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Workshop No. 3

Nature-Based Solutions for a Circular Economy Transformation in the GCC Countries

1. Directors

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2. Abstract

The global society has seen unprecedented economic growth that limited global poverty. However, it is widely agreed that the economic model adopted created the existential crisis of climate change. We realize today that the linear economic model cannot sustain our life standards indefinitely. A new circular approach is suggested to adjust our priorities and re-orient infrastructure investments. In this context, we look at nature to get inspired and identify solutions that can increase the resiliency of our societies, protect and restore the ecosystems, and maintain the necessary economic growth without further undermining the planet's boundaries. Nature-based solutions (NBS) serve this ambitious and multi-factorial purpose due to their inherent ability not only to tackle climate change but also to provide a series of ecosystems services and social benefits. This workshop focuses on the potential to integrate NBS into the circular economy paradigm in the Gulf Cooperation Council (GCC) countries. Our goal is to discuss the potential of NBS to stimulate a circular model of economic growth in the region, their contribution to new circular strategies for climate change adaptation given climatic extremities the GCC countries face, the multiple benefits of these concepts, and the key actions needed to increase the awareness and attract more investments on nature-based approaches in the near future. Considering the growing environmental challenges in the region, this workshop will further explore how such sustainable approaches can enhance resource efficiency, reduce waste, and promote/restore the ecological balance. The GCC nations are uniquely positioned to lead in the adoption of innovative environmental solutions, and this workshop aims to discuss best practices, case studies, and potential applications.

3. Context

The GCC region is among the driest areas and the most water-stressed regions worldwide. The average annual temperatures reach 25°C and exceed 30°C in summer, with the annual precipitation being below 250 mm, and in many desert areas, being even lower than 50 mm. Most of the GCC countries suffer from absolute water scarcity, i.e., their annual water supply from natural freshwater sources is below 500 m³ per person to cover the domestic, agricultural and industrial demands. However, water demand in the region is increasing due to population growth, urbanization and industrialization, and a growing agricultural sector, since many countries are implementing long-term programs to diversify their economy and reduce their dependence on oil exports. In addition, climate change is adding more pressure on this situation. At the same time, waste management practices in the region remain largely unsustainable and waste production is still high. Waste generation and management are key contributors to an economy's overall carbon footprint, an aspect that GCC countries are increasingly seeking to reduce to mitigate climate change.

Under this frame, nature-based solutions (NBS) appear as appropriate technological solutions that can address main issues in the various economic and resources sectors (water, energy, food, waste) in this region. NBS provide a series of ecosystem services through a strategically planned network of high-quality green spaces that can further boost resilience. Many studies indicate that NBS can limit climate change impacts on human society and the environment and support the wider vision of circular economy for increased resilience and effectively addressing the challenges posed by climate change. NBS can also act as complementary interventions to the decarbonization of sectors' operations by neutralizing emissions that businesses and enterprises cannot eliminate due to technological barriers.

The adoption of NBS and the principles of the circular economy can play a crucial role in mitigating these challenges. These approaches emphasize the use of natural processes and the reuse-recycling of resources to create a more sustainable and resilient environmental management framework. The concept of NBS can not only effectively address the climate change challenges but also increase the resilience of the ecosystems via circular economy strategies, i.e., reuse, reduce, recycle, remanufacture, and repurpose towards closing the loop of materials and energy flows and eliminating waste generation. NBS can work in a densely populated city where green areas can be built and/or created on top of the existing or new grey infrastructure, e.g., a park on top of a parking garage, or an urban garden on top of a school. Such benefits are particular important for the urban environment in GCC countries that face high temperatures and water scarcity under the hot and arid climate of the region. Research studies have already demonstrated, for example, that the adoption of NBS strategies in Saudi cities could bring down the average temperature by almost 5°C. NBS for water treatment combined with the reuse of treated wastewater is also another practice that can reduce the pressure on the limited water resources, while adding a sustainable parameter in the local/regional water balance.

Considering the above, the workshop aims at bringing together researchers, professionals, policymakers, and practitioners to discuss the opportunities and barriers to the wider and upscaled adoption of NBS in the GCC region. By leveraging the unique environmental conditions of the region, the goal is to identify strategies that can reduce reliance on finite resources while promoting ecological restoration and sustainability.

4. Workshop Focus/Objectives

- Promote Nature-Based Solutions (NBS):

Explore how nature-based systems, such as constructed wetlands, green roofs, vertical gardens, aquaponics, hydroponics, rainwater harvesting, bioretention cells etc., can enhance the sustainability and environmental protection in GCC countries while dealing with water scarcity and contributing to sustainable waste management in an ecological and cost-effective way.

- Encourage Circular Economy Practices:

Examine the principles of the circular economy, focusing on reducing waste, restoring the local/regional water cycle, recovering nutrients, producing food and biomass, reusing materials and water, remanufacturing and recycling materials and fostering resource efficiency in various sectors, particularly water and energy and the built environment.

- Case Studies and Regional Applications:

Present and discuss case studies from within but also outside the GCC region that demonstrate the successful integration of NBS concepts in the sustainable environmental management that integrates the circular approach at various scales.

- Collaboration and Policy Development:

Encourage collaboration between government entities, private sector, and researchers to develop policies and initiatives that promote the adoption of nature-based and circular economy practices.

5. Papers Focus/Topics

The topics we would like to cover include

- nature-based solutions and green-blue infrastructure for sustainable water management such as constructed wetlands for wastewater and sludge treatment and reuse, green roofs, green walls, rain gardens, green facades, vertical gardens, bioretention systems, microalgae culture, rainwater harvesting, urban forests, swales, soakways, green/blue corridors, drain ways, participatory watershed management, coastal mangrove restoration, phytoremediation, etc.),
- water-energy-food nexus in circular economy, urban agriculture and horticulture, ecosystem restoration, regenerative agriculture, biorefineries, aquaculture and aquaponics
- circular bioeconomy, biomaterials, biochars, compost, bioenergy, biomass to fuel,
- regenerative urbanism urban heat island mitigation strategies, improving mental health and well-being in urban areas, eco-villages,
- environmental impact & life cycle assessment, social life cycle and impact assessment,
- stakeholders' engagement and citizen participation

6. Paper Structure, Referencing, and Format

Authors should refer to the [GRM Paper Guidelines](#).

7. Publication Plans

We plan a special issue in a journal (Circular Economy and Sustainability and Blue-Green Infrastructure), a joint journal publication on the workshop topic and a book volume in the springer series 'Circular Economy and Sustainability.'

Papers that cannot fit in with the joint publication will be considered for publication individually in a journal or as a GRC paper, under the guidance of the workshop directors.

8. References

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9. Directors' Bio Notes

Prof. Alexandros Stefanakis is an academic in Greece with long professional experience in the field. He has worked in the GCC as a practising engineer in the past and also taught at a local University in Oman. He is the President of the International Ecological Engineering Society, and Regional Coordinator of Africa and Middle East for the ‘Wetlands for Water Pollution Control’ Group of the International Water Association. He is also European Climate Pact Ambassador appointed by the European Commission. He has designed, managed, and nature-based solutions and constructed wetlands across Europe, Middle East, Africa, USA and South America for wastewater treatment and reuse integrated with waste management practices.

Dr. Tahra AlRashdi is a researcher and lecturer at a GCC University who recently was also awarded her PhD. She has worked on nature-based solutions as well focusing on circular sludge management and carried out research in this field. She is Lecturer at the University of Technology and Applied Science (UTAS) in Muscat, Oman.