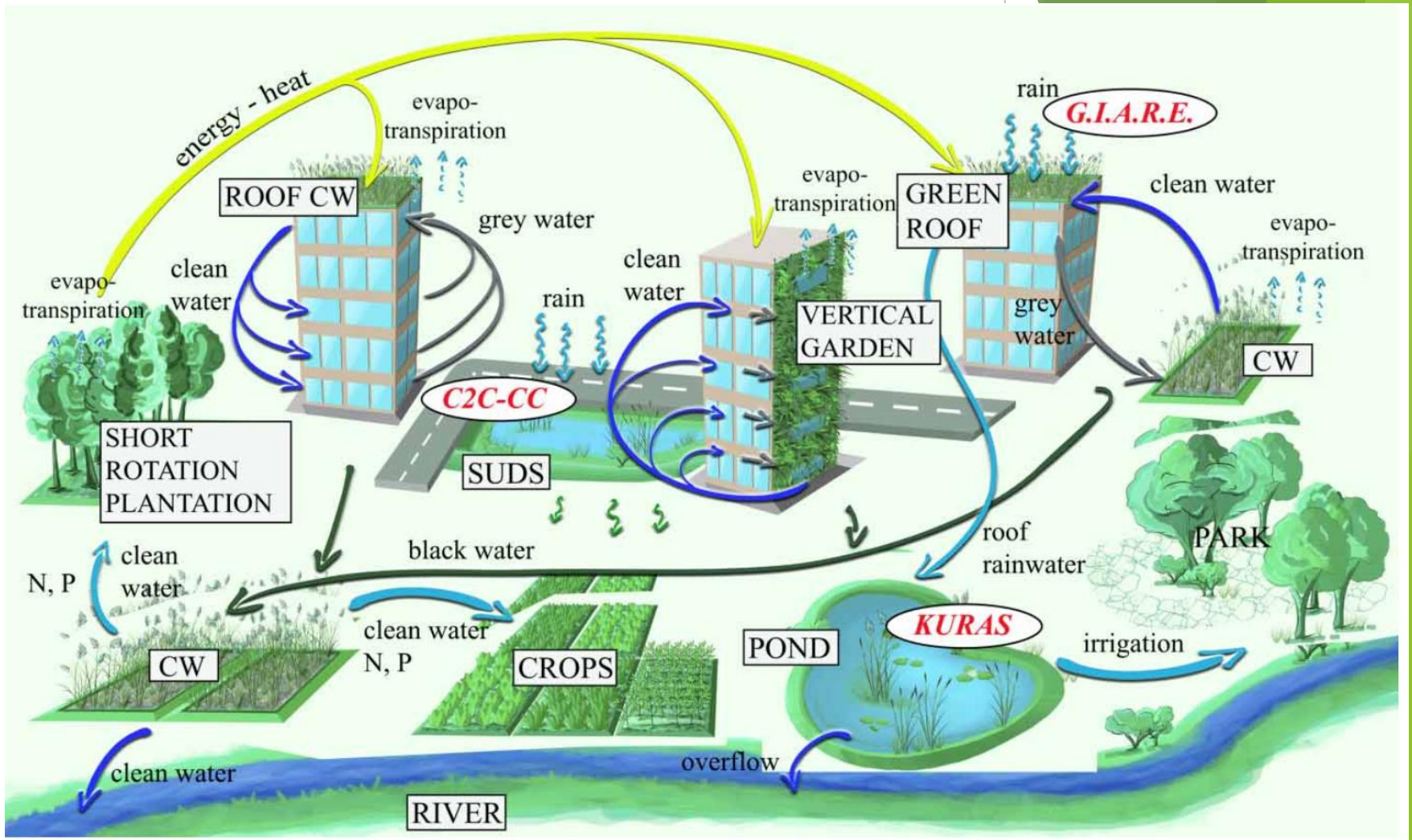
3. What are the oppportunities for integration of DBNS into urban infrastructure?

Related to water management

G.I.A.R.E: Italian Project

KURAS: German Project

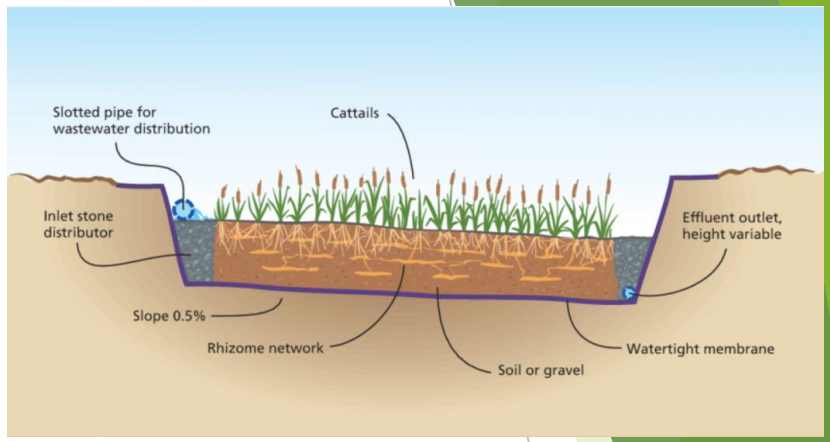
C2C-CC: Danish Project



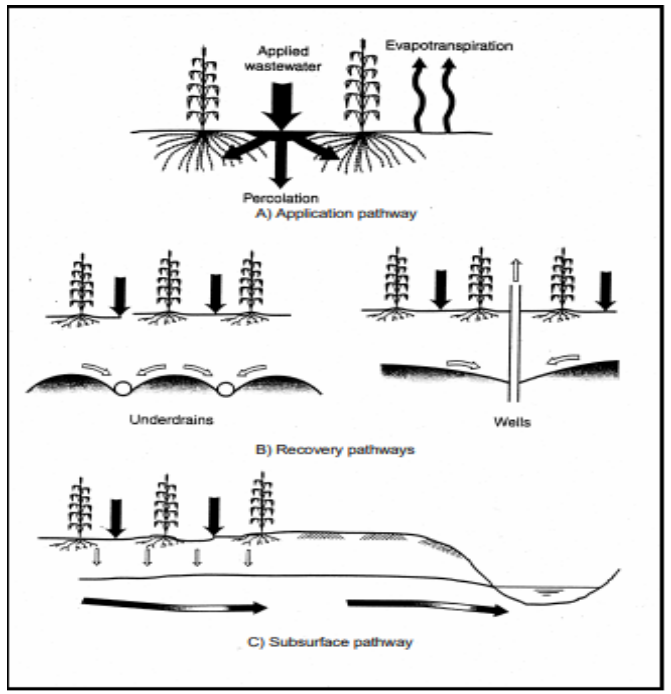
Extracted from Oral et al., (2020) – Original Source: Masi et al. (2018)

DBNS can contribute to urban landscape via ;

- Natural and constucted wetlands
- Riparian buffer strips
- Urban green spaces and green buildings
- Reforestation activities (UN WATER, 2018)
- Slow Rate Treatment Systems (EPA, 2002)

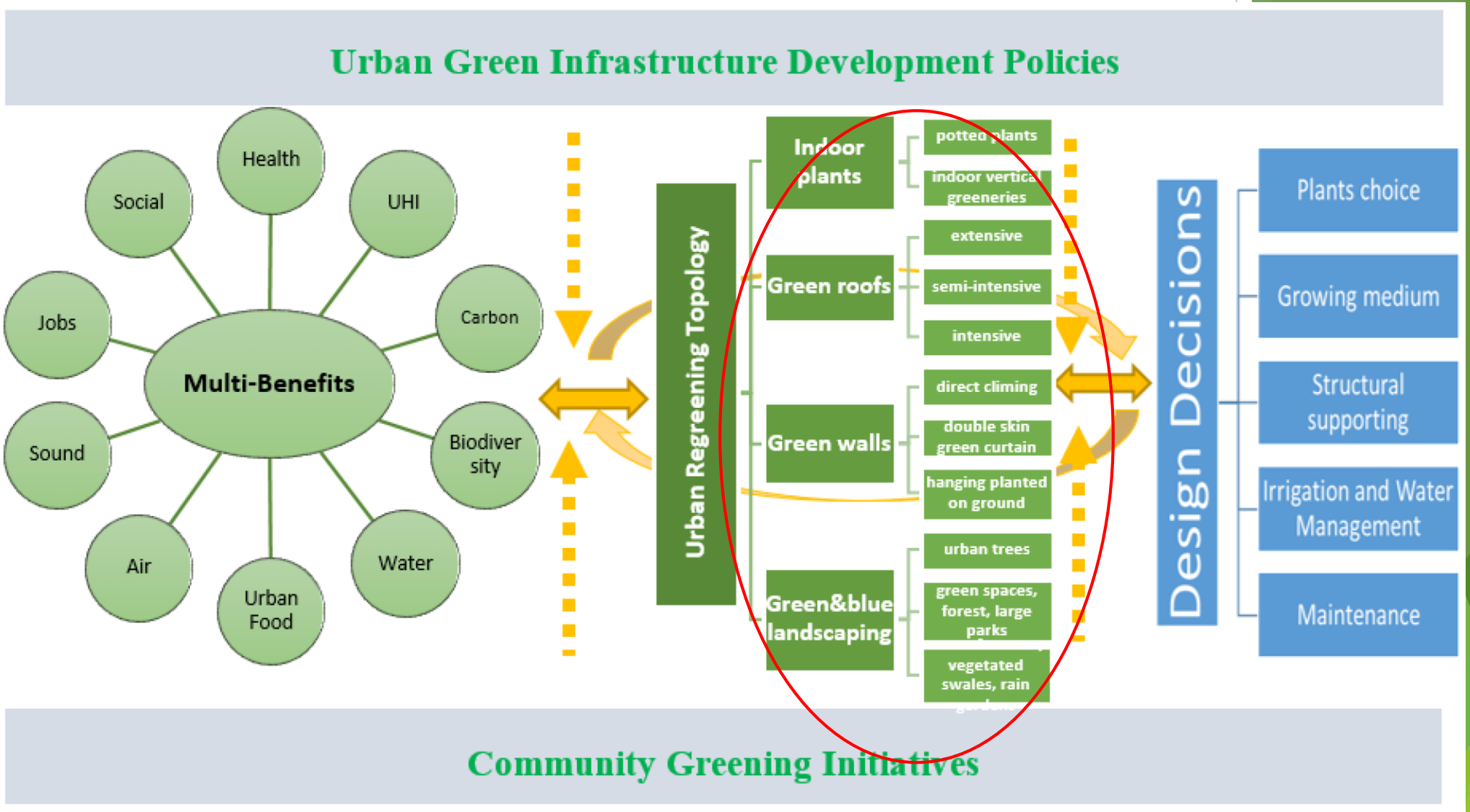


(Grismer and Shepherd,2011)



(UN WATER, 2018)

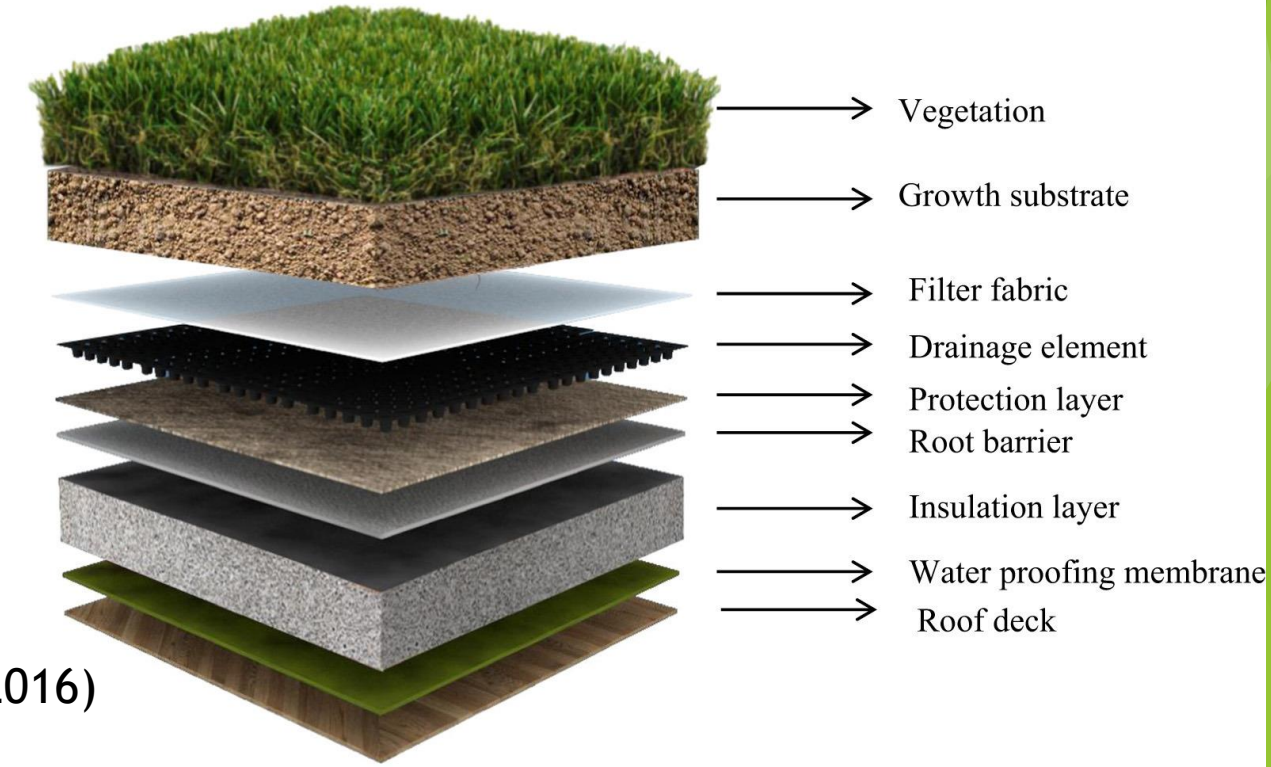
Related to urban infrastructure



(Xing, et al. 2017)

Green Roofs:

A green roof (also known as an eco-roof, planted roof, nature roof, living roof or roof greening system) is a living, vegetative system that contains a substrate (growing media) and a vegetation layer at its outermost surface. The design and construction between the roof structure and the growing media varies, but typically includes a geo-textile filter, drainage layer, root barrier and a waterproof membrane. Depending upon the vegetation layer, the growing media depth can vary from 20mm (for extensive systems utilising sedum mats) to 1500mm (for intensive systems containing large shrubs and trees) (Önder, 2014).



(Vijayaraghavan, 2016)

1.**Ecological Benefits**
Stormwater Management
Moderation of Urban Heat Island Effect
Improved Air Quality
Increased Biodiversity
Noise Reduction
Reduction of Electromagnetic Radiation
Waste Diversion

2.**Economical Benefits**
Energy Efficiency Increases
Water Retention
Increased Roofing Membrane Durability
Fire Retardation
Urban Agriculture
Local Job Creation Marketing

3.**Other Public Benefits**
Aesthetic Improvement
New Amenity Spaces
Improved Health
Well-Being Educational Opportunities

(Önder, 2014)

Green Walls:

Green wall is the common term to refer to all forms of vegetated wall surfaces. Traditional green wall methods are historically known, since the Hanging Gardens of Babylon and the Roman and Greek Empires. In Mediterranean climates, vines were commonly used to cover pergolas, shading the building envelope, or on building walls, cooling the envelope during summer (Manso, Castro and Gomez, 2015).

Green wall systems can be used as a passive design solution contributing to buildings sustainability performance . Vegetation has the potential to improve the microclimate both in winter, functioning as a complementary insulation layer, and in summer providing shade and an evaporative cooling effect . Vegetation absorbs large amounts of solar radiation while the effect of evapotranspiration of plants can further reduce the impact of solar radiation, showing increased humidity levels and surface temperatures lower than hard surfaces (Manso, Castro - Gomez, 2015).

(architecturalrecord.com, 2020)

4. Conclusion

- DBNS are important tool for adaptation and mitigation of climate change
- They help to build resilient societies.
- Allow to establish environmental policy and planning

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Thank You

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Short Biography

Hasan Volkan Oral *is a full-time researcher at the Department of Civil Engineering (English), Faculty of Engineering, İstanbul Aydın University. He holds his and MSc and Ph.D. degrees from the Institute of Environmental Sciences, Bogazici University of Istanbul, Turkey. The title of his Ph.D. dissertation was "Impacts of land-use change on soil respiration and elemental carbon in the forests of Karasu district". After obtaining a Ph.D. from Bogazici University, he conducted his postdoctoral studies at the Ben Gurion University of Negev, İsrael in the fields of Agricultural and Environmental Sciences. Currently, he is working on environmental sustainability, nature-based solutions, and circularity applications in environmental sciences & engineering.He is also* representing Turkey as the management committee member and Working Group Leader statuses in some COST Actions.