

ROUNDTABLE:

INTEGRATING GREEN AND GREY INFRASTRUCTURE FOR WATER SECURITY AND CLIMATE RESILIENCE

Innovative approaches combining traditional grey, and natural green infrastructure are needed to meet growing challenges of climate change and water security. Natural infrastructure, such as wetlands, forests, and even soil, can help to maintain and protect water resources from floods and droughts, and provide solutions to challenges across the water sector. This session explores nature-based solutions, frameworks from which to evaluate them, and how to create conditions and incentives for implementation.

Ms. Kathia Havens, Program Analyst, World Bank, Austria introduced the session's speakers, Mr. Klaas de Groot, Senior Water Resources Management Specialist at the World Bank, Ms. Irene Lucius, Regional Conservation Director Central and Eastern Europe at the World Wildlife Fund, and Dr. Günter Langergraber, Head of Department, University of Natural Resources and Applied Life Sciences, Vienna (BOKU).

Green and Grey, a new generation of infrastructure to tackle the challenges of water security and climate resilience

Mr. Klaas de Groot walked the audience through the “why”, “what” and “How” of the World Bank's engagement in the implementation of nature-based solutions and green infrastructure to create a new generation of Infrastructure capable of tackling the challenges of water security and climate resilience.

For the Bank, this topic is quite hot: Only recently, various World Bank documents on the use of nature-based solutions and their benefits have been published, among them the flagship report “The Economic Case for Nature” stating that over half of the world's GDP is generated by industries that depend on ecosystems services. The report also shows that a collapse of these ecosystem services will lose the global economy an estimated 2,7 Trillion USD by 2030. The World Bank has also published the report “An Epic Response”, providing a framework for innovative governance in flood and drought risk management and also covering the specific needs for implementation of natural based solutions. Already in 2019, the Bank's report on “Integrating Green and Grey: Creating Next Generation Infrastructure” indicated that as a result of climate change, economic and demographic development, by 2050 nearly 20 percent of the world's population will be at risk of floods and the majority will live in water-scarce areas. Traditional grey infrastructure alone may no longer provide the necessary solutions, and the

potential of natural systems and green interventions to protect, sustainably manage, and restore natural or modified ecosystems comes into focus.

Green Infrastructure strategically preserves, enhances or restores elements of a natural system such as forest, agricultural land, flood plains or mangroves to produce more resilient and lower-cost services. Mr. de Groot remarks that while historically, the World Bank's focus was on either infrastructure building or environmental projects, there is now a growing awareness that putting nature to work through natural based solutions will not only enhance infrastructure services, but generate significant social and environmental benefits as well. Such projects often lower costs, promote sustainable development and offer opportunities to improve community livelihoods, aligning perfectly with the World Bank's core mandates, complementing the Bank's twin goals to reduce poverty and increase shared prosperity, and offering an important key to achieve a water secure world for all.

As examples for the potential of green infrastructure, Mr. de Groot mentions that restoring mangroves is five times more efficient than built infrastructure, and that, while the cement industry contributes 8% to the world's carbon emissions, making traditional infrastructure construction a highly carbon-intensive process, nature based solutions have the potential to contribute to carbon sinks. In fact, by capturing and storing carbon, forests and other ecosystems can deliver up to one third of the emission reductions needed by 2030.

Practical experience from the many projects that are supported by the World Bank teaches that the main challenge is to find the most efficient balance between nature based green and conventional engineered gray infrastructure, based on thorough knowledge of the potential of interventions and what is possible given the local circumstances. In urban flood management, for example, there are ample opportunities to combine storm drains and pump systems with storm water retention in parks and on green roofs to reduce peak flows and flooding risks.

The feasibility of nature-based solutions depends on a complex mix of a number technical, financial, legal, institutional and social factors. While on the technical side, green infrastructure requires the same careful evaluation and planning as built infrastructure, financing can often be the biggest stumble block in getting a project off the ground, although nature-based solutions produce environmental and social co-benefits that significantly enhance their overall economic viability.

These multiple benefits are best exploited in cross-collaboration between a multitude of governmental and non-governmental institutions. Social dimensions are often more success-critical in nature-based solutions than in built infrastructure. They rely on community buy-in, especially when changes in land use are needed to increase ecosystem services, but when properly planned, such interventions will more often than not increase community benefits.

Tackling these complexities pays, says Mr. de Groot. Experience shows that green approaches provide cost-effective solutions, which is especially attractive in budget-constrained post-Covid environments. Nature-based solutions have proven to lower and avoid cost while generating additional climate, economic and social benefits, some of which can be monetized to generate additional cash flows through, e.g. carbon credits, water quality credits and even biodiversity credits. Nature based solutions also provide access to green and sustainably linked finance, and generate opportunities to capture an increased lending volume.

Indeed, an increasing number of financial instruments supports the implementation of green interventions, and the number of infrastructure projects with nature-based solutions components is on a steady rise. Within the World Bank, a number of programs on environment, urban

development, water security, and on climate change and adaptation has been initiated, with financing by various donors. A portfolio review for the fiscal years 2012 to 2020 shows that in disaster risk management alone, the Bank is engaged in 73 large lending projects that feature nature-based solutions valued at 4.6 billion USD.

Mr. de Groot closed his presentation encouraging the audience to access the many reports and technical notes on this topic through the website of the World Bank, including the Flagship Reports on integrating green and grey and the recently published report on Governance for Flood Risk Management.

Harnessing nature for sustainable water resources management

Next, Irene Lucius, Regional Conservation Director Eastern Europe of the World Wildlife Fund threw light on the practical side of green infrastructure projects, presenting examples from pilot projects that demonstrate the multiple benefits gained from ecosystem restoration.

The Liberty Island Restoration Project in Hungary focused on restoring an almost dried up river sidearm behind a rock-filled dam. The dried-up area drew invasive species, and sedimentation threatened water supplies from nearby drinking water wells. Mr. Lucius calls it fortunate that the mayor in this community addressed the WWF for help in a restoration project that was implemented between 2009 and 2013 with funding from the EU and other partners. The restoration succeeded in stopping sedimentation, securing the drinking water wells, reviving the fish population, bringing invasive species under control and creating a now very popular recreation zone for the local population.

Ms. Lucius's next example is a river restoration currently in the planning stage in Reghin, Romania. Now a canal in the midst of the city, the planners are currently looking into different restoration options how to make the river available for economic and recreational purposes as well as for flood risk mitigation. The WWF has commissioned an economic impact assessment study by Ernst & Young to assess the economic recovery finds that are currently being allocated. The study found true added value for the economy, an impressive amount of job opportunities and altogether an attractive return on investment for the city, showing that river restoration in cities is feasible and also produces a tangible impact on the urban standard of living.

The third example is a floodplain restoration project along the Danube in Romania. Here, the WWF has been engaging with the local population, discussing different restoration options, to find an option that would have serious local support. Dyke construction in the year 1900 Dykes left a formerly lively ecosystem all but dried up, with only a small lake left. The land is under intensive agricultural use that is particularly feasible through EU direct payment subsidies, which makes a full-scale restoration unlikely. A realistic scenario would focus on the restoration of the lake area with the added value of improving fish production there, an option that found huge interest of the local community and even support from some of the local farmers, giving the project a realistic chance of implementation within the next decade.

Noting that engaging with the locals and giving them a choice of options to secure their buy-in is seriously hard work, Ms. Lucius turns to the obstacles that nature-based solutions often meet. She names the trust issue here, when there is insufficient evidence from pilot projects to prove that these solutions really produce the expected benefits. Another issue is short-term thinking, because nature-based solutions take time to prepare, designing each project individually based on a painstaking investigation of the environmental conditions.

Pay-off periods can also be longer than with conventional solutions, and the complexity of the necessary multi-sectoral negotiations can be a serious stumbling block. Land rights and agricultural interests add to the complications. When it comes to funding, the largest stumbling block is often the funding of the complicated feasibility studies in the project preparation phase.

Concluding her presentation, Ms. Lucius remarks that nature-based solutions find themselves in an uphill fight with off-the-shelf grey infrastructure solutions that enjoy higher trust. Yet, they usually beat conventional approaches, provided that their multiple benefits are taken into account and that their costs can be written off over an appropriate amount of time.

Natural solutions for rural wastewater treatment

Next to take the stage was Günter Langergraber, Head of Department, University of Natural Resources and Applied Life Sciences, Vienna (BOKU). He presented a practical use case of green infrastructures, i.e. natural solutions for rural wastewater treatment. When it comes to wastewater treatment, rural areas have characteristic challenges. The smaller the settlement and the number of connected households, the higher are the fluctuations in water amounts and wastewater concentrations, putting the infrastructure under changing stresses. These infrastructures also suffer from a lack of trained operators. For all these reasons, small wastewater treatment plants need to be simple in design, construction and operation, and robust enough to deal with high fluctuations.

Options for wastewater treatment in rural areas are limited. The most costly method is collecting the waste and treating it off-site at the nearest treatment plant.

The most outdated approach is onsite collection in black septic tanks without any secondary treatment, nowadays more often than not complemented by a biological secondary treatment. Prevalence of these options depends on local conditions and sanitary regulations.

A green option is using the soil as recipient for treated or partially treated wastewater, and an even greener option is to stop looking at wastewater as waste and to view it as a resource. Solutions that recover resources like treated nutrients, organic matter or heat are usually based on separate collection of black water and grey water streams.

Fully biological solutions are either intensive treatment systems where the biomass and microbes are carrier mediums like filters, or solutions where biomass is suspended in activated sludge systems or SBR plants. Also available are natural treatment systems that require larger footprints, for example treatment wetlands or waste stabilization ponds.

In rural wastewater treatment wetlands, water flows either horizontally through a filter bed planted with macrophytes, or vertically. The oxygen supply in water-saturated horizontal is limited, therefore degradation processes are mainly anaerobic, and organic matter can be easily removed. In vertical flow systems water is intermittently loaded into the system and percolating through the filter, carrying enough oxygen to feed aerobic degradation processes.

System choice depends largely on legal requirements for effluent qualities, but all types of wetland treatment systems depend on an effective primary treatment to prevent clogging filters.

Typically, the footprint of a wetland system is 5m² per connected person, and in Austria, such treatment plants typically serve less than 50 connected people, with 95% of the population connected to systems larger than that.

A case study based on monitoring data from 2400 small treatment plants in Upper Austria which shows that while all types of systems meet the legal requirements, given proper operations, maintenance and monitoring, but systems that integrate a wetland stage perform better, over a longer period of time.

Mr. Langergraber concludes that natural solutions are suitable for rural areas, all the more because rural communities need simple, robust technologies that they can operate without specialist knowledge. Contradicting a widespread prejudice, the data show that wetland systems perform well, achieving at least the same results as conventional solutions while being more robust and easier to operate.

Engaging the audience

Following these three presentations, a very lively Q&A ensued. Asked about practical experience with the implementation and adaptation of nature-based solutions, Mr. Klaas de Groot reports an increasing acceptance of these types of interventions at a political level. Referring to his experiences from projects all over Latin America, he agrees with the list of stumbling blocks that Ms. Irene Lucius had mentioned, adding that „It's never going smooth. But then again, which project is?" In this context he stresses that nature-based solutions are not a panacea and that success is a question of finding a proper balance with conventional solutions and also depends of timing. Adding green infrastructure to already finished projects is often less attractive than integrating nature-based solutions upstream from a treatment plant during the planning stage. Still, Mr. de Groot recommends to view every individual situation through NBS glasses to see what type of balance would be best for that project.

Regarding the influence of the EU flood directive on project-related discussions with authorities and stakeholders, Ms. Irene Lucius calls all relevant EU Directives helpful to various degrees with the Water Framework Directive usually the WWF's main argument, and the Floods Directive a strong runner-up when it comes to advocating for a strong nature-based solution element in a project. The Habitats Directive is, in her experience, a comparatively weak argument for restoration, but on a general level the WWF also argues with alignment or enforcement of the Habitats Directive.

Asked if there are government-supported subsidized NBS development schemes and how to promote green solutions against an industry that supports a conventional approach, Mr. Langergraber reports that in Austria, subsidies for small treatment plants are available, but they are technology-independent. Not helping the case of nature-based solutions is the fact that nowadays, conventional plants come as technology packages, and often cheaper than wetland solutions. In this context, Mr. Langergraber recommends marketing by showcase, mentioning a treatment plant in Slovenia that runs a publicly accessible demonstration center for nature-based solutions.

In her final statement, Ms. Irene Lucius reflected on the future of nature-based solutions and their broad acceptance, differentiating between the water management community, where she sees a growing openness for green projects, and the wider society. She names as a main stumbling block the hesitation to engage with an agricultural sector that is producing economic revenues in countries that are struggling for growth and where challenging revenue generating economic activities is difficult to say the least.