



# Nurturing vegetation in Mumbai: Greening in vulnerable neighborhoods

## A CONSULTATIVE STAKEHOLDER WORKSHOP TO MAINSTREAM ECOSYSTEMS-BASED SERVICES AND GREENING THROUGH A COMMUNITY-DRIVEN APPROACH TO CLIMATE RESILIENCE

December 14-15 2022 | Mumbai | Deepti Talpade, Shruti Maliwar, Lubaina Rangwala

### INTRODUCTION

Increasing urbanization and concretization, higher population densities, and depletion of the city's green cover, combined with the impact of climate change, have created urban heat islands (UHIs), resulting in pockets of extreme heat across Mumbai. The Mumbai Climate Action Plan (Brihanmumbai Municipal Corporation 2022) contains some key observations regarding climate risks in the city which include the following:

- The land surface temperature (LST) has risen by 5–6°C in some areas within two decades owing to changes in land use and land cover, large built-up footprint, loss of green cover, excessive use of concrete, and high use of reflective roofing materials in the city (Jairaj and Malaviya 2019). Higher LSTs have created more UHIs in the city, resulting in areas that are more exposed to heat than others. Areas in the city that are most vulnerable to heat risks lie mostly in poor neighborhoods.
- Higher-density informal settlements with sparse vegetation cover were observed to be 6–8°C warmer than the neighboring residential areas (see Figure 1).
- For example, 40 percent of the population residing in the M-East ward is exposed to heat stress as opposed to 0.9 percent of the population in the A ward.

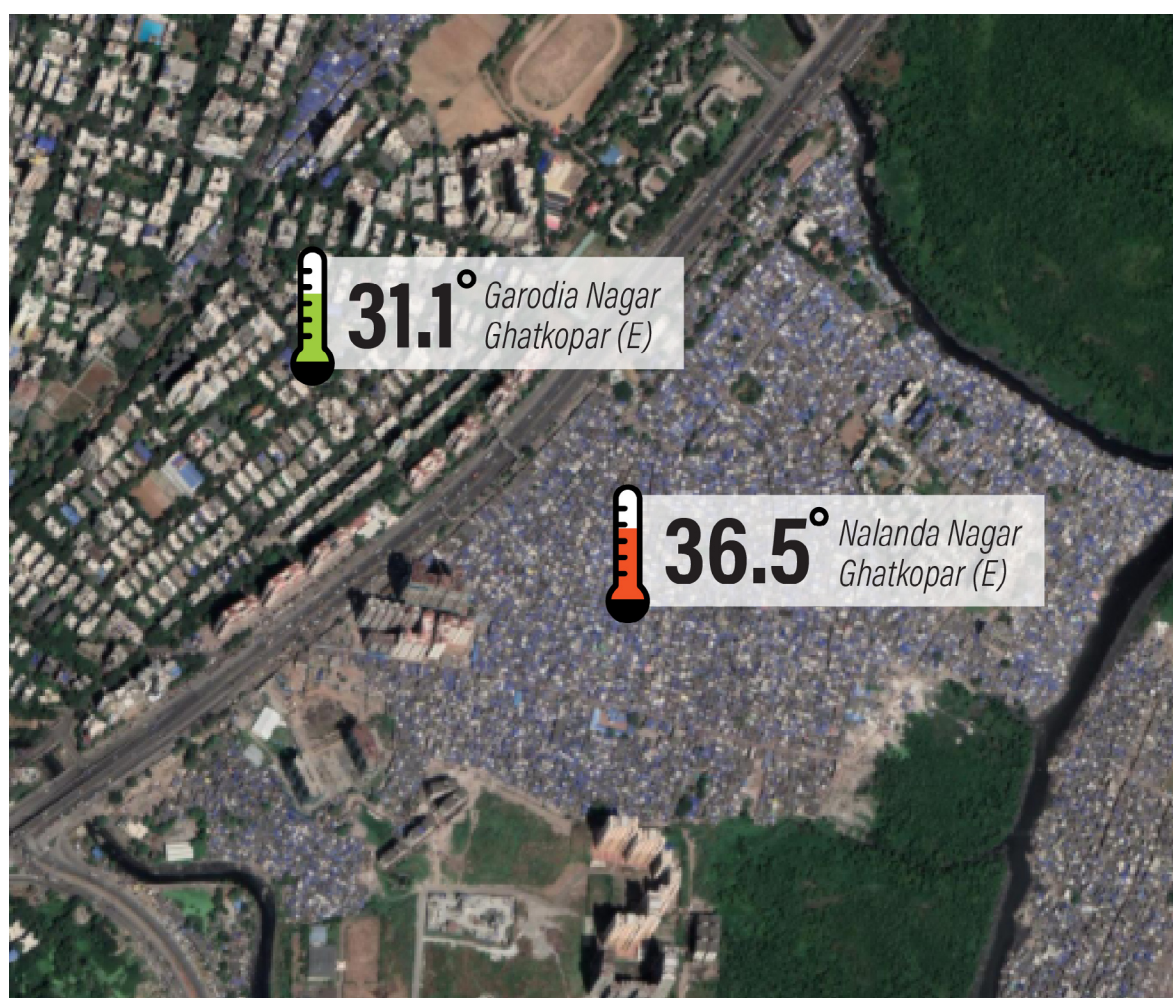
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FIGURE 1. Temperature differences seen in the city



Source: WRI India using Landsat (USGS) of October (2017–19); Maxar Technologies, Google Earth.

As a climate adaptation strategy, the city has pledged to increase its green cover to 40 percent by 2030, ensure equitable access to green open spaces, and restore as well as enhance biodiversity.

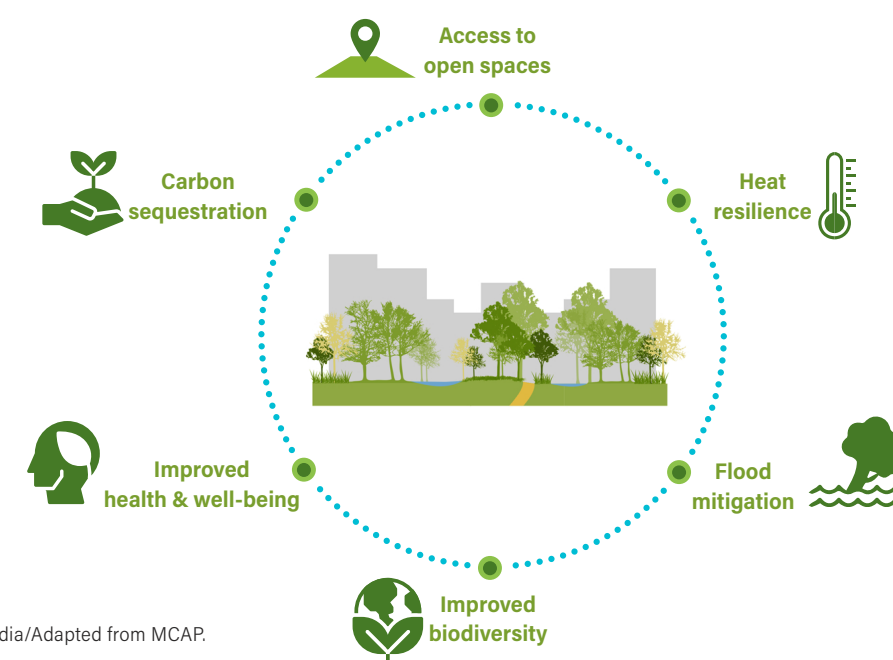
In pursuit of this goal, World Resources Institute India; the Garden Department and Tree Authority, Brihanmumbai Municipal Corporation (BMC); Tata Institute of Social Sciences (TISS); and Youth for Unity and Voluntary Action (YUVA) have been piloting green strategies in vulnerable neighborhoods by incorporating citizen science. This project is a part of the Cities4Forests initiative funded by the Caterpillar Foundation. The sites for greening are located in informal settlements and resettlement colonies in M/E and P/N wards, which are most vulnerable to heat and flood risks.

As a part of this ongoing work, a stakeholder workshop titled “Nurturing Vegetation in Mumbai: Community Based Adaptation in Vulnerable Neighbourhoods” was conducted on December 14 and 15, 2022.

## PURPOSE OF THE WORKSHOP

The workshop was intended to develop coordinated and collaborative approaches necessary to implement greening solutions for long-term climate and community resilience. Over two days, citizen representatives, the government, subject matter experts, NGOs, community groups, and solution providers contributed to discussions on the challenges and best practices related to nurturing greening in vulnerable neighborhoods.

FIGURE 2. Co-benefits of urban greening



Source: WRI India/Adapted from MCAP.

## CHALLENGES

The project partners have observed several challenges while choosing appropriate sites and proposing programs to implement greening. The broad challenges are as follows:

- **Lack of access to open spaces and green cover**  
Dense, overcrowded settlements and lack of open spaces have been responsible for a rise in respiratory disorders (Doctors for You and MMR-EIS 2018). Mosquito breeding due to waterlogging in the available common open spaces has led to vector-borne diseases (YUVA 2019). The challenge is to find potential sites for increasing multi-use open spaces and prioritizing the creation of green areas.
- **Lack of awareness of scientific and ecological approaches to greening**  
Greening initiatives by the community have failed in the past owing to the lack of scientific approaches to the choice of vegetation and the techniques used to sustain them. The challenge is to engage residents through workshops, meetings, educational programs in schools, and awareness campaigns to build collective knowledge and capacities regarding scientific methods of planting.
- **Complexity of upgrading basic infrastructure while maintaining greening**  
Problems such as dumping solid waste, mixing of sewage and storm water in common drainage channels, and lack of water supply in vulnerable neighborhoods are common (YUVA 2019). The challenge is to address these problems through systemic improvements in basic service provision and incorporation of integrated greening solutions.
- **Issues of inclusivity and community engagement for long-term ownership**  
Residents lose faith in the local municipal bodies when basic services are not adequately provided. The interests of marginalized communities, including children, women, senior citizens, and people with disabilities are usually ignored in design solutions. The challenge is to create a platform for ownership that prioritizes their needs to ensure true engagement and inclusivity.

To address these challenges, the workshop was divided into five sessions.



**FIGURE 3. Lal Maidan in Lallubhai compound, illustrating waterlogging and solid waste management issues affecting access to open spaces**



Source: Youth for Unity and Voluntary Action (YUVA).

## LEARNINGS AND OPPORTUNITIES FOR ACTION

### SESSION 1: What is the status of green infrastructure in priority zones within Mumbai?

A systematic approach must be taken to identify neighborhoods that are most prone to climate risks. This includes mapping existing open spaces, green cover, adjacent natural ecosystems, UHIs, and local issues. Tools and systems are needed to analyze this data for informed action on the ground. This session threw light on existing and potential technologies, tools, and procedures that can help prioritize areas for action.

Based on the framework adopted for the study on an open spaces in Mumbai commissioned by the Mumbai Metropolitan Region-Environment Improvement Society (MMR-EIS) in 2015 and executed by Adarkar and Associates, founder Neera Adarkar observed that a database of spatially mapped open spaces that includes various layers of accessibility, usage, environmental features, state of maintenance, and inclusivity can serve as an important information source for decision-making on improving open spaces in priority areas (Adarkar Associates and MMR-EIS 2015).

Through another study on the accessibility of informal settlements to open spaces (Ekbote 2019), Abhijit Ekbote, geographic information systems (GIS) consultant, recommended using open-source tools such as Open Data Kit (ODK) to create dynamic dashboards using spatial layers to query complex datasets regarding aspects of open spaces such as ownership of undeveloped parks and areas with the least accessibility to gardens. The discussion showed how such methods can be integrated with informed action to improve accessibility at the planning and policy levels.

A zoomed-in view on the status of green open spaces in M/Ward by Avinash Kaur from TISS revealed the various health risks in residential neighborhoods due to pollution from dumping grounds, biomedical incinerators, and chemical factories, along with insufficient lighting and ventilation in informal settlements (Bhide n.d.). Micro-spaces within informal settlements were highlighted as potential sites for greening, conflict resolution, livelihood creation, solid waste management, and resilience building.

The Garden Department agreed to create a dashboard, which they informed is in the pipeline, to map open spaces, accessibility, amenities, and first aid and maternity services. Hiren Daftardar, Ex-Deputy Chief Planner, Development Plan, BMC, explained that apart from the open space reservations shown in the Mumbai Development Plan DP 2034, there are several instruments in the Development Control and Promotion Regulation 2034 (i.e., DCPR 2034; [Municipal Corporation of Greater Mumbai 2018]) that can help achieve the benchmark of 4 square meters per person allocated in DP 2034; that is, when developing plots larger than 4,000 square meters, a certain percentage needs to be allocated for open spaces, which can contribute to the pool of open spaces and help the BMC achieve the benchmark. Open spaces of various scales that have been handed over to the Garden Department can be designed for different ages groups and purposes. Amita Bhide, Professor, TISS, emphasized that the knowledge of common citizens about local biodiversity can be used to make them custodians of their open spaces, and the BMC needs to be open to constant feedback in this regard. It was advocated that open spaces should be used to manage vulnerability to hazards, and complex parameters such as permeability, publicness, and biodiversity should be incorporated in design to improve green infrastructure and access its status.

#### Opportunities for action:

- Detailed parameters such as biodiversity, publicness, accessibility, and permeability need to be considered while making an inventory of open spaces and integrated in the dashboard. This will facilitate decision-making on which wards need priority action for improving green cover and open spaces.
- Due to inadequacy of open spaces in informal settlements, micro-spaces should be identified as potential areas for greening and for fulfilling the multiple open-space needs of the community.
- The local knowledge of citizens about greening should be used within existing institutional systems for neighborhood-level interventions.
- Different scales of open spaces should be acknowledged while designing parks to serve different age groups and populations.

### SESSION 2: What are the scientific approaches, methods, and typologies of greening that can be adopted in vulnerable neighborhoods?

An ecological approach toward greening is most effective for climate adaptation. Scientific methods to increase biodiversity and carbon sequestration, reduce heat and air pollution, and maintain green cover were discussed in this session.

Kirti Wani from Oikos suggested processes and principles to ensure ecologically sensitive decision-making to enhance biodiversity, reduce heat stress, and increase the permeability of the ground in Mumbai. The process includes conducting detailed ecological surveys to identify the current diversity, mapping habitats, procuring a diverse selection of native species (Oikos for Ecological Services n.d.) to enhance biodiversity, and adopting circular approaches when working with soil, water, and waste. She strongly emphasized adopting greening approaches/typologies that suit specific ecological zones such as forests, mangroves, riparian areas, street avenues, and parks.



**FIGURE 4. Food forest layout implemented by Earth4Ever, following the principles of syntropic agroforestry**



Source: Earth4Ever.

The Earth4Ever team presented examples of permaculture food forests implemented in Mumbai and Wada, highlighting regenerative farming systems and sustainable habitat strategies that also increase local biodiversity (see Figure 4). They introduced scientific methods that focused on soil rejuvenation, multi-layered intensive planting, water harvesting through trenches, and the creation of zero-waste cyclical systems. The indigenous community uses this method to cultivate cash crops, herbs, and fruit trees, and obtain ecological and livelihood benefits.

The panel session opened with discussions about land restoration through traditional and scientific methods, the challenges encountered in scaling up best practices, and integration of local knowledge and greening practices in greening solutions. Owing to the limited availability of open spaces for greening, micro-greening initiatives by the community were discussed as an alternative. The Garden Department stated that guidelines for micro-planting in homes, podium gardens, and terrace gardens were currently being formulated. These would include methods of species selection, maintenance and feasibility assessment of available spaces, and sourcing materials. The roles of multiple agencies need to be integrated when deciding tree species, especially along roads, to ensure minimal damage to vegetation. Dr. Shubhalaxmi Vaylure, Director of Ladybird Environmental Consulting, emphasized the need to create biodiversity hubs, small spaces for biodiversity in the city with a focus on birds, bees, butterflies, and insect life. Existing micro-greening initiatives such as kitchen gardens could be scaled up to attract biodiversity within the city space. Adarsh Reddy, Deputy Conservator of Forests, Mumbai Mangrove Conservation Unit and Mangrove Cell, explained that when mangroves grow organically in government land, the area is notified as forest land but this is not applicable for private land. A state executive committee with top bureaucrats is responsible for grievance redressal and overseeing mangrove conservation, eco-tourism promotion, and livelihoods.

#### Opportunities for action:

- City planting should incorporate a diverse selection of species and typologies of native plants appropriate to the local climate and ecological zone/habitats, identified through periodic ecological surveys.
- To adopt a circular approach to greening through reduced resource utilization, local materials should be used and waste generated on-site should be recycled for mulching and composting.
- Ecological education, awareness, and capacity building for scientific greening should be ramped up.
- Various efforts are needed to increase biodiversity in the city by raising citizens' awareness; scaling up kitchen gardens; planting appropriate non-monoculture, native, and non-invasive species appropriate for each ecological zone; creating biodiverse food forests; and increasing livelihood opportunities.
- Clarifications and grievances about the existing procedures of claiming inhabited lands for mangroves can be flagged to the state-level executive committee for protection of mangroves.

#### SESSION 3: How can community-based practices be embedded in local green design and governance?

Community-driven practices and community ownership of our immediate environment are needed for the long-term sustenance of vegetation. This session discussed success stories and challenges related to the adoption of decentralized people-led greening practices.

Community organizers Priya Shinde and Ashwini Desai, who are from TISS, along with project consultant Simpreet Singh, presented stories of community-led small-scale greening initiatives within M/E Ward collected over four months. They described their successes and challenges, which clarified the kind of support, resources, and training that needs to be provided for scaling-up community-led climate adaption initiatives.

Bhagwan Kesbhat, CEO of Waatavaran, demonstrated the five-month implementation of the People's Biodiversity Register (PBR) process for Bhandup Pumping Station to record the local biodiversity and make it accessible through an interactive dashboard (Waatavaran n.d.). The process included mapping the biodiversity and natural resources through community field surveys.

Anjali Karol Mohan, partner at Integrated Design, demonstrated place-based mapping, stakeholder engagement, and planning methods to develop climate adaptation actions in Bhopal, Dharwad, and Ranchi. Broader infrastructure and social concerns were documented through oral histories, site observations, and mapping of land use to understand the effect of urbanization and climate change on settlements. Low-cost nature-based greening solutions were designed in community commons to create climate resilience. There was a strong emphasis on community participation across the project stages through focus groups, discussions and co-design sessions. (MHT and INDÉ 2022b)

Ansari Shahenshah Masroor, a community organizer with YUVA, introduced the ongoing vulnerability assessment undertaken at Ambujwadi, an informal settlement in the P-North ward. The aim of the assessment is to develop local adaptations that take into account and address, in addition to climate goals, the most pressing vulnerabilities of the local population. The panel discussion focused on collective efforts to identify local biodiversity, methods of community engagement, coping mechanisms of communities toward climate adaptation, and scaling-up of community efforts with the support of the BMC and the private sector. There was a strong emphasis on ways to integrate local knowledge with greening policy/guidelines. The Garden Department described the efforts made to increase citizen participation, especially for the aftercare of plants. The Vruksha Sanjivani Abhiyan was organized for the maintenance of existing trees, and students, NGOs, and other residents participated in the conservation efforts (The Indian Express 2022).



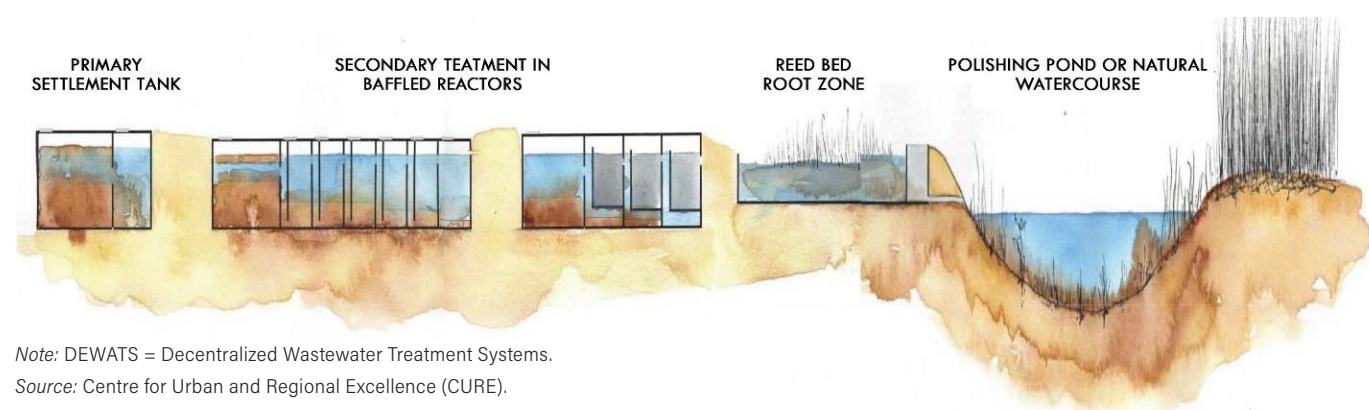
**Opportunities for action:**

- Urban infrastructure design and planning needs to be adapted to the specific needs of informal settlements.
- Existing statutory tools such as PBRs are necessary for preparing local biodiversity plans, monitoring natural resources, and improving sustainable livelihoods.
- Coordinated and collaborative approaches by different stakeholder and community groups are required to reduce communication gaps and adopt more holistic approaches to greening. Actions around joint resource management with communities and institutions could be further explored.
- Local knowledge should be used within existing institutional systems to encourage feedback on neighborhood-level interventions.
- Training sessions to scale up and support community-led greening initiatives should be conducted. A database of plant species suitable for micro-greening and methods of planting based on limited resource availability could be created to formalize the knowledge gained (an example is the Urban Thottam platform (Urban Thottam n.d.) created by the Chennai Resilience Centre [CRC]).
- Possibilities for decentralized engagement of the BMC with local community groups and NGOs should be explored to understand greening perceptions, build relationships with the community, and share responsibilities.
- Breaking down climate science into easily understandable concepts translated into local languages and distributed across communities can help empower communities to build resilient systems (MHT and INDÉ 2022a).

**SESSION 4: How can water-positive solutions, solid waste management, groundwater recharge, and food security be addressed through greening?**

The most pressing infrastructural problems in vulnerable neighborhoods cannot be ignored while conserving or increasing green cover. This session looked at the possibilities of integrating hybrid infrastructure solutions while addressing greening.

**FIGURE 5. DEWATS system implemented by the Centre for Urban and Regional Excellence (CURE)**



Note: DEWATS = Decentralized Wastewater Treatment Systems.  
Source: Centre for Urban and Regional Excellence (CURE).

Siddharth Pandey from the Centre for Urban and Regional Excellence (CURE) shared best practice methods for Decentralized Wastewater Treatment Systems (DEWATS) (see Figure 5) implemented in various cities, the one in Agra for a settlement close to the Taj Mahal being especially noteworthy. The practice adopted an ecological, collective approach and localized solutions as principles for creating holistic

development. The DEWATS system was used to improve sanitation and toilets. Treated water was used for farming, which contributed to livelihoods and created a clean locality for promoting tourism. It was emphasized that holistic community-driven approaches are long-drawn-out processes that need to be divided into short-, medium-, and long-term goals.

Biomimicry Technologies Pvt. Ltd proposed installing an Urban Pure mini solar sewage treatment plant (STP) to recycle wastewater for use in city parks. This system, which is compliant with the Central Pollution Control Board of India (CPCB) standards, can recycle 24,000 liters daily and eliminate the existing dependence on groundwater for irrigation in parks.

**FIGURE 6. (Left) Community garden providing livelihood for Self Help Group (SHG) women and (right) greens used in mid-day meals at an anganwadi**



Note: Anganwadis are child care centers that were started by the Indian government in 1975 as a part of the Integrated Child Development Services program to combat child hunger and malnutrition.  
Source: Chennai Resilience Centre.

The Chennai Resilience Centre presented a range of decentralized greening efforts through its urban farming initiatives (see Figure 6). They help set up, maintain, and monitor vegetable gardens in homeless shelters, anganwadis, schools, and resettlement colonies/poor neighborhoods. The gardens offer a range of benefits including access into nutritious food, livelihood opportunities, improved thermal comfort, and overall physical and mental well-being. As an example of environmentally responsible practices, the vegetable gardens act as critical spaces of learning, innovation, and behavioral change, while promoting the practices of composting and recycling of wastewater and waste material. The CRC also identified government schemes that can promote and incentivize garden champions who have a long-term vision for their community and environment (Roy and Ayyangar 2023).

Kartiki Naik from WRI India explained that the impacts of climate change such as groundwater depletion and flooding, which vulnerable communities are already exposed to, will be worsened by deficiencies in provisioning services such as sewage and water supply. In terms of greening, collaboration between the Water Supply, Road & Traffic, and Garden departments is needed to ensure usage of decentralized wastewater usage for irrigation instead of freshwater tankers. Platforms are needed to collect data and plan for water positivity systematically rather than rushing to implement ad hoc solutions.

Jyoti Mhapsekar, Founder Member, Stree Mukti Sanghatana, who works with ragpickers and supports them through skill development, threw light on the various livelihood challenges they face due to the centralized system of waste management in the city. The emphasis was on addressing the requirements and challenges of women ragpickers. Even though decentralized waste management is a best practice, cooperation from



citizens and enforcement by the government are lacking. The efforts of the ragpickers to convert wet waste into compost are undermined because the product finds neither a market nor acceptance by the Solid Waste Management (SWM) and Garden departments. The BMC should acknowledge this service by the waste pickers, incentivize their efforts, and set affordable rates for testing compost so that the quality of compost produced by ragpickers can be upgraded.

Dnyanadev Mundhe, Deputy Superintendent of Gardens, BMC, explained the best practices in waste recycling currently being carried out in gardens, zoos, and waste-to-energy plants. Former officer on Special Duty, Anand Jagtap, highlighted the caste system as one of the biggest barriers in bringing about behavioral changes to enforce waste segregation and decentralized waste management. An integrated approach by the BMC and technical/research institutes is important for a systemic approach to waste management.

Prasanna Jogdeo, Founder, Lemnion Green Solutions Pvt. Ltd, shed light on the importance of an ecosystems approach to waterbody rejuvenation and greening. Its practice showed how sewage water, SWM, and community behavior were integrated holistically in natural solutions for river rejuvenation in Pune.

#### Opportunities for action:

- Decentralized systems for sewage water treatment and recycling for irrigation in parks or urban farming are good practices that eliminate dependence on fresh water.
- Recycling and reuse of water at the building, cluster, and watershed scale to meet short-, medium- and long-term water needs should be explored when implementing landscape interventions.
- The operational and maintenance aspects of smart technologies should be considered in the design process. For long-term sustenance, solutions that are nature-based, require minimal maintenance protocols, and can be operated by local residents should be prioritized.
- Greening champions and stewards from the local community should be supported by government schemes that promote and fund their engagement in such programs.
- Integrated, natural, holistic, and data-driven solutions with sustainable livelihoods should be encouraged for the long-term sustenance of any nature-based solution or greening intervention.
- To ensure livelihood creation through composting or greening processes adopted by the poorer sections of society, economic models, incentives, and government support are imperative.

## SESSION 5: Rooftop greening—Successes and failures

The scarcity of open spaces in the city has led to efforts to provide green roofs, roof gardens, and rooftop farming in Mumbai. Citizens, solution providers, building experts, and government bodies have contributed to projects and policies for increasing green cover on rooftops. However, challenges to long-term implementation and scale-up of best practices hamper these efforts. This session focused on jointly finding solutions to the problems confronting rooftop greening in Mumbai.

Julius Rego, a rooftop farming expert with 20 years of experience, gave insights into the importance of good soil preparation, low-cost recyclable lightweight containers for planting on rooftops, and volunteer support for the upkeep of vegetation. He referred to farming techniques from *The One-Straw Revolution*, a book by Masanobu Fukuoka, who regarded natural methods of farming as a means for human development (Fukuoka, 2009).

Robert Fernandes, Landscape Consultant, K. Raheja Corporation, shared an example of green roof practice in new buildings through a project executed in Pune. The following standard operating procedure (SOP) for mainstreaming green roofs in new buildings was presented:

- For buildings with a plot area exceeding 1,000 square meters, landscape design and structural designs (with live loads) must be submitted along with the building approval documents.
- The percentage of softscape and hardscape in the terrace/podium should be specified.
- Sunken slab should take the load of soil and irrigation. The department should specify the load limits.
- Waterproofing and strengthening should be mandatory.
- Native plants and biodiversity should be prioritized in species selection.
- The building approval should include sign-off by the Garden Department to ensure that all these steps are executed properly.

The Superintendent of the Garden Department, Jeetendra Pardeshi, indicated that rooftop greening and green roofs will be the future of the city, fulfilling the need for open spaces and providing economic benefits. Given the vast variation in building types, income groups, and the use of terraces, varied green roof initiatives will have to be planned on a case-by-case basis.

The Sub-Engineer from the Development Plan Department, Sandeep Mane, stated that the Development Control Regulations permit rooftop greening/farming in Regulation (37) (22). However, there is no SOP that ensures it will be scientifically done. Regulations that ensure assessment of the safety of the structure and waterproofing will now be added to the policy.

There was a discussion on cracks in cement roofs caused by heat, later leading to seepage and leakage of water through the building. However, there is evidence that suggests greening on roofs can prevent the direct heating of cement terraces, thus reducing cracks and leakages in cement roofs.

It was pointed out that green roofs and solar panels compete for space on terraces for the tax incentives offered by the government to promote them. The panel opined that green roofs are more valuable as a sustainable intervention for terraces.

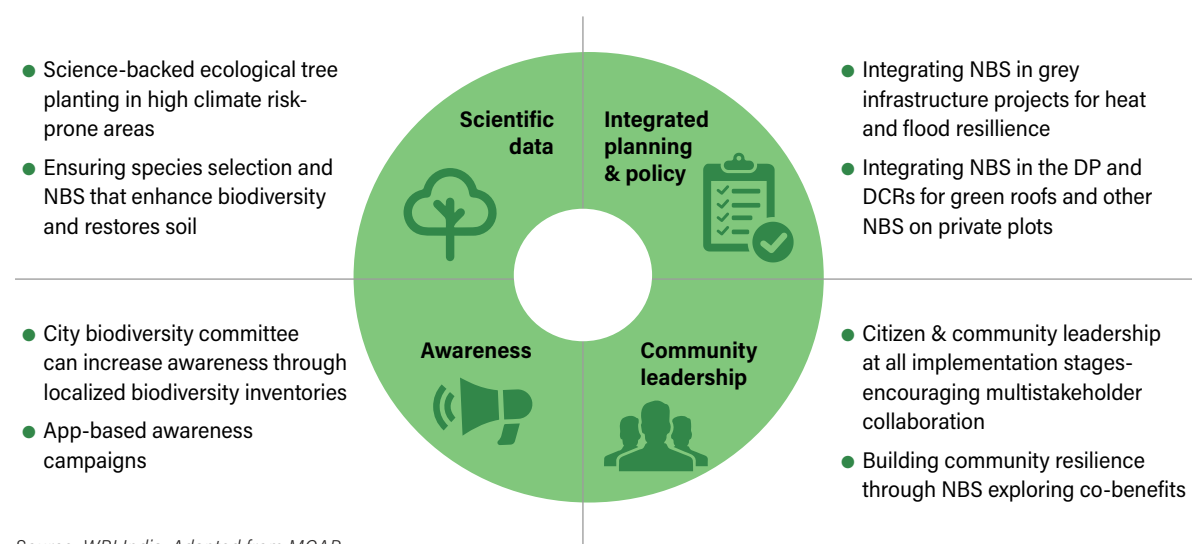
Sahil Kanekar, WRI India, said that percolation of rainwater on green rooftops was a service to the city because it would reduce the runoff coefficient by an estimated 20 percent, reducing the burden on the city's stormwater systems.

#### Opportunities for action:

- Greening as retrofits in existing buildings and in proposed buildings needs a different approach and hence different SOPs integrated with the Development Control Regulations.
- The Garden Department must be consulted for green roof approvals in new buildings to ensure that proper methods are adopted.
- Green interventions on existing terraces need a varied approach based on their structural capacity, type of waterproofing, usage, and arrangement for maintenance.
- Micro-greening guidelines in balconies, podiums, and terraces can be made available to common citizens.



FIGURE 7. Greening approach for Mumbai.



Source: WRI India, Adapted from MCAP

## THE WAY FORWARD

The key objective of the workshop was to discuss ways to develop sustainable strategies for greening in vulnerable neighborhoods through community-driven approaches for climate resilience. As the outcomes of the workshop suggested, a multi-stakeholder approach is essential to achieve this goal. Going ahead, we look forward to collaboratively work toward the following:

- Develop detailed environmental and social parameters for the inventory of open spaces shared through an interactive dashboard (participatory dashboard for aftercare of vegetation).
- Bring together stakeholders such as government agencies, NGOs, community groups, and experts on a common platform to share knowledge, identify best practices, and promote partnerships through workshops, committees, webinars, and forums.
- Enable coordinated efforts between the local government, community groups, NGOs, and subject-matter experts to implement low-cost, low-maintenance, place-based greening solutions and develop collaborative methods to sustain them.
- Engage with the community and create partnerships with local NGOs to recognize indigenous knowledge, local greening practices, and priority areas for greening.
- Develop capacity-building, awareness, and training programs to communicate scientific planting knowledge and maintenance mechanisms with the aim of empowering communities to scale up greening projects.
- Share guidelines for aspects such as space identification, soil conditioning and nutrition, plant selection, environmental considerations, smart water use, pots and planters for micro-level greening initiatives, and provisioning resources to scale them up at the household/society scale.
- Institutionalize a scientific ecological process to be followed for landscaping within recreation grounds–playground (RG–PG) plots and open areas in the city in collaboration with a biodiversity/ecology expert.
- Examine holistic greening solutions that also integrate basic infrastructure needs in poorer neighborhoods, and find means to incentivize participation and create livelihood practices associated with greening.
- Increase coordination and collaboration between different government agencies and departments, such as Solid Waste Management, Storm Water Drainage, and Garden, to deliver these integrated greening infrastructure solutions.

## APPENDIX

Presentation pdfs and the plant list can be referred to from:

[https://onewri-my.sharepoint.com/:f/g/personal/priya\\_narayanan\\_wri\\_org/EuuTrGRvEKZHR\\_XhiZunwukBXGDcCeGYkdnHgiCgJW1nTg?e=NnjB3Y](https://onewri-my.sharepoint.com/:f/g/personal/priya_narayanan_wri_org/EuuTrGRvEKZHR_XhiZunwukBXGDcCeGYkdnHgiCgJW1nTg?e=NnjB3Y)

## LIST OF PRESENTERS AND PANELISTS

### INAUGURAL SESSION:

**Jeetendra Pardeshi**, Superintendent of Gardens and Tree Officer, BMC

### CONTEXT SETTING FOR WORKSHOP:

**Lubaina Rangwala**, Program Head, Urban Development and Resilience, WRI India

**Deepti Talpade**, Program Manager, Nature-Based Solutions and Urban Greening, WRI India

**Shruti Maliwar**, Senior Project Associate, Urban Resilience, WRI India

**Manasi Pinto**, Senior Project Associate, Youth for Unity and Voluntary Action (YUVA)

**Avinash Kaur**, Program Manager, Tata Institute of Social Sciences (TISS)

### SESSION 1: What is the status of green infrastructure in priority zones within Mumbai?

**Neera Adarkar**, Founder, Adarkar & Associates, Founding Trustee & Chairperson, School of Environment and Architecture (SEA)

**Abhijit Ekbote**, GIS Consultant, Urban Designer

**Avinash Kaur**, Program Manager, TISS

**Jeetendra Pardeshi**, Superintendent of Gardens and Tree Officer

**Hiren Daftardar**, Ex-Deputy Chief Planner, Development Plan, BMC

**Dr. Amita Bhide**, Dean, School of Habitat Studies, TISS

**Lubaina Rangwala**, Program Head, Urban Development, WRI India (Moderator)

### SESSION 2: What are the scientific approaches, methods, and typologies of greening that can be adopted in vulnerable neighborhoods?

**Kirti Wani**, Oikos for Ecological Services

**Aparna Bangia, Komal Thakur, and Priti Bhosale**, Earth4Ever

**Dnyandev Mundhe**, Deputy Superintendent of Gardens (Tree Authority), Garden Department, BMC

**Dr. Shubhalaxmi Vaylure**, Director, Ladybird Environmental Consulting

**Adarsh Reddy**, Deputy Conservator of Forests, Mumbai Mangrove Conservation Unit and Mangrove Cell

**Dr. Priya Narayanan**, Program Manager, WRI India (Moderator)



**SESSION 3: How can community-based practices be embedded in local green design and governance?****Priya Shinde, Ashwini Desai and Simpreet Singh**, TISS**Bhagwan Kesbhat**, Founder and CEO, Waatavaran**Dr. Anjali Karol Mohan**, Partner, Integrated Design: INDÉ**Vikas Waghmare and Ansari Shahenshah Masroor**, Community Organizers, YUVA**Dnyandev Mundhe**, Deputy Superintendent of Gardens, Garden Department, BMC**Mehali Patel**, Director, CRISIL Risk and Infrastructure Ltd.**Roshni Nuggehalli**, Executive Director, YUVA (Moderator)**SESSION 4: How can water-positive solutions, solid waste management, ground water recharge, and food security be addressed through greening?****Siddharth Pandey**, Associate Director, Centre for Urban and Regional Excellence (CURE)**Onkar Tiwari**, Director, Biomimicry Technologies Pvt. Ltd.**Parama Roy**, M&E Advisor at Chennai Resilience Centre**Akshaya Ayyangar**, Senior Research Associate, Chennai Resilience Centre**Dr. Kartiki Naik**, Program Manager, Water Management, WRI India**Jyoti Mhapsekar**, Founder Member, Stree Mukti Sanghatana**Dr. Prasanna Jogdeo**, Founder, Lemnion Green Solutions Pvt. Ltd.**Deepti Talpade**, Program Manager, Nature Based Solutions, WRI India (Moderator)**SESSION 5: Rooftop greening—Successes and failures****Julius Rego**, Rooftop farming expert**Robert Fernandes**, Landscape Consultant, K. Raheja Corp.**Sandeep Mane**, Sub-Engineer, Development Plan Department**Deepti Talpade**, Program Manager, Nature Based Solutions, WRI India (Moderator)**CONTRIBUTIONS TOWARDS WORKSHOP COORDINATION**

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COMMUNICATIONS:

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COPYEDITING FOR PROCEEDINGS:

**Santosh Matthew Paul****LIST OF ABBREVIATIONS****MMR-EIS:** Mumbai Metropolitan Region–Environment Improvement Society**BMC:** Brihanmumbai Municipal Corporation**WRI:** World Resources Institute**TISS:** Tata Institute of Social Sciences**YUVA:** Youth for Unity and Voluntary Action**NBS:** Nature Based Solutions**NGO:** Non-governmental Organization**CURE:** Centre for Regional and Urban Excellence**CRC:** Chennai Resilience Centre**CPCB:** Central Pollution Control Board**RG:** Recreation Ground**PG:** Playground**SOP:** Standard Operating Procedure**DEWATS:** Decentralized Wastewater Treatment Systems**SWM:** Solid Waste Management**SWD:** Storm Water Drainage**DCPR:** Development Control and Promotion Regulation**DP:** Development Plan



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## ABOUT WRI INDIA

WRI India is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

### Our challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

### Our vision

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

### Our approach

#### COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

#### CHANGE IT

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

#### SCALE IT

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.



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