BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: B10

Sustainable urban planning and policy in the Global South: endorsing and mainstreaming ecosystem services from blue-green infrastructure

Hosts:

	Title	Name	Organisation	E-mail
Host:(1	Dr.	Dhanya Bhaskar	Centre for Policy Studies, Indian Institute of Forest Management, Bhopal, India	dhanyab@iifmbhopal.edu.in
Co-host(s):	Dr.	Shalini Dhyani	Water Technology and Management Division, National Environmental Engineering Research Institute, Nagpur, India and IUCN Commission on Ecosystems Management	shalinidhyanineeri@gmail.com

Abstract:

With rampant urbanization currently observed and predicted in the Global South, creating and maintaining blue-green infrastructure (BGI) has emerged as a critical pathway for sustainable urban development. Diverse BGI elements such as urban green spaces, constructed wetlands, sponge gardens, permeable pavements, biopores, rooftop gardens, wetlands, lakes, streams and rainwater harvesting are increasingly recognized for their multifunctional roles in ensuring diverse ecosystem services ranging from mitigation of urban floods, pollution, heat islands, disaster risks, climate impacts, to provisioning and cultural benefits. The potential of urban BGI in enhancing human physical and mental wellbeing along with fostering social cohesion and stewardship are being widely appreciated, following the pandemic induced lock down across the globe.

BGI has gained immense attention worldwide in the last few years as an urban planning strategy for enhancing green and blue spaces. Most success stories in this regard are however confined to the Global North. In the Global South where BGI serves not only regulatory and cultural functions, but more importantly sustains livelihoods of marginalized urban residents, a distinct approach is imperative for its planning and implementation. This session proposes to unpack the centrality of ecosystem services from BGI in ensuring urban sustainability and resilience in the Global South from diverse cases and examples. The proposed session aims to bring to the fore the promise in leveraging BGI for urban resilience with a view to inform sustainable and inclusive urban planning processes in

the Global South. We invite abstracts that share the contributions of multiple services of BGI in urban sustainability transitions and analyze the opportunities and challenges in maintaining ecosystem service flows and uses from BGI through city appropriate policy and planning measures.

Goals and objectives of the session:

a. To synthesize evidences of ecosystem services from diverse BGI contributing to urban resilience and sustainability in the Global South

b. To provide inputs for reorienting urban planning processes in the Global South by incorporating ecosystem services from BGI to address local concerns

c. To recommend mechanisms to incentivize institutions and programmes that preserve and augment ecosystem service flows from BGI

Planned output / Deliverables:

Depending on the session outcomes, any two among the following outputs will be planned:

1. A policy brief on integrating ecosystem services from BGI in urban planning and policy in the global South

2. A synthesis paper

3. A blogpost in IUCN Commission on Ecosystem Management's official blog i.e. Harnessing Nature

4. A newspaper article

Related to ESP Working Group/National Network:

BWG 10 – Urban systems

II. SESSION PROGRAM

Date of session: Wednesday 15th December 2021

Time of session: 15.30-17.30

Format: 10 minutes presentation followed by 5 minutes of Q&A

List of abstracts and speakers

Order	First name	Last name	Title of presentation
1	Harini	Santhanam	Greening the grass, blueing the water: aligning environmental neuroscience with blue-green infrastructure planning to synergize the delivery of Nature-based Solutions
2	Li	He	Study on the planning transmission and application of nature-based solutions in native ecological practice of small riverhead basin
3	Marccelina	Inggrid	A Case Study on Catchment-Based Flood Risk Management in Yamada River
4	Hyunh Lam Thi	Mai	Unravelling the Mechanisms Linking Cultural Ecosystem Services from Urban Blue Spaces and Human Well-Being: A case study in a rapidly urbanising area in central Vietnam
5	Shalini Dhyani, Jayshree Shukla, Saptrishi Dutta and Paras Pujari		Assessing the demand-supply gap of urban green spaces (UGS) and Ecosystem Services (ES) for Green Infrastructure (GI) planning in Nagpur, India
6	Rajarshi	Dasgupta	Operationalizing the Circulating Ecological Sphere (CES) concept for fostering Nature-based resilience across urban-rural gradient
7	Hishmi Jamil Husain, Nikhil Raj, Suraj Kumar		Economic Valuation of Ecosystem Services of Forest Areas In Jamshedpur Division, Jharkhand, India
8	Saif	Shahrukh	Air Pollution Removal by Dhaka's Urban Forest

III. ABSTRACTS

1. Greening the grass, blueing the water: aligning environmental neuroscience with blue-green infrastructure planning to synergize the delivery of Nature-based Solutions

Harini Santhanam, School of Natural Sciences and Engineering, National Institute of Advanced Studies, Bangalore

Synergizing the blue-green infrastructure (BGI) planning using Nature-based solutions (NbS) is being proven as a successful framework to advance sustainable development in global cities. Research in this field is mainly focussed on 3 factors: the methodologies adopted, technologies used or implementation in the context of rapidly urbanising cities and centres. Planning of BGI and adoption of NbS no doubt improves the local sustainability characteristics through enhanced ecosystem services of typical urban ecosystems such as lakes, rivers, ponds, parks, urban forests etc. However, their implementation needs extended awareness to include the dynamic factors of both natural and human origins influencing the NbS/BGI usages especially in ecotonal zones, where the scale of urbanisation is rampant. On one hand, strategizing the 'design', 'placements' and 'engagement' of BGI in urban centres with a long-term perspective needs the active involvement of urban planners. On the other hand, the long-term preservation of the utility of the BGI in the form of NbS needs to be a planned, integrative human-environment endeavour owing to the differential belief systems of the humans of these cities engaging one-to-one with the BGI. Further, the importance of aligning elements from environmental neuroscience needs to be investigated in depth to strengthen the human-nature nexus, especially in biodiverse regions such as India in the Global South. From a public participatory approach, the cross-over from a mere 'feel-good-about-NbS-in-my-neighbourhood' towards 'NbS-lifestyled' and 'NbS conscious' approaches can provide a solid foundation to plan, deliver and sustained use of the ecosystems services of urban BGI. These ideas and concepts from environmental neuroscience will be explored in the context of selected inland, mountainous, and coastal cities of differential urbanisation rates in India.

2. Study on the planning transmission and application of nature-based solutions in native ecological practice of small riverhead basin

Li He, Netherlands, Southwest Jiaotong University, China

The development of the Economic Development Zones (EDZ) in China reflects the characteristics of industrialization and urbanization in this period, as well as the interactive relationship between the influence of the Western urban development concepts and the Chinese concepts of native ecological practice. In the process of development and construction, natural ecological resources such as small water systems, which are easily transformed into landscape spaces, become key spaces for measuring the function of the ecological service and urban landscape image. In the process of native ecological practice of development and use of ecological resources, it gradually turns to engineering facilities that

cooperate with NBSs [Nature based Solutions] to solve urban ecological problems through repeated trials and errors. Taking the processes of planning and constructing a water system in Xingwen District in the Bazhong Economic Development Zone (EDZ) as a research object, which is a small watershed of the Ba river, this study explores how to comply with urban demands and implement planning and design combined with the NBSs and local construction in the process of development and construction of EDZ, and how to better fit the interactive relationship between the hydrological process, land use and multi-stakeholders in the construction process. Summarizing the ecological logic between natural elements and urban development, as well as the spatial strategies of coordinating the interests of multi-stakeholders, this study explores how to effectively connect the NBSs to solve ecological problems in the dynamic process of urban development and construction.

3. **A Case Study on Catchment-Based Flood Risk Management in Yamada River**

Marccelina Inggrid, Civil Engineering Department, Kyushu University, Japan

In recent years, the risk of flooding around Japan is rising due to heavy rainfall and global warming. Therefore, Japan has been developing a new flood management means which utilizes the whole catchment area of the river instead of utilizing only the river body. This method is called Catchment-Based Flood Management. Yamada River, which is one of the tributaries of Kuma River at Kumamoto, Japan, still experiences severe flooding during heavy rainfalls despite having many means of infiltration. Therefore, in this study, the Catchment-Based Flood Management method in the Yamada River catchment area will be assessed. In this study, a model of Yamada River is made with the DioVISTA simulator software. In this study, Flood Management Measures which are Detention Basins, Levee, and both Detention Basins and Levee, are going to be applied to the Yamada River model. Four detention basins with a total capacity of 1.63 x 106 m3 are created, while a levee with a height of 1.5 m is created at the upstream part of Yamada River. With the addition of the four detention basins, the peak discharge decreased by 10.83% and the peak reached 15 minutes slower. With the addition of the levee, the housing on the upstream of Yamada River is protected from inundation. With the addition of both detention basins and levee, the peak discharge decreased by 10.17%, and the peak reached 15 minutes slower. Also, the housing on the upstream of Yamada River is protected from inundation. Therefore, it can be concluded that all properties from the addition of only the detention basins and the levee are kept. Therefore, Catchment-Based Flood Risk Management measures were assessed to be effective to decrease and slowing the peak of discharge of Yamada River.

4. **Unravelling the Mechanisms Linking Cultural Ecosystem Services from Urban Blue Spaces and Human Well-Being: A case study in a rapidly urbanising area in central Vietnam**

Hyunh Lam Thi Mai, University of Tokyo

Studies have explored the positive human wellbeing outcomes accruing from the use of and access to urban green/blue spaces through the provision of cultural ecosystem services (CES). CES contribute to human wellbeing through complex mechanisms, including improved physical activity, enhanced social relationships, attachment to the place, cultural fulfilment, and personal learning. Many local and national governments are increasingly identifying that investment in green/blue spaces can be a cost-effective measure to improve the wellbeing of urban residents, especially concerning physical and mental health. However, there are still many major gaps in our understanding of the complex mechanisms mediating CES and human wellbeing outcomes, including whether these mechanisms manifest in the same way in individual and collective scales. Using a rapidly transforming urban coastal ecosystem due to tourism in Da Nang city in Vietnam, we explore (a) the different mechanisms in which CES from urban blue spaces contribute to human wellbeing and (b) whether these mechanisms mediate wellbeing outcomes differently at individual and collective scale. This is achieved through a combination of individual interviews and focus group discussions with residents and other stakeholders. Our findings support the previous research that wellbeing is experienced at both individual and collective scale and contributed by CES via regenerative, satisfactive, intuitive, transcendentive, retrospective, cognitive, evolutive, cohesive, communicative, remunerative, collaborative, and destructive mechanism. Synergies are found among the CES benefits to many wellbeing constituents at both levels, featuring the potential of harnessing the synergistic effects between recreational services and cultural heritage/educational value. Specific interventions could be proposed to promote the synergies, reduce the trade-offs, and increase simultaneously wellbeing outcomes at both scales. The findings from the case study in Vietnam can have broader applicability to similar fast-paced urbanised cities in Asia and allow the exploration of potential causalities in the field of urban resources management.

5. Assessing the demand-supply gap of urban green spaces (UGS) and Ecosystem Services (ES) for Green Infrastructure (GI) planning in Nagpur, India

Shalini Dhyani, Jayshree Shukla, Saptrishi Dutta and Paras Pujari
Critical Zone Research Group, CSIR National Environmental Engineering Research Institute, Nagpur, India

The adaptation capacities are crucial to ensure urban resilience and Urban green spaces (UGS) are key indicators of quality of life. The provision of public green and blue spaces as a public asset in urban areas, can minimize the negative impacts of urban expansion and loss of natural resources. Implementation of an urban resilient framework requires creation of green spaces to maintain the sustainability of socio-cultural, economic, and ecosystem services flow. We carried out a participatory survey in Nagpur, India to understand citizens' response to public UGS and the benefits they are aware as Ecosystem Services. A total of 1050 individuals from 100 wards were questioned in early 2020. 11% respondents strongly agreed, while, 40% agreed that there was sufficient greenery around them.19.5% respondents disagreed while, 2.3% strongly disagreed on having sufficient greenery around them. ES

from UGS was assessed under provisioning, regulating and cultural service categories. Under services related to regulation (heat islands and air pollution abatement) 30% disagreed to having sufficient green spaces available in the city to address the issue. A huge interest for using UGS for various cultural benefits by the locals was clear especially for health and psychological benefits. 82% respondents confirmed fresh air, 63.4% health benefits, 33.2% stress control while, 22.1% informed nature observation was good for human health. Our study helped grading 50 locations as green with good amount of UGS, 44 as orange that need special focus for restoring the degraded UGS and 19 red zones for special planning needs for Green Infrastructure (GI). We suggest prioritizing actions and funds in respective green, orange and red wards by appropriate BGI conservation and management. Development of Natural Infrastructure (NI) as per the ward specific urban population, build up density should be implemented

6. Operationalizing the Circulating Ecological Sphere (CES) concept for fostering Nature-based resilience across urban-rural gradient

Rajarshi Dasgupta [1], Bijon Kumer Mitra [1], Wijitbusaba (Ann) Marome [2], Pimnara Rodkul [2]
[1] Senior Policy Researcher, Integrated Sustainability Centre, Institute for Global Environmental Strategies, Japan
[2] Urban Development Planning & Policy Program, Faculty of Architecture and Planning, Thammasat University, Thailand

The study narrates a case study for the implementation and operationalization of the 'Circulating Ecological Sphere (CES)' concept to better understand the ecosystem linkages at the urban-rural gradient and plan for Nature-based resilience. With the help of spatially explicit ecosystem service models, we quantified the food production potential and water availability from the urban core to an area within the 20 km radius at a spatial resolution of 30m. The total farmland area was used as a proxy indicator of current and future food production potential. We considered the average yield of 2400 kg/ha of rice and 1500kg/ha for other vegetables. Similarly, we calculated the annual run-off for water availability based on rainfall, evapotranspiration, vegetation status and soil categories. Overall, the study illustrates that it is possible to create a self-sufficient city region under the current land use, though uncertainties exist in future land development. The paper advocates for strong structural and economic linkages among urban and peripheral rural areas for structural and inclusive resilience.

7. Economic Valuation of Ecosystem Services of Forest Areas In Jamshedpur Division, Jharkhand, India

Hishmi Jamil Husain, Nikhil Raj, Suraj Kumar
Centre of Excellence for Biodiversity Management, Corporate Sustainability, Tata Stee Ltd. Jamshedpur, India

The current study provides the economic valuation of the forest area of the Jamshedpur forest division (JFD) in the state of Jharkhand, India. Jamshedpur forest division accounts for 25% of the total land area. It is also one of the largest industrial areas in Asia and home to thousands of industries from conglomerate TATA to CTC limited. The companies pollute the environment by burning coal and through mining activities, so they make a considerable amount of investment in conserving forests and compensating for the losses. This division covers five ranges namely Mango, Ghatshila, Musabani, Chakulia and Rakhamines. The protected and reserved forest contribute to safeguarding wilderness and natural system which results in maintaining ecological process and therefore provides various goods and services. For instance, the forest provides various kinds of provisioning services such as Non-Timber Forest Produce (NTFP) goods like tendu leaves, Sal leaves mahua flowers and bamboo, agricultural goods like rice and vegetables, and employment generation. It helps in regulating various Ecosystem Services (ES), such as forest is essential in conserving soil,nutrient retention, groundwater recharge and pollination. In addition, it provides support services such as habitat loss avoided.

The evaluation has been done by mapping 28 ecosystem services from various studies. The different framework has been adopted to better decision making under various scenarios. Proper methodologies are used to value the benefits. Moreover, the investment multiplier is calculated to give an idea to stakeholders about the investment return ratio. This study has valued forests under different frameworks. Under stock and flow benefits the total economic value comes out to be INR 19,517 crore (USD 2622.9 Million), Under the Total Economic Value (TEV) framework the value is INR 4,264 crore (USD 573.04 Million) and under the tangible and intangible benefit framework, the value is INR 4264 crore (USD 573.04 Million). Different values under the various frameworks are necessary for different stakeholders of forest and to assist them to make an optimal policy decision for conservation of forest.

8. Air Pollution Removal by Dhaka's Urban Forest

Saif Shahrukh, Department of Soil, Water and Environment University of Dhaka, Bangladesh

In cities, roadside vegetation is exposed to air pollutants, including a wide variety of particulates-borne toxic compounds. An investigation was undertaken to assess the tolerance or sensitivity of four roadside trees (Ficus benghalensis, Ficus religiosa, Mangifera indica, and Polyalthia longifolia) towards air pollutants, including particulates. The four species were sampled from four different locations of Dhaka, Bangladesh. Air pollution tolerance index (APTI) was assessed using the total chlorophyll content, ascorbic acid content, relative water content, and the pH of the extract from the leaves of the studied plants. The results were compared with similar species at a non-polluted site in a nearby area having a similar soil-climate complex. The total chlorophyll content decreased with the increasing particulate matter loads. APTI of the investigated plants ranged from 10.31 to 12.51 meaning they were either sensitive or intermediately tolerant. M. indica was found to be intermediately tolerant in three sampling sites. The results indicated that these evergreen species are good indicators of air pollution and can be used as an early warning tool for air pollution level that is harmful to human health. Anticipated performance index (API) was also calculated to assess the overall performance of

a plant in a particular region where some socioeconomic and biological characteristics were taken into consideration. From the API, M. indica was judged as good performer maintaining the highest score (68.75%) amongst the selected plant species irrespective of different sites. The accumulation of heavy metals (Cd, Cr, Pb, and Ni) on leaves of four tree species were investigated, and a predictive foliar metal accumulation index (MAI) was developed. *F. benghalensis* was found to have the highest MAI value (13.60). Based on these three indices, the most suitable plant species for green belt development in urban areas were identified and recommended for long-term air pollution management.