

IWA World Water Congress & Exhibition

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Nature Based Solutions for Climate-Resilient Cities in Developing Countries Under Change

Chairs: Nilo Nascimento (UFMG, Brazil), E.M. Mendiola (USP (Brazil))



WORKSHOP SUGGESTED BY

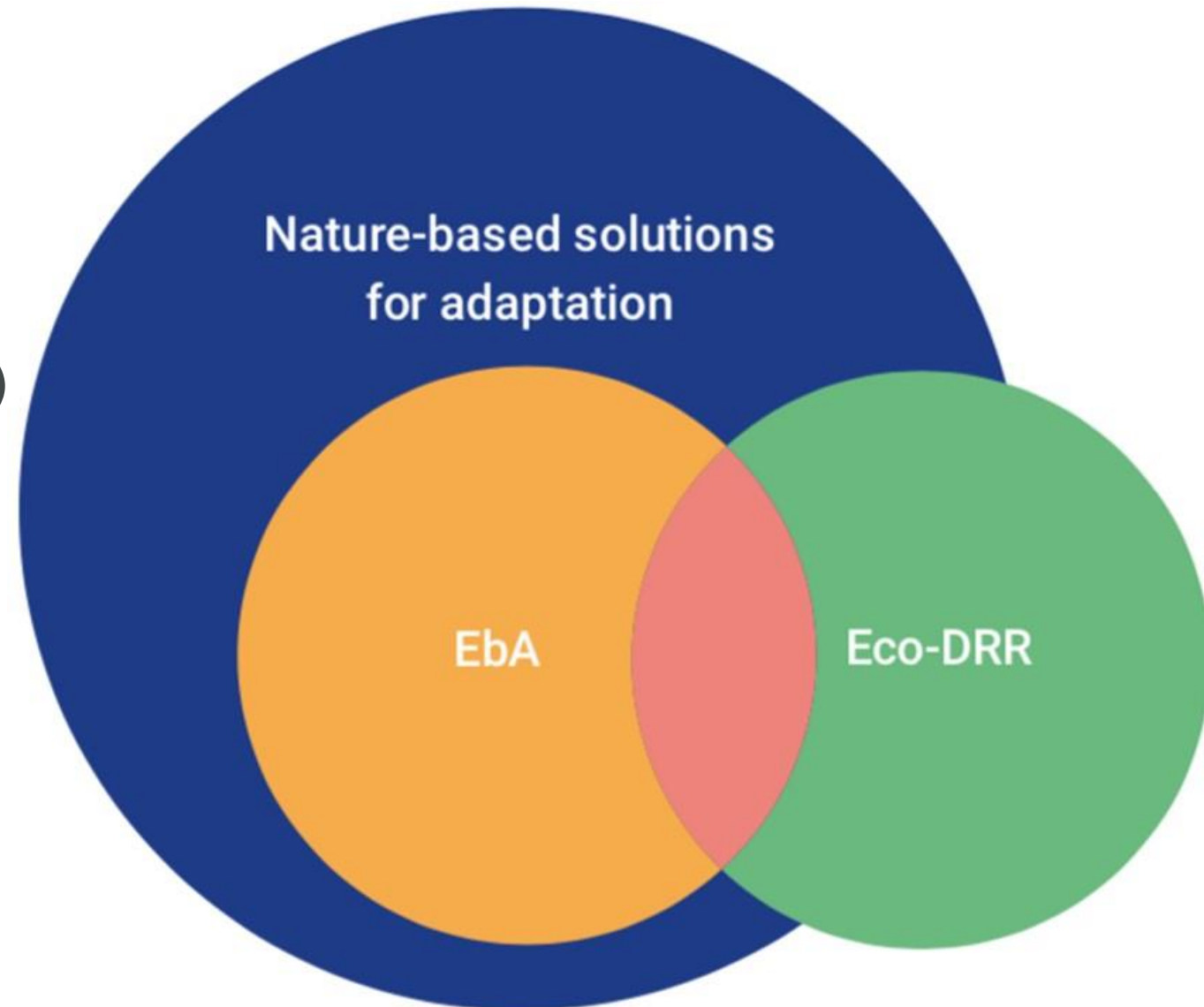


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- Maryam Imani, Anglia Ruskin University, UK
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NBS: Multiple roles and expected benefits

NATURE BASED SOLUTIONS:

- Inspired and supported by natural processes
- Ecosystems based approaches (EbA)
- Adaptation and resilience to changes
- Providing sustainable Eco-DRR (disaster risk reduction)
- Contributing to carbon sequestration



IPCC Report (WGII, 2022)

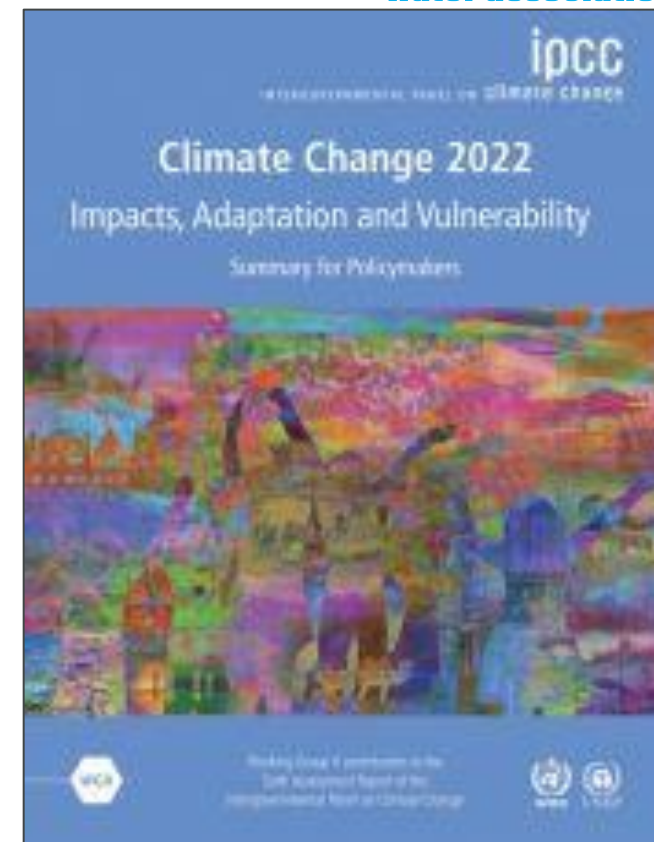
Ecosystem approach (including NBS) is essential for adaptation

Climate change has already led to changes in terrestrial, freshwater and ocean ecosystems on a global scale, with many effects on a regional and local scale.

The changes relate to:

- ecosystem structures
- geographical range of species
- Species extinction
- phenology

Impacts on ecosystems are greater than expected in previous IPCC assessments



SO how can we implement NBS effectively while facing multiscale ecosystem and biodiversity crisis?



IPBES & IPCC Report (2021)

Limiting global warming and protecting biodiversity are mutually reinforcing goals and achieving them is key to delivering societal benefits.

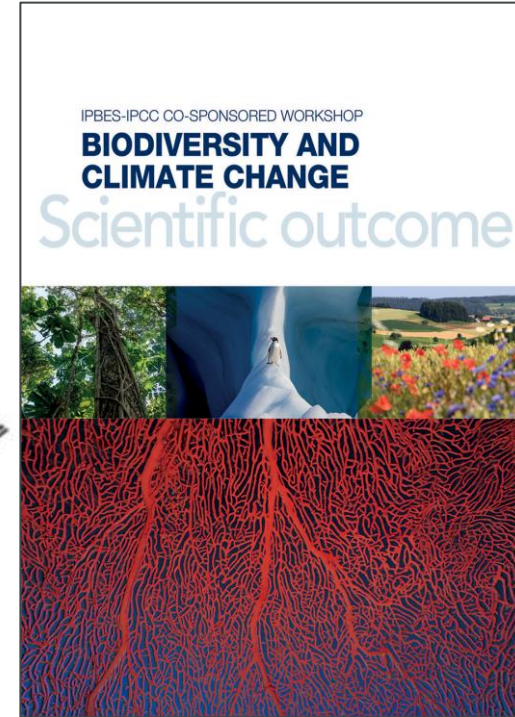
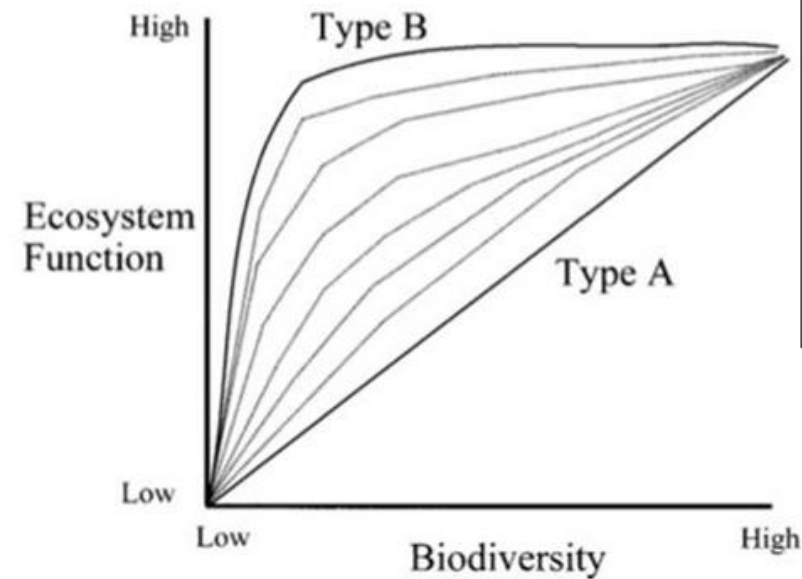


Figure 3.4. Relationship between biodiversity and ecosystem function. In a type A relationship, all species contribute equally to ecosystem function. In a type B relationship, ecosystem function is effectively provided by a relatively small proportion of the species, leaving many redundant species that are too rare to make a substantive contribution. Source: Schwartz *et al.* (2000).



In the climate crisis BLUE GREEN INFRASTRUCTURE:

- should be formally classified as **‘CRITICAL INFRASTRUCTURE’**
- regulated by national and international laws and operational regulations as other critical infrastructure (e.g. energy or communication sector)
- Standards for its maintenance must be based on **ECOLOGICAL PRINCIPLES**
- must support biodiversity, landscape water retention and connectivity



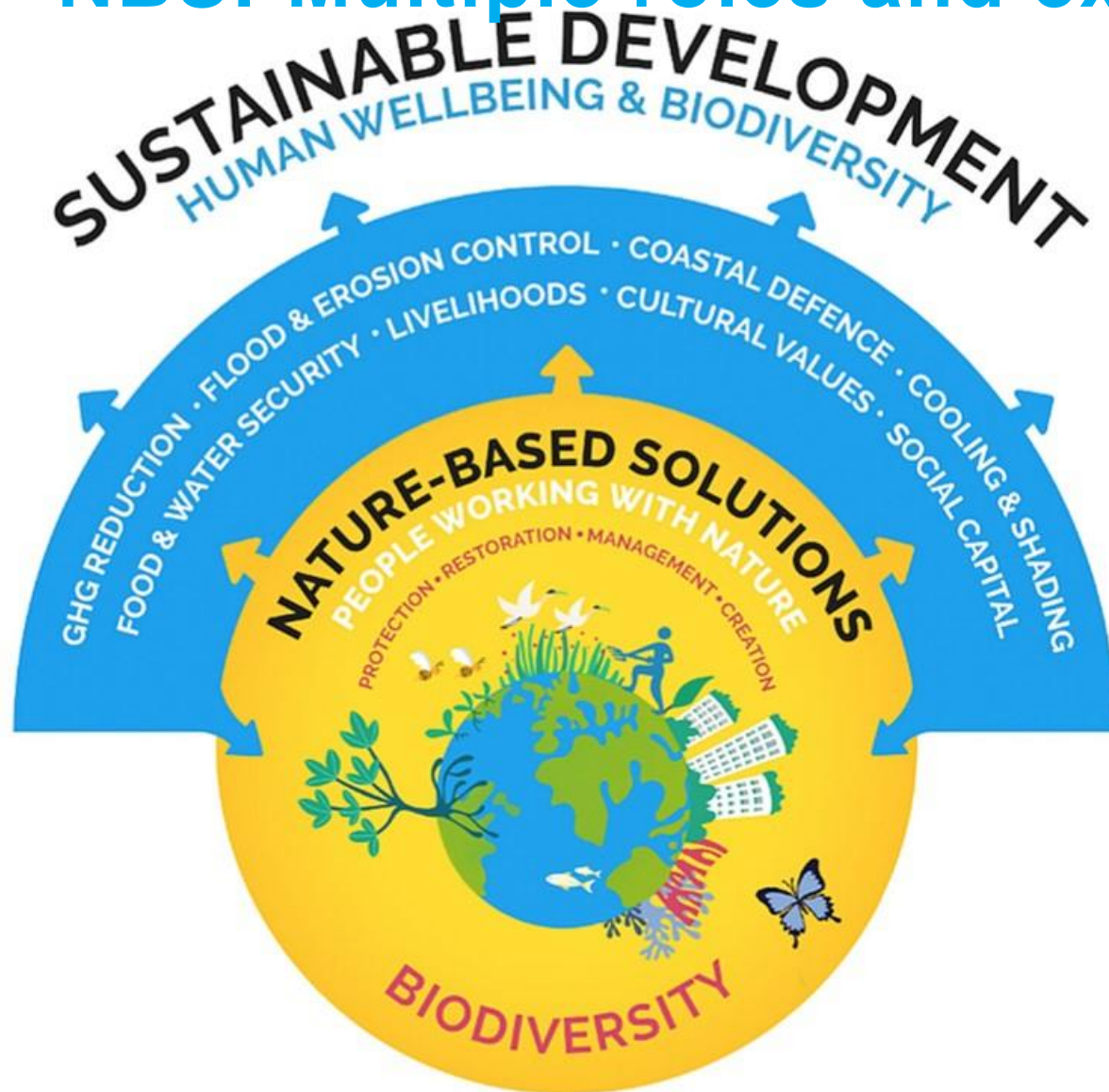
Wagner, I.

Nature 607, 657 (2022)

doi.org/10.1038/d41586-022-02000-7

Such approach can accelerate protection and restoration of nature, and the adaptation of socio-economic systems to climate change.

NBS: Multiple roles and expected benefits



- Reducing wet weather diffuse pollution
- Mitigating heat island development in the urban environment
- Mitigating environmental impacts of agricultural, industrial and mining activities
- Restoring and protecting riparian areas
- Promoting connectivity among green areas and biodiversity
- Creating opportunities for social cohesion, social connections leisure, sports, social connections
- Diversifying income generation opportunities
- Enhancing participatory processes and environmental governance
- Contributing to water, food, energy security

ADAPTATION TO A HIGHLY MODIFIED ENVIRONMENT



IWA Water Wise Cities

17 Principles for Water-Wise Cities



1 Regenerative Water Services

- Replenish Waterbodies and their Ecosystems
- Reduce the Amount of Water and Energy Used
- Reuse, Recover, Recycle
- Use a Systemic Approach

5 Building Blocks



Vision



Governance



Knowledge
& Capacity



Planning
Tools



Implementation
Tools

Regenerative water services

Water Sensitive Urban Design

Basin Connected Cities

Water Wise Communities

4 Water-Wise Communities

- Empowered Citizens
- Professionals Aware of Water Co-benefits
- Transdisciplinary Planning Teams
- Policy Makers Enabling Water-Wise Action
- Leaders that Engage and Engender Trust

THREE QUESTIONS:

1. What is it about developing countries that demands a different approach to NBS from developed countries?
2. What new/different approaches have been proven to address the challenge of NBS in developing countries?
3. What implications do these have for strategic actions / governance?

QUESTION 1:

1. What is it about developing countries that demands a different approach to NBS from developed countries?

WORKSHOP ANSWERS TO QUESTION 1:

1. Land scarcity and trade-offs with high demand for new housing settlements
2. NBS seems to be a luxury solution
3. “Will these give me a job?”
4. Governance challenges
5. Cost of NBS demands the assessment of benefits beyond money
6. Speed of the development and high pressure for anticipating the results
7. Low performance in maintenance
8. Bottom-top approach needed
9. In developing countries we are always responding to emergencies

PANEL TENTATIVE ANSWERS – QUESTION 1

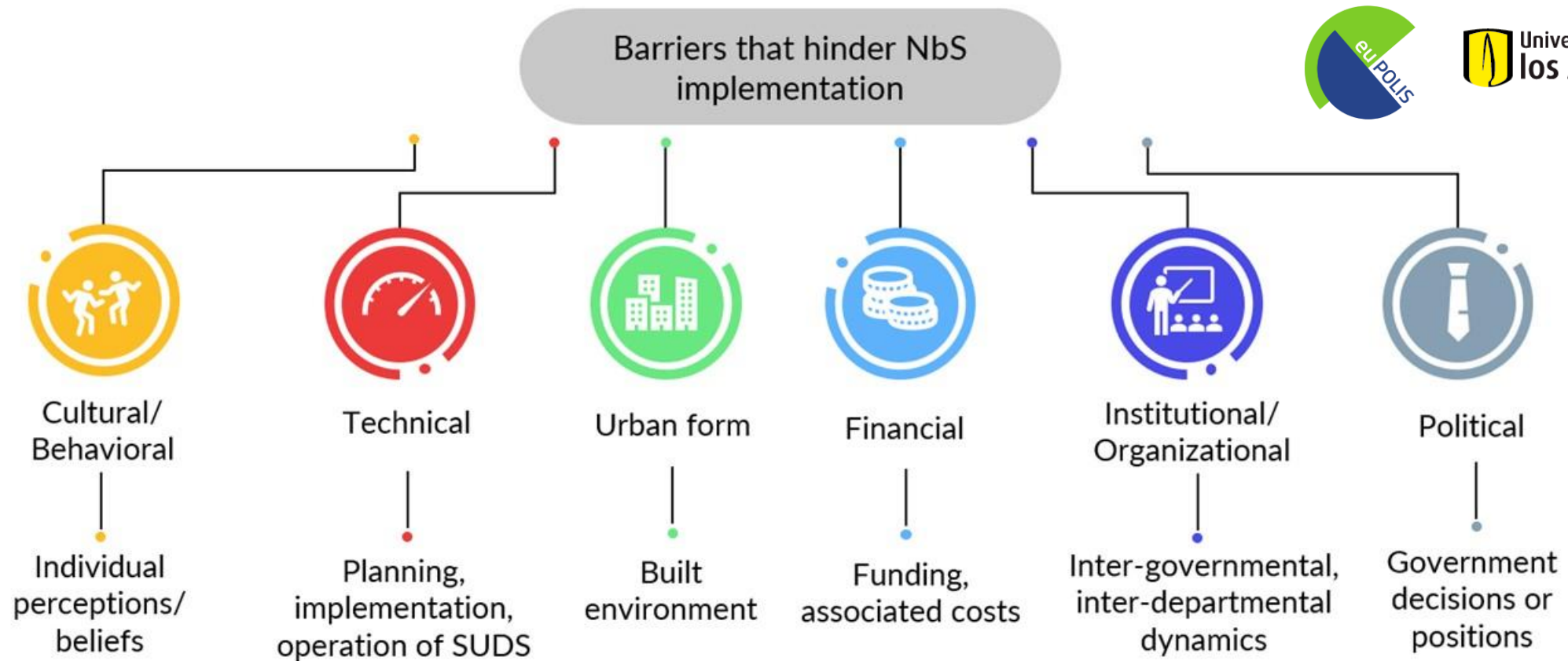
PANEL TENTATIVE ANSWERS – QUESTION 1:

1. Lack of/insufficient knowledge/skills/expertise (perception, common understanding, benefits, technical knowledge and so on) about NBS/SuDS in regulatory/governmental bodies/local authorities leading to the lack of/insufficient engagement/investment (low priority);
2. Lack of /insufficient guiding documents (technical knowledge);
3. Lack of/insufficient/immature education/training (e.g., from specialist to public);
4. Complex decision-making process (multiple organisations) – where SuDS adoption lands? (flood management office, town planning, highway authorities ???);
5. Lack of communication between and within organisations;
6. Lack of desire/willingness to adopt/pay/enforce by governing bodies and regulators (similar to what said above);
7. Inequality or lack of fair/ insufficient distribution of resource and knowledge.
8. Absence of a dedicated team in charge

PANEL TENTATIVE ANSWERS – QUESTION 1:

1. Government emphasis is on basic services like water supply and sanitation.
2. The impact of high levels of inequality – NbS seen as a luxury for the ‘rich’ and inappropriate for the ‘poor’.
3. The ‘politics of space’ – land is highly contested by those who have little / none. This leads to the frequent invasion of any open space by people looking for a place to erect a home for themselves or create a livelihood.
4. Lack of capacity in government – at all levels – makes it harder for them to implement policies.
5. Lack of expertise at all levels
6. Much poorer quality of urban runoff.
7. No money

PANEL TENTATIVE ANSWERS – QUESTION 1: ASSESSMENT OF LOCAL-CONTEXT BARRIERS IS KEY



- Technical barriers have great relevance in the Global South context.
- Operation and maintenance are a big concern.
- Cultural/behavioral barriers might trigger the appearance of other barriers.

PANEL TENTATIVE ANSWERS – QUESTION 1: MICROBIOLOGICAL RISK ASSOCIATED WITH THE TREATMENT OF STORMWATER RUNOFF BY NBS



SUDS treatment train in Parque Metropolitano San Cristóbal Sur. Source: JPRS

- Study site: Metropolitan park, Bogotá, Colombia.
- Pathogen concentrations of *Salmonella spp.* and *E. Coli O157* were much higher than those reported for stormwater in developed countries.
- Potential risk, mainly for children.
- Outputs: Operation and management recommendations to reduce children's exposure to polluted stormwater runoff

WORKSHOP ANSWERS TO QUESTION 1: (MELISSA GRACIOSA)



São Paulo – SP, Tietê River Floodplain



São Paulo – SP, Jabaquara district

WORKSHOP ANSWERS TO QUESTION 1: (MELISSA GRACIOSA)



São Paulo – SP, Zavuvus Stream watershed

WORKSHOP ANSWERS TO QUESTION 1: (MELISSA GRACIOSA)



Amapá – AP – Slums on stilts on Amazonas River basin

WORKSHOP ANSWERS TO QUESTION 1: (MELISSA GRACIOSA)

Metropolitan Region	Total Population (million)	% of population living in favelas	Total population in favelas (million)
Belém – PA	2.15	53.9	1.13
Manaus – AM	2.02	48.0	0.97
São Luis – MA	1.30	24.5	0.32
Recife – PE	3.72	23.2	0.85
Rio de Janeiro – RJ	11.8	14.4	1.70
São Paulo- SP	19.7	11.0	2.17
Belo Horizonte - MG	5.54	9.1	0.49
Porto Alegre – RS	3.90	6.2	0.24
Curitiba - PA	3.15	5.7	0.18

1. Governance and institutional key points:

- Local – Municipality – Regional – State – Federal spheres: need for an integration scheme and social involvement
- Preference for centralized solutions – large drainage and sanitation facilities: easier for government to manage but difficult to build (high costs, lack of areas);
- Strict regulation for conservation areas, that promotes irregular occupation and, also, makes more difficult to regularize them

QUESTION 2:

2. What new/different approaches have been proven to address the challenge of NBS in developing countries?

WORKSHOP ANSWERS TO QUESTION 2:

1. Mangroves planting by communities, after the education about their important role on flood prevention
2. Creation of employments and local opportunities
3. Old and traditional approaches: hearing the traditional and community knowledge

PANEL TENTATIVE ANSWERS – QUESTION 2

PANEL TENTATIVE ANSWERS – QUESTION 2:

1. Make use of technology to facilitate the communication between and within the responsible organisations/groups
2. A champion in each organisation
3. Benchmarking to show business case, with enough evidence of its effectiveness to decision makers
4. Get the SuDS/NBS plan aligned with/incorporated into planning at the early stages of planning permission.
5. More collaboration to share knowledge and experience for replication and localisation (learn from the mistakes of developed world), Investment in education and training
6. To incorporate as a Key factor in climate adaptation
7. SMEs to get involved

PANEL TENTATIVE ANSWERS – QUESTION 2:

1. Engagement with local residents from the outset before attempting any physical interventions.
2. Employment of local residents – who are often extremely poor – in construction and maintenance. Engagement with state-funded job creation schemes.
3. Provision of financial incentives to local residents to engage with the project e.g., pay for litter collection, on-site stormwater reduction, appropriate management of greywater.
4. Setting up of civil society partnerships ('Friends of' groups in Cape Town parlance) where possible (this might be more applicable to higher income areas) to encourage 'self-help'.
5. Identification and support of existing NbS practices in the informal sector.
6. Flexibility of approach e.g., in the use of street art to highlight the benefits of NBS and engender a sense of pride among local residents
7. Don't fall into the trap of thinking there is only one community in any area; there are usually dozens and it is important not to engage with some to the exclusion of others.

PANEL TENTATIVE ANSWERS – QUESTION 2:

1. NBS as a strategy to improve public health and wellbeing without adding life-cycle costs:
 - To build an intervention-aimed liveability model rooted in community needs and engaging the community's diverse potential
 - To enhance participatory processes in re-designing and transforming public spaces, while promoting new governance and new financing models
 - All these considering climate, ecological and socio-economic conditions
2. Local design standards and regulatory frameworks initiatives:
 - Since 2018, the Local Water Utility issued regulations for the design and construction of SUDS, easing the implementation process.
 - New Bogotá's land-use plan acknowledged SUDS as strategies for comprehensive water management, defining management responsibilities.

WORKSHOP ANSWERS TO QUESTION 2: (MELISSA GRACIOSA)



Example in SPMR

Sustainable stepped
spillway

Ecological alley

FAU-USP – TCFAU Project
(2011-2016)

Coordenação: Prof. Maria
Lucia Refinetti Martins

Alvarenga, São Bernardo
do Campo

WORKSHOP ANSWERS TO QUESTION 2: (MELISSA GRACIOSA)



Construction-site School | Students and Professionals

- Local approach
- Social involvement
- Risk control
- Multiple uses

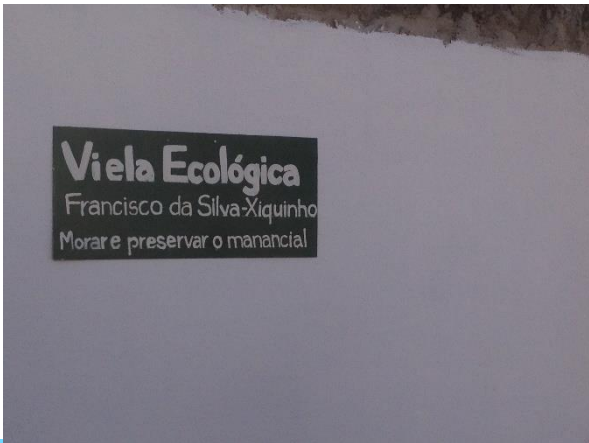
WORKSHOP ANSWERS TO QUESTION 2: (MELISSA GRACIOSA)

Projeto Canteiro Escola LabHab FAUUSP – Finep

Travessa Ecológica Xiquinho – Parque dos Químicos, Alvarenga - SBC



WORKSHOP ANSWERS TO QUESTION 2: (MELISSA GRACIOSA)



Construction-site School | Students and Professionals

WORKSHOP ANSWERS TO QUESTION 2: (MELISSA GRACIOSA)



QUESTION 3:

3. What implications do these have for strategic actions / governance?

WORKSHOP ANSWERS TO QUESTION 3:

1. NBS need to be addressed in the regulation
2. NBS implemented and supported by local leaders
3. Which kind of infrastructure is adequate for long-term lifespan
4. Conflicts between the different governments scales
5. The challenge for designing guidelines suitable for the different small scale realities

PANEL TENTATIVE ANSWERS – QUESTION 3

PANEL TENTATIVE ANSWERS – QUESTION 3:

1. Inclusive budgets that allow for payment to local residents e.g., in return for labour. This includes maintenance.
2. Contextual solutions that allow for inclusion of cultural traditions, familiar methods, and the use of indigenous plants.
3. Less dependence on traditional professionals; we need people who can work across many disciplines.
4. The development of resident-led, local land implementation guidelines
5. Local authorities need to be open to experimentation – including acceptance of the risk of failure. Partner with research organisations.
6. Place is more important than discipline; Local Authorities need to restructure their departments to be more ‘cross-cutting’ to avoid the ‘silo mentality’ of traditional departments (engineering, parks, solid waste, social development etc.).
7. Procurement / tender processes need to be changed from the current emphasis on the lowest price to ‘value for money’

PANEL TENTATIVE ANSWERS – QUESTION 3:

8. Huge need for capacity development at all levels:

- Introduce new appropriate university programmes
- Consider the strategic ‘twinning’ of cities to provide funding (high income countries) and/or advanced knowledge (perhaps the emphasis here should be on middle-income countries with experience and success to help out those who are struggling, e.g., some Brazilian approaches could be readily transferred to South Africa).
- Free availability of suitable online training material.

1. Governance and institutional key points:

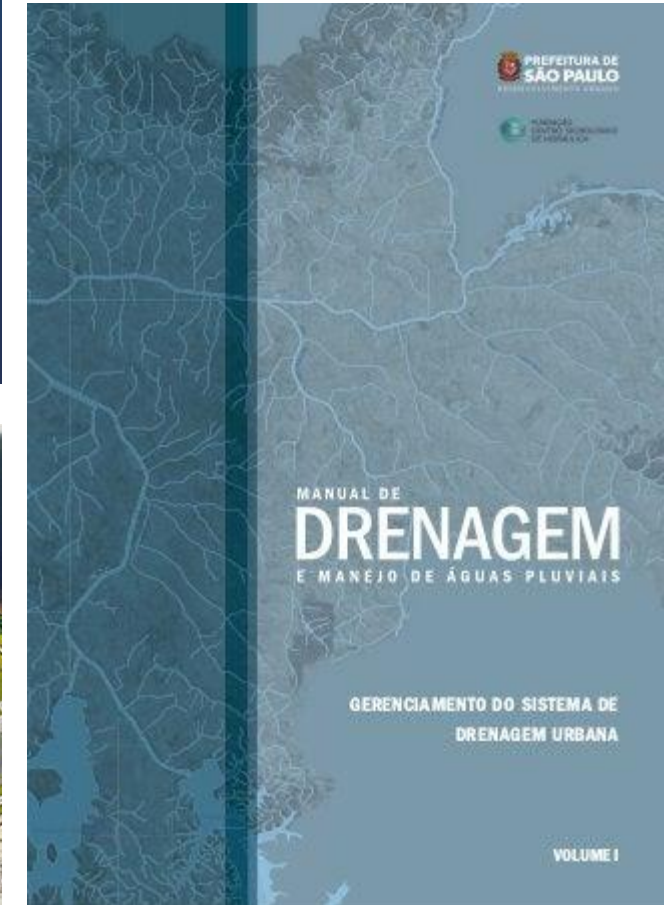
- Try to integrate Local, Municipality, Regional, State and Federal spheres for planning, implementing and maintaining
- Change the preference for centralized solutions – large drainage and sanitation facilities: easier for government to manage but difficult to build (high costs, lack of areas);
- flexibilization of the Strict regulation for conservation areas, that promotes irregular occupation and, also, makes more difficult to regularize them

1. Use the structure of watershed committees to get together users, small and large farmers, communities' leaders, stakeholders, investors, in order to receive demands and try to address it



2. To promote NBS in planning

- Urban drainage masterplans,
- watershed masterplans,
- urban masterplans



3. Institutional scheme

- Who plans and designs?
- Who pays?
- Who constructs?
- Who maintain?

4. Specific Funding programs

- Federal
- State
- Municipal