Climate change solutions inspired by nature

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A promising strategy to strengthen climate resilience is through NBSs (nature-based solutions). Inspired by nature, NBSs tackle challenges caused by climate change while also providing environmental, social and economic benefits through the protection, sustainable management and restoration of ecosystems.

Driven by the belief that NBSs can replace conventional concrete-based engineering solutions to mitigate climate-related hazards now and in the future, OPERANDUM has developed tools to demonstrate this. At the heart of the project lie its open-air laboratories (OALs) that it has set up for local stakeholders to co-design and implement NBSs for specific hazards in rural and natural regions. Ten OALs have been established overall in Australia, Austria, China, Finland, Germany, Greece, Ireland, Italy and the United Kingdom to address hazards such as river flooding, coastal erosion, landslides and droughts.

OAL-Italy: A successful example

One example of a successfully implemented NBS, in Italy's OAL, "is a dense vegetation cover using a mixture of twelve deep rooting perennial herbaceous species on an earth embankment of the Parano River," reports an article posted on the website of OPERANDUM project coordinator University of Bologna, Italy. "The site is in a populated area with industrial and agricultural activities and is threatened by a high risk of flooding associated with soil erosion on the riverbank. The NBS was co-designed with local stakeholders to prevent riverbank failure induced by erosive processes and soil instability … and therefore mitigate flood risk. Laboratory experiments in a recirculating, tilting hydraulic flume demonstrated the efficacy of the plants to hamper the erosive process. The NBS was then implemented in the site where soil conditions are continuously monitored by a series of sensors that measure soil water content, matric suction and pore water pressure. Hydrological and hydraulic modeling have quantified the efficacy of the NBS to mitigate flood risk in present and future climate."

OPERANDUM-supported researchers also explored the potential of a green roof NBS as a way to mitigate urban flooding. Using a simulation study, they investigated the effectiveness of different types of vegetation used on green roofs to reduce run-off, and then validated their findings

on a real-world green roof in Dublin, Ireland. The research results were published in the journal *Sustainability*.

An NBS platform for all

Another key project outcome is the Geospatial Information Knowledge Platform (GeoIKP), an open online platform on NBSs officially launched in February 2022. The GeoIKP offers user-customized content and interfaces for scientists looking for NBS-related research data, citizens interested in grassroots solutions to specific hazards, policymakers looking for related legislation, and companies in search of business partners, clients or funding opportunities.

Crowdsourcing is a core element of the GeoIKP. Through crowdsourcing, over 500 NBS case studies have been collected from all over the world, in addition to about 2,400 data sets on NBSs.

Besides professional users, the OPERANDUM (OPEn-air laboRAtories for Nature baseD solUtions to Manage hydro-meteo risks) project's GeoIKP also caters to novice users with no experience in NBSs. For example, in its newly launched Citizen Stories, it offers vulnerable, affected or concerned citizens the opportunity to share their personal experiences of NBSs applied in their areas, inspiring others to also take action.

More information: Arunima Sarkar Basu et al, Theoretical Framework to Assess Green Roof Performance in Mitigating Urban Flooding as a Potential Nature-Based Solution, *Sustainability* (2021). DOI: 10.3390/su132313231

OPERANDUM project website: www.operandum-project.eu/

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