

# GREENING MUMBAI

CITIZEN'S HANDBOOK FOR GREENING INITIATIVES  
from balcony gardens to large scale plots

 मुंबई  
CLIMATE ACTION PLAN



Cities4Forests



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### Feedback form

Scan the QR code or [click here](#) to access the feedback form for the 'GREENING MUMBAI- Citizen's Handbook for Greening Initiatives: from balcony gardens to large spaces' manual.

The form is open for suggestions from December 18 to February 10, 2023.

## Foreword

As the Superintendent of Gardens and Tree Officer, BMC, I am proud to present 'GREENING MUMBAI- Citizen's Handbook for Greening Initiatives: from balcony gardens to large spaces'. It is first of its kind handbook by the BMC to encourage greening at the grassroots level.

The objective of the manual is to help citizens with scientific greening practices and solutions such that the city adopts a culture of planting with a plan, to contribute to the biodiversity. This is in alignment with the climate adaptation and mitigation efforts that the BMC is adopting for overall climate resilience.

Having spread across 483.14 sq.km. area and servicing the needs of 128.7 lakh population, BMC through its garden department provides services to maintain around 1068 recreational, sports, amenities, green & open spaces in Mumbai. It has maintained 3 million trees which amount to 4.6 MT carbon sequestered. Mumbai has been recognized as the Tree City of the world in 2022 by the Arbor Day Foundation and United Nations Food and Agriculture Organization, for fulfilling responsibilities of tree care, setting rules to govern urban forest, tree management, maintaining inventory of local tree assets, allocating resources for tree management plan and organizing annual tree festival to educate citizens.

Mumbai's Garden Department has received appreciation letter from Counsel General Japan for successful implementation of Miyawaki techniques: a Japanese method to create dense native forests, in a short time, in limited space. It has received The CSR Journal Excellence Award 2021 for Sustainable Urban Innovations for Green Initiatives and Earth Care Award 2021 from JSW-Times of India group as 'Enablers for Urban centered Climate Change Management'.

In one of many such efforts of increasing green cover in Mumbai, the manual aims to reach out to individuals, cooperative societies, community-based organisations, NGOs, RWAs, corporates and institutions, thereby creating an enabling environment for achieving scientific greening at scale. The manual introduces greening practices at three scales depending on the area available to the citizens- small, medium, and large (S-M-L) at household, society, and neighborhood level.

I thank my team at the Garden department and Tree Authority for contributing to this manual. My heartfelt gratitude to the WRI India team for their input and for making the manual a collaborative effort from various subject matter experts, community representatives, academic institutions and government departments.

**Shri. Jeetendra Pardeshi**

*Superintendent of Gardens and Tree Officer,  
Gardens Department,  
Brihanmumbai Municipal Corporation*

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## **oikos for ecological services**

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## **References from the following handbooks and website have been used throughout this manual**

Urban Greening Guidelines, 2014<sup>2</sup>  
by Town and Country Planning Organisation, Ministry of Urban Development, Government of India

Lecture Notes- 26th Exhibition of plants, flowers, fruits, vegetables and Workshop on Horticulture, 2023<sup>6</sup>  
by Gardens Department, BMC

Homegrown Sabzi, Urban Farming for Absolute Beginners<sup>7</sup>  
by Edible Routes | Praxis - Institute for Participatory Practices

Urban Thottam- Revitalizing Urban Food Systems (<https://urbanthottam.com/>)<sup>8</sup>  
by Chennai Resilience Centre

A Guide to set up a Natueco City Farm<sup>20</sup>  
by Urban Leaves, An initiative of Vidya Varidhi Trust

Not Really Waste (A guide to composting)<sup>31</sup>  
by Jyoti Mhapsekar, Founder, Stree Mukti Sanghatana

**Other sources referred to in the manual can be accessed through the reference section.**

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○ Applicable to all scales

● S/M scale

● M/L scale

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SMALL

MEDIUM

LARGE

Figure A: Illustration showing the small, medium, large scale spaces for greening in Mumbai



# 01

## Introduction

Increasing urbanization and concretization have resulted in urban heat islands in our city, creating pockets of extreme heat across Mumbai. With limited space for parks, gardens, and other green spaces, we need to look at alternative solutions to increase green cover.

This manual will help you look at spaces, around your home, neighborhoods and wards, where green pockets could be created. Greening practices can accelerate our efforts towards greening our city for better thermal comfort, biodiversity, and improved health.

A key priority of the Mumbai Climate Action Plan is to increase the vegetation cover and permeable surface of the city by 30-40% by the year 2030 and ensure an equitable distribution of open spaces with increase in the per capita open space to 6 sqm by 2040.<sup>1</sup>

By Ameya Khandekar

# How to use this manual?

Follow the steps below to explore the spaces that can be greened, basis user typology, planting requirements and associated governance, permissions and safety mechanisms.

## SPACE

Identify the space you have for planting and see if it is small, mid-size or large scale

## USER TYPE

Identify user type to learn more about planting requirements and the possible permissions needed

## CONTENT

Follow the relevant colour code (S/M or M/L), based on your user type and space, to find the content you need

### 1 WHAT IS THE SPACE YOU HAVE?

HOME/BUILDING		NEIGHBOURHOOD	LARGE SCALE PLOTS
Windows	Corridors	Common open spaces	Private open spaces
Balconies	Terraces	Pocket parking	Gardens
Verandahs	Society open spaces	Underused spaces	Private vacant plots
Private terraces	Compound walls		Institution lands



SMALL

MEDIUM

LARGE

S/M

M/L

### 2 WHO DOES THIS SPACE WORK FOR?

- S/M Individual
- S/M Society
- M/L S/M Community-based Organisation
- M/L S/M Non-Government Organisation
- M/L S/M Resident Welfare Groups
- M/L S/M Corporate/ Company
- M/L S/M Institution

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# What is greening in S-M-L spaces?

Greening in S-M-L spaces refers to local interventions to increase green cover and biodiversity in our city. Greening interventions by citizens at the household (balconies, windows, doors, verandas), society (terraces, play areas, left-over spaces), or neighborhood (public/private vacant undeveloped plots) level can go a long way in impacting local climate and well-being. Though these are small steps towards greening, they can impact society at large by providing certain ecological, physical, social, and economic benefits. Working across scales to ensure that spaces are integrated within the overall city landscape can enhance biodiversity, increasing ecosystem benefits.<sup>2</sup>

Citizen-led greening solutions are focused on achieving the Sustainable Development Goals of Climate Action (SDG 13), Sustainable Cities and Communities (SDG 11), and Good Health and Well-being (SDG 3).<sup>3</sup>

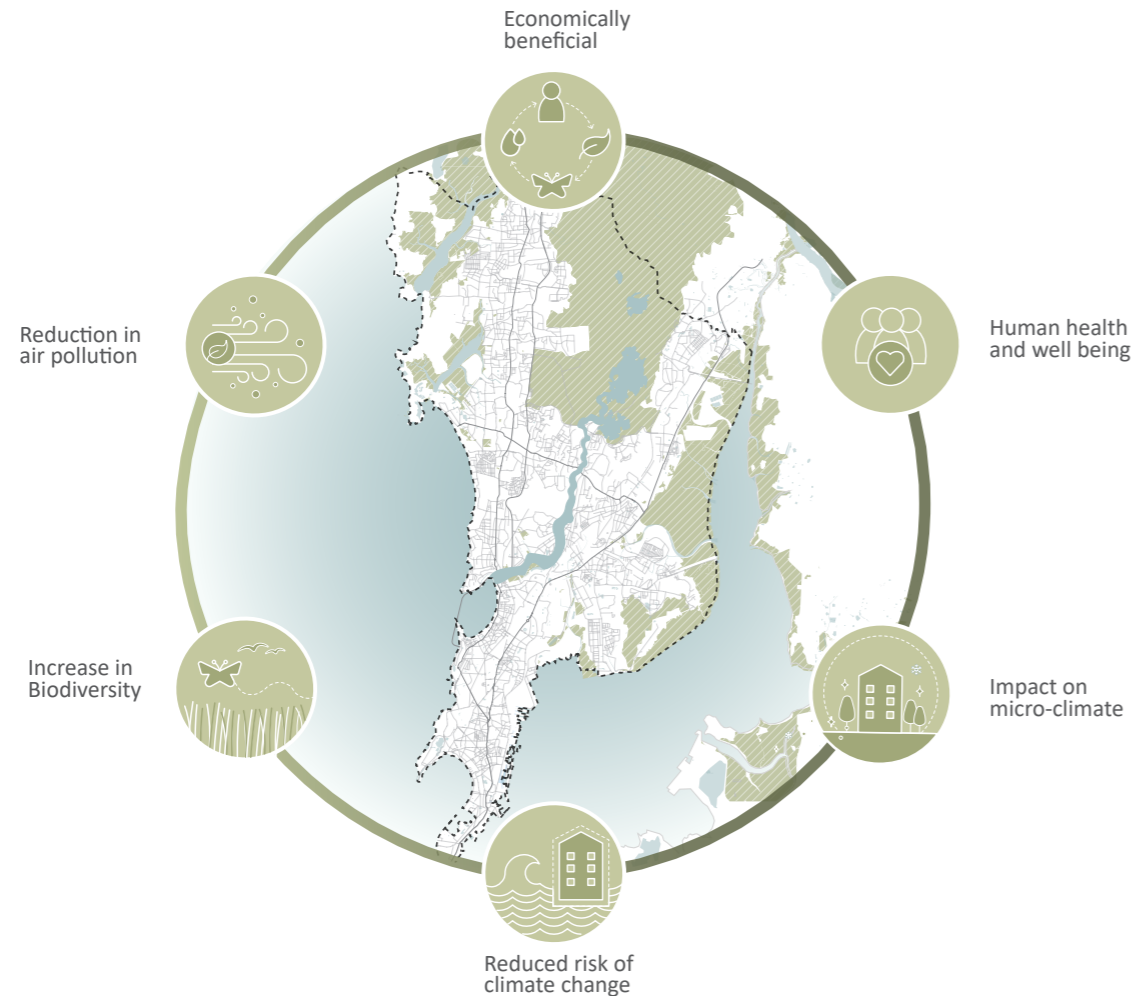


Figure 1.1: Benefits of greening

# Why this manual?

The manual aims to provide a cohesive approach to guide greening initiatives through ecological practices and citizen engagement, and to suggest feasible greening solutions for Mumbai. Different types of open spaces have been categorized into three scales for the purpose of suggesting best practices for greening.

Additionally, a step-wise approach that includes planning, design, and management methods has been suggested. A services repository for location of BMC nurseries, native plant species and FAQs for greening, has been made available.

## Before discussing how to develop greening projects, let's look at where we can do this.

This manual categorizes the kinds of spaces that can be used for greening into small, medium, and large, based on the scale and the entity taking the initiative.

Image 1A, 1B, 1C: The three categories of spaces for citizen-led greening in Mumbai



By Tata Institute of Social Sciences

**SCALE 1 | SMALL**  
Household/building level

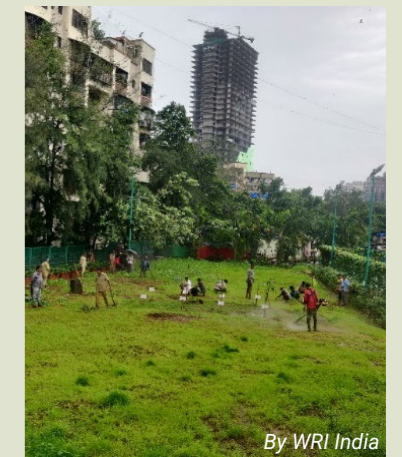
Window (Chajja, grill, sill), verandah, balcony, private terraces



By YUKR 91 / Getty Images via iStock

**SCALE 2 | MEDIUM**  
Society and neighbourhood level

Society terraces, corridors, common open spaces, pocket parking, and underused pockets of vacant spaces within neighborhoods



By WRI India

**SCALE 3 | LARGE**  
Large scale plots

Private open spaces, vacant plots, gardens, institutional lands

### DISCLAIMERS:

1. Any agencies mentioned in the manual are not authorized by the BMC, they are mentioned for reference purposes only.
2. All the processes in the manual are suggestive and are examples for best practices.
3. This manual is not an exhaustive collection of scientific methods and processes. It provides an overview of some approaches to greening.
4. Indoor plants are not discussed in this manual.
5. Greening along streets and below flyovers is not included.
6. This manual does not cover all kinds of spaces within Mumbai. It provides examples of the different scales that one may find in the city.





SMALL

MEDIUM

LARGE

# Built environment in Mumbai

Mumbai consists of different kinds of urban forms, including various housing typologies<sup>4</sup>, industrial lands, institutional plots, commercial areas, and public infrastructure. These guidelines represent approaches to greening on three broad scales – small, medium, and large – that cover various types of open spaces.

*Image 1D: Photograph of Mumbai showing different neighborhood typologies and categories of spaces for greening*

By Hardik Joshi

# 02

## How to identify small, medium, and large spaces

In this chapter, we have illustrated the different spaces where greening can be possible and is currently practiced. Such spaces can be found across Mumbai and differ in terms of their social and ecological contexts, form and design, the policies under which they took shape, and activities they are used for.



Small



Medium



Large

Google Earth Image

Icons via thenounproject.com

# SMALL

Windows, verandahs,  
balconies, private terraces

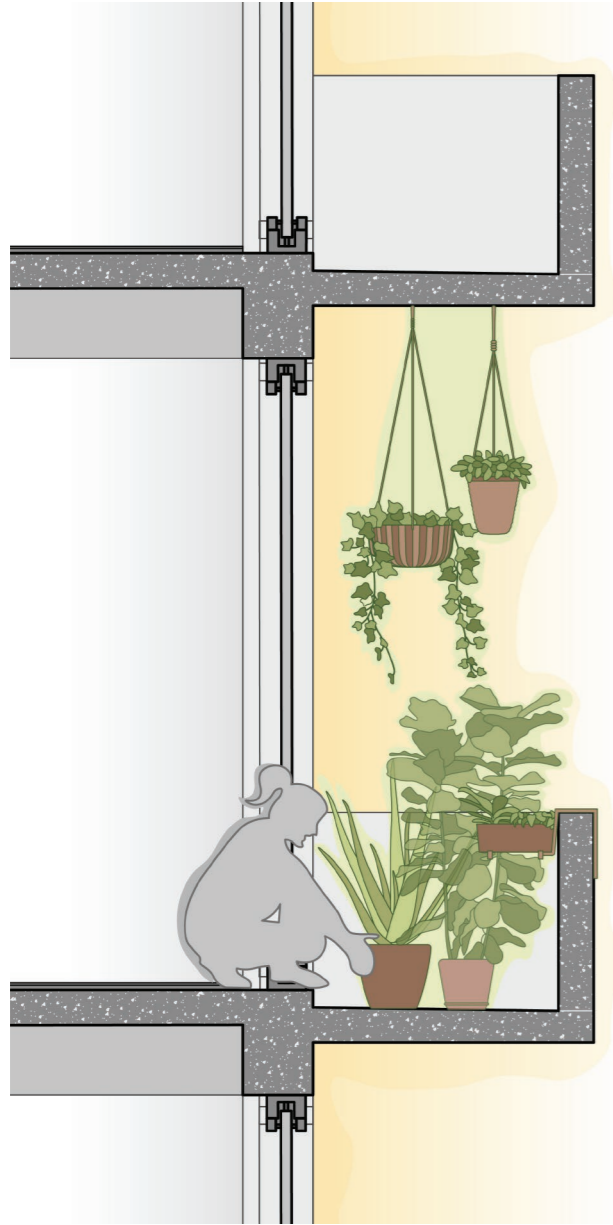


Figure 2.1 | Greening in balconies using planters, hanging pots, etc.



Image 2A: Greening in balconies using planting containers



Figure 2.2: Container planting in windows with grills projecting externally at sill level.

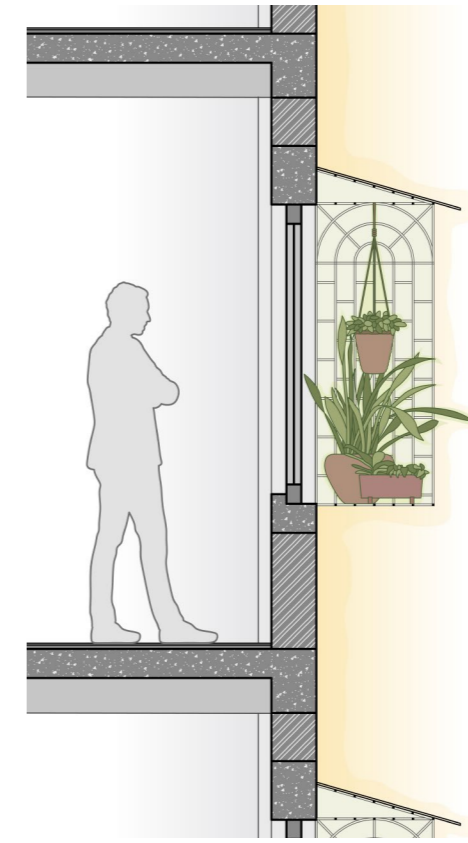


Figure 2.3: Container planting in windows with grills projecting externally at the floor level.

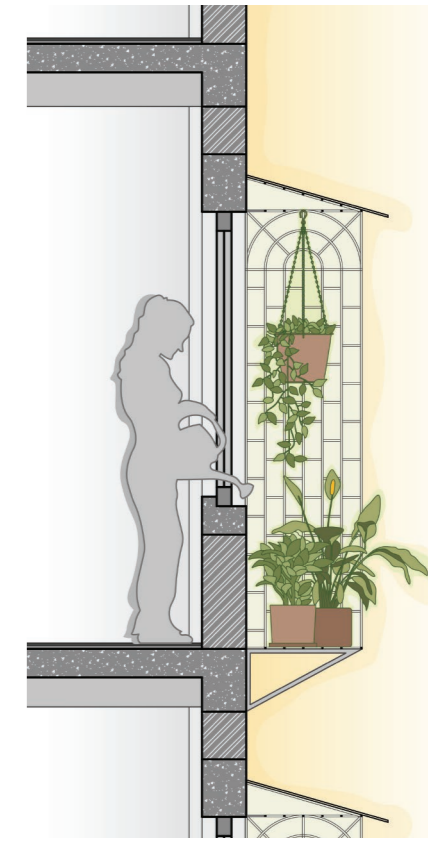


Figure 2.4: Container planting on projected windowsills



Image 2B: Container planting in windows with grills projecting externally at the floor level.



Image 2C: Container planting on projected floor slab

# MEDIUM

*Terraces and corridors within institutions and societies, compound walls, society open spaces*

- Vehicular road
- Pedestrian walkpath
- Underutilized spaces within the chawl's plotline can be greened through collective efforts
- Common corridor of a chawl can be greened using container planting

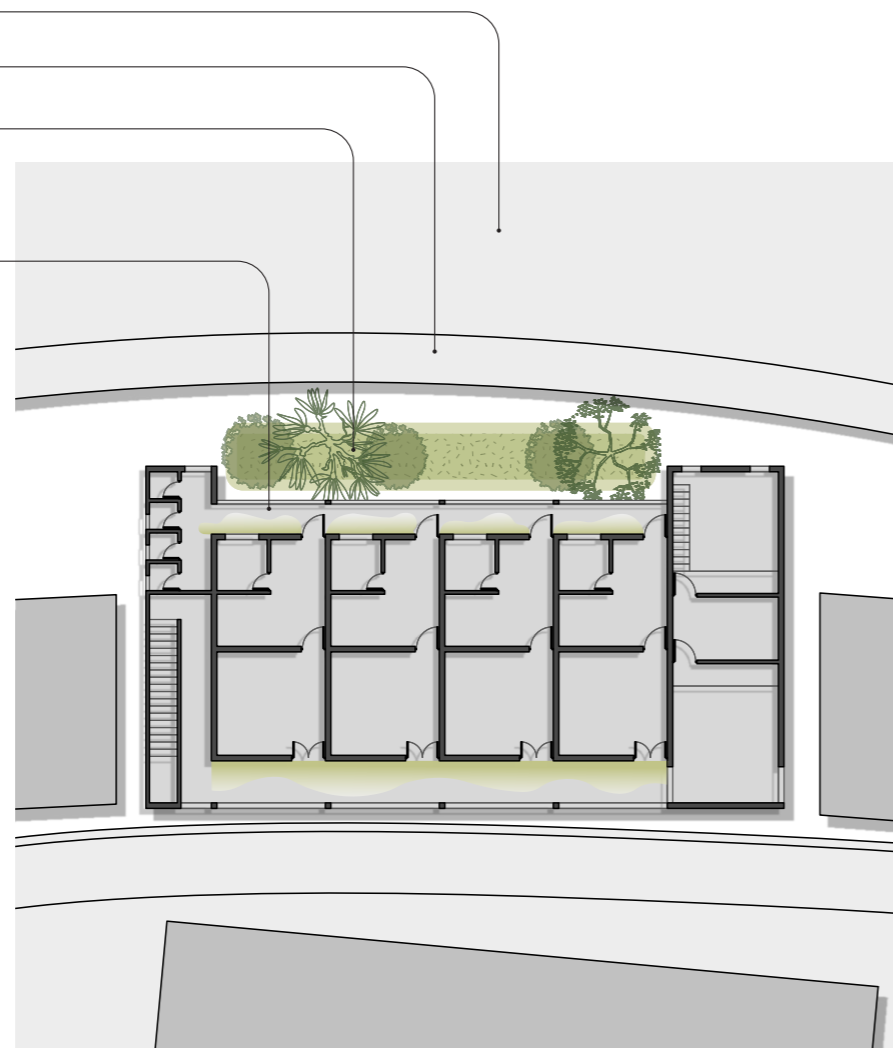


Image 2D: Greening in common corridors of a chawl in Lalbaug

Figure 2.5: Greening in common corridor spaces and open pockets in a chawl

- Greening on podiums
- Greening in society common open spaces
- Building compound wall



Image 2E: Greening on podiums in apartment complexes

Figure 2.6: Greening in common open spaces, periphery stretches and podiums in apartment complexes such as private apartments of 70s and 80s, Suburban Township Housing, high-rise apartments, etc.

# MEDIUM

Common open spaces, pocket parking, and underused pockets of vacant spaces within neighborhoods



Image 2F: Greening in shared open space in Gorai Site and Services Scheme

Figure 2.7: Greening in shared open spaces in housing typologies like Site and Services Scheme



Image 2G: Common open space in Ambojwadi currently used for parking has a potential for greening

Figure 2.8: Greening in common open spaces in an informal settlement such as Ambojwadi, P/N ward

# LARGE

*Private open spaces, gardens, vacant lands, Institution lands*



Figure 2.9: *Open spaces adjacent to mangroves such as the above highlighted plot in Mahul gaon, a Resettlement and Rehabilitation(R&R) colony, can be greened using mangrove associated species*



Figure 2.10: *Plots adjacent to forest ecosystem such as the above highlighted plot near Sanjay Gandhi National Park can be greened using forest associated plant species*



Figure 2.11: *Private open spaces in densely built areas such as Kherwadi, Bandra can be leveraged for greening using native plant species of Mumbai*



Figure 2.12: *Plots adjacent to waterbodies such as the one highlighted in the diagram at Marol adjacent to the Mithi river can be greened using water adaptive native plant species*



# 03

## Understanding Site Conditions

Whether planting by windows of homes or in larger plots, a careful assessment of the area being considered for greening can yield better insights into its favorability for planting/greening. The site conditions assessed can help determine what methods to adopt while planting, and any other essential measures needed to ensure the sustenance of the greening interventions.



Sunlight and Orientation



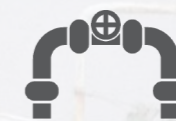
Local Biodiversity



Soil and water conditions



Topography and Hydrogeology



Structure and Safety



Social use and Accessibility

By Joshua Molony

Icons via [thenounproject.com](https://thenounproject.com)

# Sunlight and Orientation

## SUNLIGHT

Plants need sunlight to grow and thrive. Each plant has its own requirements for sunlight and shade. Plants can be categorized broadly into those that require low sunlight (shade), medium or partial sun, and full sun.<sup>5</sup>

It is important to assess sunlight conditions on the site available for greening, and note the quantity (intensity), quality (wavelength from light spectrum), and duration of exposure to the sun. Plants typically 4-6 hours of sunlight a day, and the requirement may differ for vegetables and fruits.<sup>6,7</sup>

The presence of large trees and buildings near the greening space can shade the area and limit the availability of sunlight. On the other hand, rooftops, terraces, and open playgrounds may receive harsh sunlight. In such conditions, providing shade nets or planting in the proximity of larger trees may be necessary to protect the plants from high heat. In all cases, newly planted saplings should not be exposed to harsh, direct sunlight for long periods.<sup>8</sup>

To assess the exposure of a given area, we can first track the sun over to see how many hours of sunlight and shade it receives.<sup>9</sup> For better understanding of sunlight received throughout the year this exercise should be carried out in different seasons. We can then choose plants best suited to the available conditions.

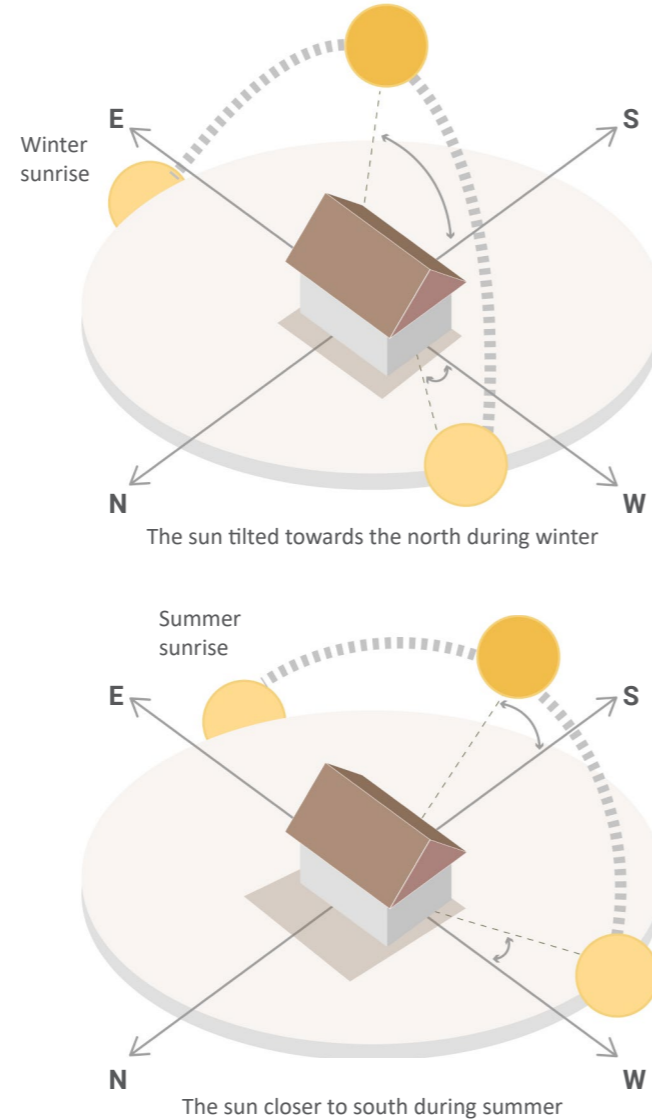


Figure 3.1: Diagram to understand sun-path

## ORIENTATION

Another key indication to determine a given space's exposure to sunlight is its orientation, or position in relation to the cardinal directions.

**South facing spaces**, if not interrupted by building shadow, receive the most sunlight, and are ideal for sun-loving plants, especially those that bear fruits and vegetables.<sup>7</sup>

**East-facing spaces** get a good amount of morning sun, while **west-facing** ones get the best sunlight in the afternoon until sunset. Plants requiring medium (part sun) and high (full sun) can do well in these spaces.

**North facing spaces** are good for shade-loving plants if they receive 2-4 hours of sunlight daily. Such spaces are suitable for growing herbs, but not other edible plants.<sup>10</sup>

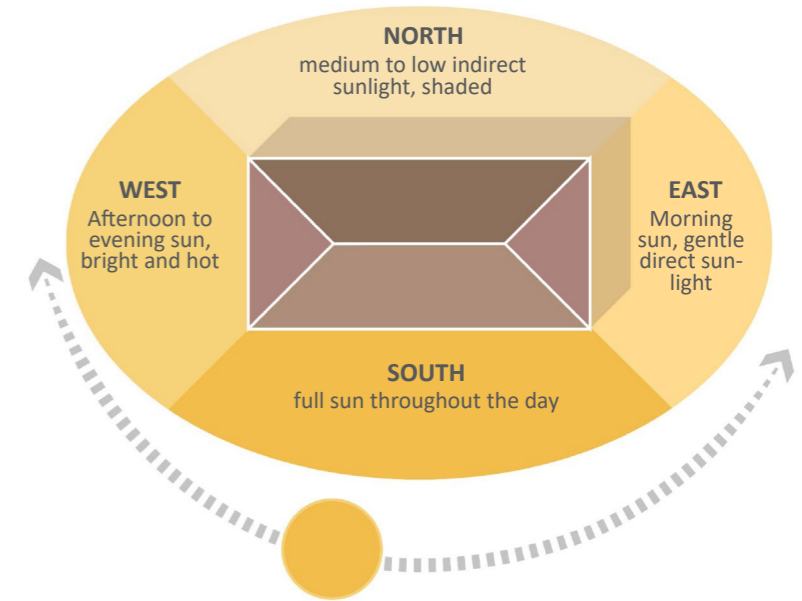


Figure 3.2: Orientation and its effect on sun exposure and duration.

**TIP :** You can determine a plant's sunlight requirements based on a few observations in its growing phase. Indicators such as pale leaves, slow growth, or the drying of leaves suggest that the plant is receiving less sunlight than it needs, and 'burned' leaf edges and shriveled dried leaves indicate overexposure.



# Understanding Local Biodiversity

## WHY IT IS IMPORTANT

The urban environment includes natural and man-made features, such as trees, birds, animals, water bodies, parks, hills, and human settlements and other built-up areas. Existing ecosystems and local biodiversity provide ecological services for the natural filtration of waste and pollution, cooling of the local climate, and flood management.<sup>11</sup>

When planning greening methods on a particular site, a local biodiversity survey can help identify species that grow naturally and easily.<sup>12</sup> Such a survey can also help develop the planting strategy.

## HOW TO DO A BIODIVERSITY SURVEY

Depending on the purpose of the greening interventions and the resources available, we can observe and record the flora and fauna – trees, shrubs, herbs, climbers, grasses, mammals, birds, reptiles, and insects. We can also record their relationships within the ecosystem. Below are the key steps to remember while carrying out the biodiversity survey:

**What to observe.** For vacant open spaces within neighborhoods, observe the local biodiversity, and identify and record the biodiversity mentioned in the point above. Ways to do this include visual observation, listening to and identifying bird calls, taking photographs, and making note of direct sightings.

**The network of people.** Local residents' welfare associations, communities, NGOs, academic institutions, and experts can be involved in this survey. Community groups and residents in the area can also share information about soil and biodiversity conditions, and the value and use of plants (medicinal, commercial, and traditional).

**Intervals and time.** The survey should cover morning and evening hours, to include different activity phases. Surveys can be conducted periodically to record seasonal variation. The time required and the number of visits will depend on the purpose, and the number of people and the expertise available. The survey can cover a 1-km radius from the site.

**TIPS :** Native plants that adapt well to the local environment leads to healthy plants that require less water and increase ecological value of the land. They provide pollen, nectar, seeds, and fruits that support numerous insects, birds, and mammals. For instance, in a mangrove ecosystem, planting Meswak, a mangrove associated species and food plant of the Common Arab Salmon, encourages this butterfly species.

Here are a few resources that can assist you in identifying Mumbai's local biodiversity-

[The Biodiversity map of Mumbai](#)

[India Biodiversity Portal](#)



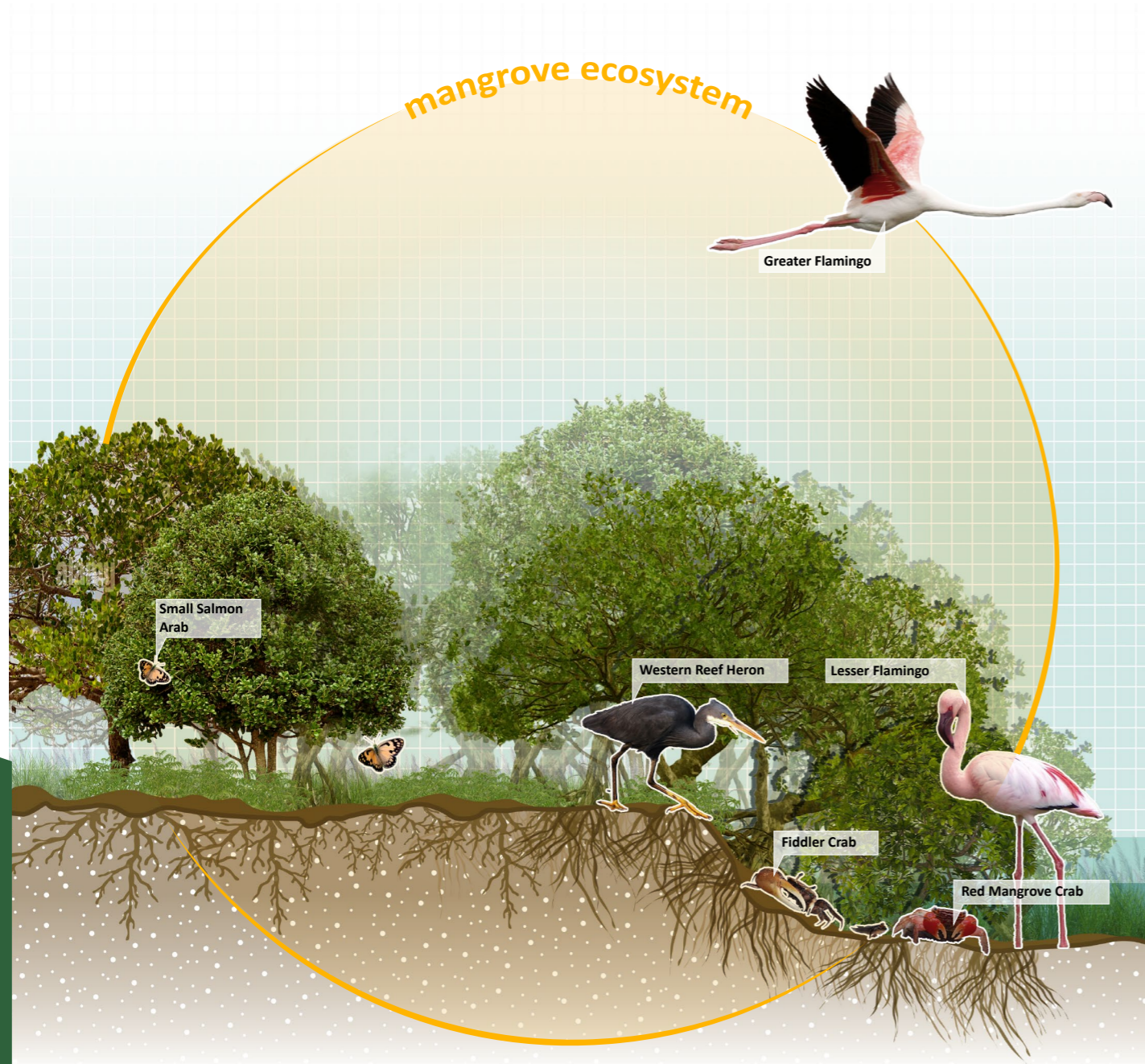
By Sejal Mehta/ RoundGlass Sustain

Image 3A: Mangroves at Sewri, Mumbai

**What to record.** Existing vegetation on site must be conserved when possible; numbered, and geo-tagged. The survey need not be an exhaustive inventory that records every species in the area. An example of a biodiversity report that shows what kinds of information can be collected is included in Annexure. (Kalina University Biodiversity Audit Method<sup>13</sup>; Ladybird consulting)

**Secondary sources.** If information about local flora and fauna is already available, it can be used as secondary data, such as existing biodiversity lists, IUCN survey, citizen science website like iNaturalist.

**Recognition of special conditions.** It is important to recognize special conditions such as the reclamation and/or rehabilitation of land prior to formulating a greening approach based on bio-climatic variations like sunlight, rainfall, and soil. Such information should be part of the biodiversity survey.



Illustrations are diagrammatic for representational purposes only and not to scale.

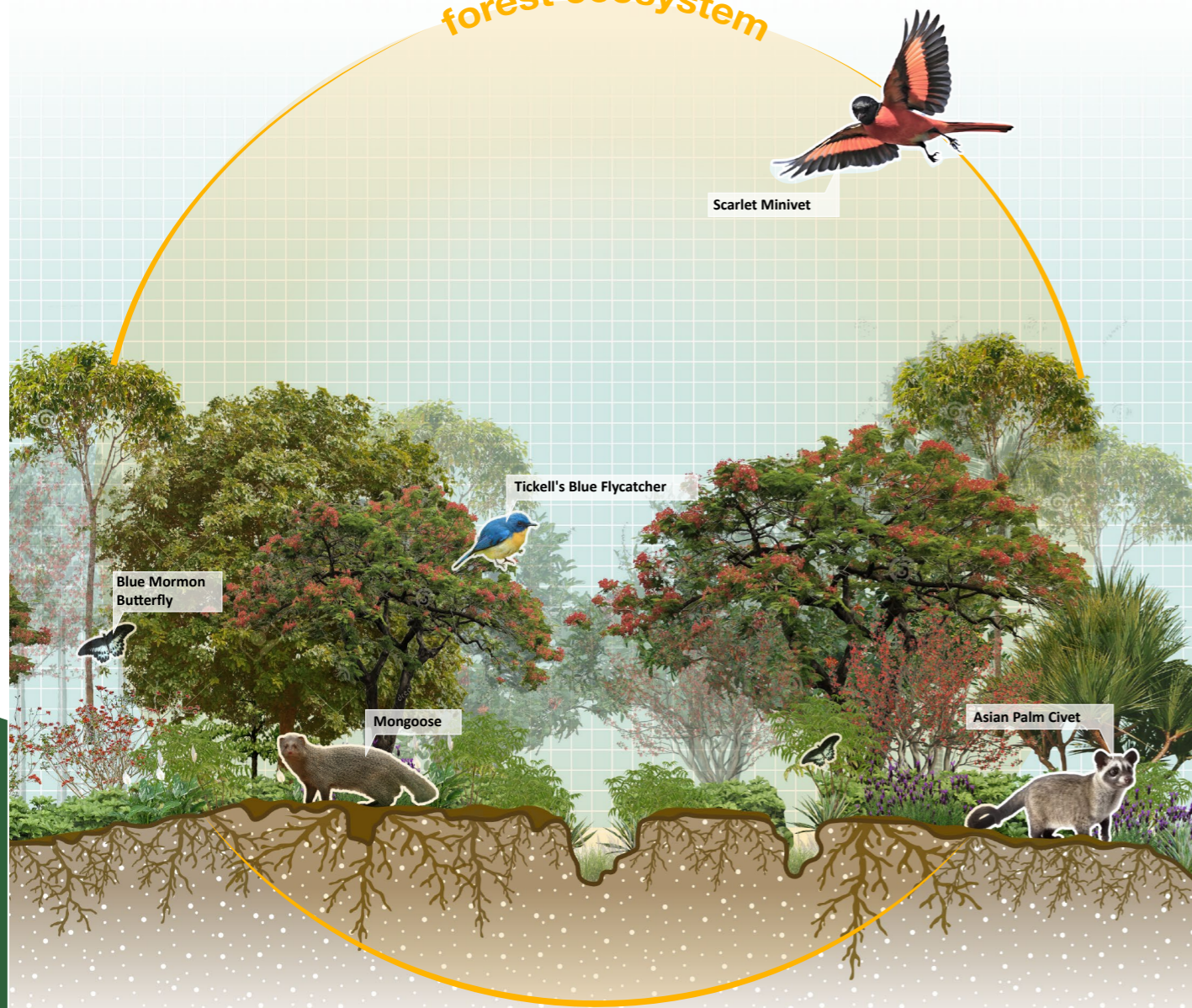
Figure 3.3: Local biodiversity observed in a mangroves ecosystem



Illustrations are diagrammatic for representational purposes only and not to scale.

Figure 3.4: Local biodiversity observed in a garden ecosystem

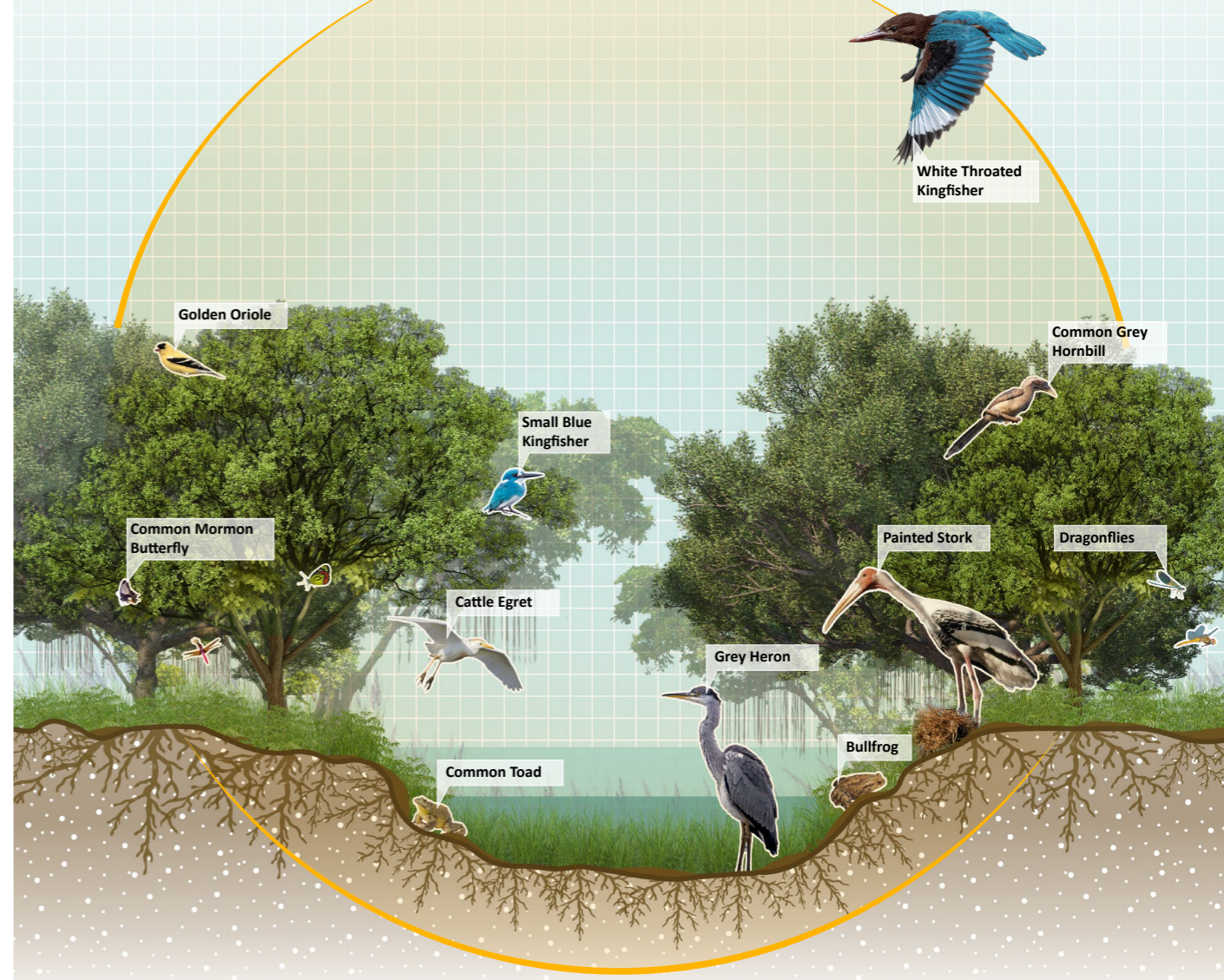
## forest ecosystem



Illustrations are diagrammatic for representational purposes only and not to scale.

Figure 3.5: Local biodiversity observed in a forest ecosystem

## river ecosystem



Illustrations are diagrammatic for representational purposes only and not to scale.

Figure 3.6: Local biodiversity observed in a riparian ecosystem

# Soil and Water Conditions

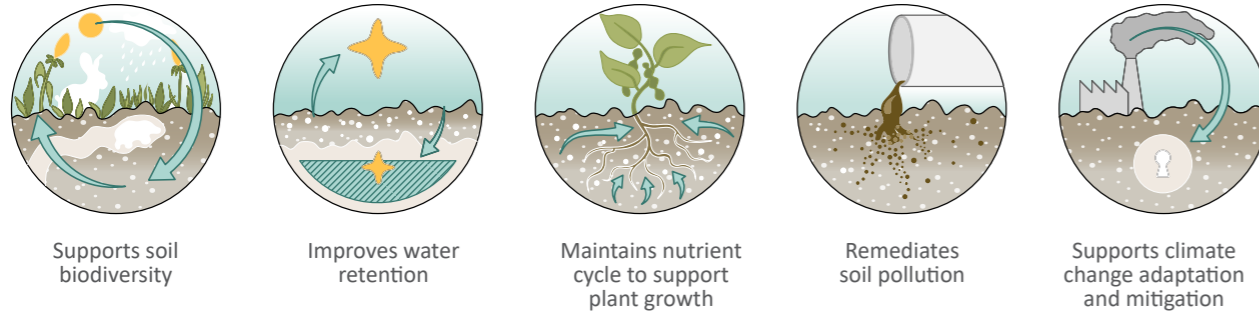


Figure 3.7: Benefits of healthy soil  
Adapted from the Global Soil Partnership, Food and Agriculture Organization of the United Nations, 2020

## SOIL CONDITIONS

Healthy soil can absorb and retain water, reduces evaporation, and creates resilience against drought and extreme heat. By improving soil fertility and productivity, we can increase the nutritional value of food and forage, and support greater biodiversity.

The simplest way to assess soil health and determine whether it is suitable for plants to grow in, is to check it for the presence of organic matter, including dry leaf content, earthworms, termites, and fungi.<sup>14</sup>

While organic matter indicates healthy soil, we can conduct a free/low-cost soil test to be completely sure that the nutrients essential to plant health are present.

Test results will provide information about the soil pH, sunlight, moisture content, and temperature – all of which can affect plant growth. It will also provide information about nutrients such as nitrogen, phosphorus, and potassium.<sup>15</sup> Soil suitable for growing plants should ideally have pH of 6.5-7.5 and should be crumbly.<sup>16</sup>

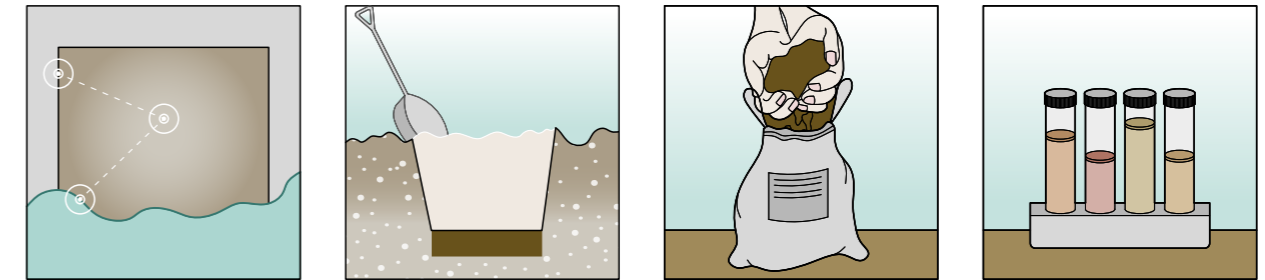
A home testing kit can provide information on some of these parameters. Each kit has its own equipment and instructions. Information on how to use this to determine plant selection is in the planting section.

**CAUTION:** The soil found in urban areas of Mumbai can be polluted or mixed with cement and other debris, making it unsuitable for greening. Such soil should be tested and restored by adding soil amendments such as compost, and organic fertilizers made from fruit peels, eggshells, etc.

## Understanding soil conditions on larger plots

We can extract and send samples to government-recognized labs. To ensure correct results, samples can be taken from different areas of the site, including locations along the periphery and the central portions, especially the areas where plants are to be grown. Soil samples should ideally be tested during the dry season, or

during a dry spell of 5-6 days during the monsoon. In some areas, construction waste and rubble may have been used to reclaim or level the land. Test pits can be made on such a site to understand the depth of debris, soil and groundwater. This will help determine the next steps for soil and biodiversity restoration.



Step 1: Identify relevant locations for soil collection within the plot.  
Step 2: Dig pits of 12 x 12 inches, 4-6 inches deep and collect the bottom soil.  
Step 3: Pack the collected soil in separate bags. Label the bag with site details.  
Step 4: Send the soil for testing to a government certified lab.

Figure 3.8: Diagram showing collection process for soil testing

## WATER CONDITIONS

To make sure that the plants remain healthy, it is important to first check whether enough water is available.

If water is not easily available, choose plants that don't require much water. Water recycling and reuse systems can also be explored.<sup>15</sup>

Irrigation measures to meet the water demand caused by greening interventions may lead to additional electricity cost. Alternatives such as solar pumps can be explored to mitigate this cost.

In some cases, the water available for maintenance may have impurities, or high salinity levels, especially if we are planting near an existing water body, such as a nallah. In such cases, a sample of the water can be submitted to a

government testing lab. Based on the results, suitable plant species can be chosen, to ensure their survival.

It is important to assess groundwater levels to understand sub-surface conditions and the flow of shallow and deep aquifers. For this, we can dig test pits during the summer and monsoon months to check water levels, or conduct a hydrogeology survey (covered in the next section).

In Mumbai, some areas experience waterlogging in monsoon months. The ideal type of landscape treatment depends on the extent of waterlogging, with appropriate species being selected to ensure a high survival rate.<sup>2</sup>

# Topography and Hydrogeology

The physical characteristics of the land, like its slope and elevation, can have profound effects on the soil quality, ecosystem, and hydrogeology of an area.

Mumbai, being an island city, has a unique geography, shaped by its history of land reclamation. Many parts of the city are just 10-15 meters above sea level, and the average elevation is 14 meters. However, the northern part of Mumbai has a contrasting landscape, featuring hills that reach approximately 450 meters in elevation, i.e., the Powai-Kanheri range. Across the city, diverse topographic and hydrological profiles emerge, influenced by their respective positions relative to the coastline, hill ranges, creeks, plains, forests, lakes, and rivers.<sup>16,17</sup>

Assessing site topography and its correlated hydrogeology is essential to understand the following:

**Soil erosion, stability and moisture levels:** Steep slopes and hillsides are more prone to erosion, which can lead to soil loss and nutrient depletion. Land at a lower elevation will have more stable and fertile soil. Land hydrology affects soil moisture levels, which directly impacts plant growth.<sup>18</sup>

**Drainage system:** The elevation of the land determines its drainage patterns. Low-lying areas may experience waterlogging, which can be detrimental to plant's root health.

**Land hydrology** helps identify flood-prone areas, allowing for strategic planting of vegetation that can absorb excess water and reduce the risk of flooding.

The topography of the selected plot can be examined using a contour map of the area, if available at local ward office, or through observations made during the monsoon.

The topographical and hydrogeological assessments help with the water resource management on the site, for instance, promoting water filtration, groundwater recharge, and efficient use of water for landscaping. In turn, this helps determine the placement and construction of retention systems in the planning stage.<sup>19</sup>

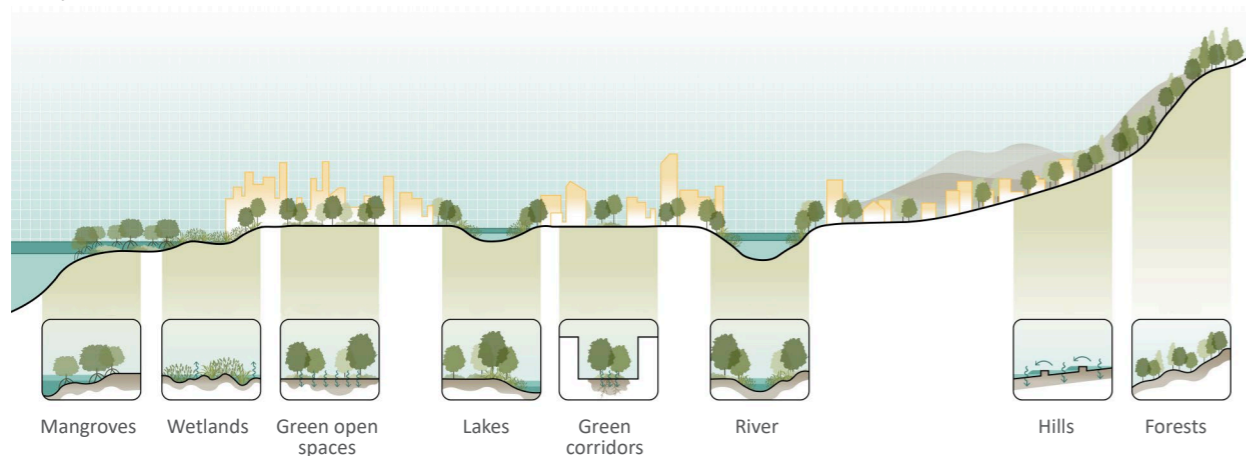


Figure 3.9 : Schematic section through Mumbai's urban fabric showing varying landforms and corresponding hydrology  
Adapted from 'A Catalogue of Nature-Based Solutions for Urban Resilience' by World Bank, 2021

# Structure and Safety

## STRUCTURE

Columns, beams and slabs are designed to bear a certain amount of weight. Before adding plants on windows sills, grills and balconies, care should be taken to ensure that the weight of the plants do not exceed this limit. Plant infrastructure (pots, soil, etc.) above the limit can cause cracks and harm the structure.

If the waterproofing of the building is damaged, water can percolate through the wall cracks, causing leakage/seepage in the floor below. To avoid this, when planting indoors or within corridors, a plate placed below the plant can help discard excess water easily. The soil mix (percentage of soil, compost, and coco peat) for the plants should be chosen to lighten the weight of the planters.

In case of retrofits (adding pots and plants on existing buildings) terrace greening can be carried out by taking the following precautions to prevent damage to the structural stability of the buildings:

In practice, planters are placed in many terraces without considering the impact of the weight on the building structure. However, a structural audit can be done to determine the slab's load-bearing capacity.

It is safe to place plants within the permissible limits. The initial weight of soil and containers is low, as a lot of biomass or bagasse is used. Over four to five years, the weight will increase due to decomposition and compaction of composted material. However, it will still be lighter in weight compared to soil from the nursery.

**TIP :** To considerably reduce the weight of the pots, mix cocopeat and compost with soil in 1:1:1 ratio. Ensure that potted plants are arranged evenly across the balcony or terrace slab to allow uniform distribution of load exerted on the structure.

## WATERPROOFING

Before beginning a greening project within a building, ensure that there are no seepage problems or cracks on the terrace, balconies, or windowsills. For old buildings, it is advisable to get the slab tested by an authorized professional.

Contrary to common belief, having a terrace garden does not contribute to seepage. In fact, as stated in 'Guide to set up a Natueco City Farm' by Urban Leaves, in a newly constructed building, it can help prevent such problems. This is because the green cover creates an even temperature, which prevents expansion and contraction in the concrete. Thus cracks and subsequent seepage problems are prevented.<sup>20</sup>

When necessary, it may be required to provide more waterproofing before undergoing planting.

## CIRCULATION

Should not block access to services such as ducts within shared corridors. A minimum of 3 meters is prescribed by the Development Control Regulations for a fire engine to move around the building in case of emergency. Circulation space for emergency vehicles is mandatory.<sup>21</sup>

## GREEN ROOFS

In new buildings, a green roof should be planned at the design development stage, in coordination with landscape and civil experts, a structural engineer, and the developer, to ensure that the slab can take the load of the green roof. Please see Section 10: Roof Landscape of the National Building Code for construction guidelines.<sup>15</sup>

Listed below are a few broad principles to be followed.

**Screed:** Adequate slopes for sub-surface drainage of vegetated areas, as well as drains, should be provided by laying a screed or concrete layer on the roof slab. To channel sub-surface water, perforated pipes can also be laid in the screed.

**Waterproofing:** To protect the building slab and its primary waterproofing membrane, a secondary waterproofing layer should be laid on the screed surface.

**Drainage and filtration:** The entire roof surface should be laid with a porous sub-surface drainage layer, which can

withstand the weight of the soil, plants, and hardscape. The unobstructed flow of water from the roof surface to the drainage chambers should be designed through catch basins and drains. The filter membrane laid on the drainage layer helps contain roots and the growing medium, allowing water retention and preventing drain clogs.

**Planting:** The type of planting, screed thickness and structural allowance for the slab will determine the soil depth and type of vegetation possible.

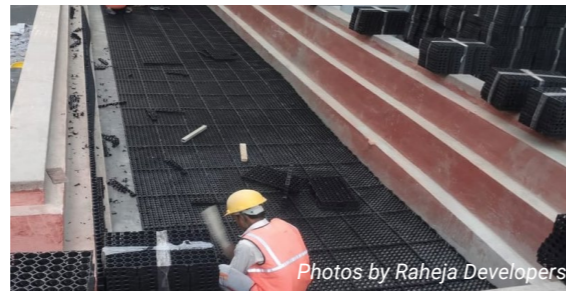
**Irrigation:** The water requirements of green roofs are different from those of ground-level planting, due to the shallow depth of a green roof and well-drained soil. The soil should be regularly monitored and moistened when required, using irrigation systems designed to provide adequate water.

**Circulation:** The green roof should be designed considering accessibility for all, wherever applicable.



Photos by Raheja Developers

Image 3A: Waterproofing for green roof



Photos by Raheja Developers

Image 3B: Drain cell laying



Photos by Raheja Developers

Image 3C: Geotextile fixing over the drain cell



Photos by Raheja Developers

Image 3D: Soil filling

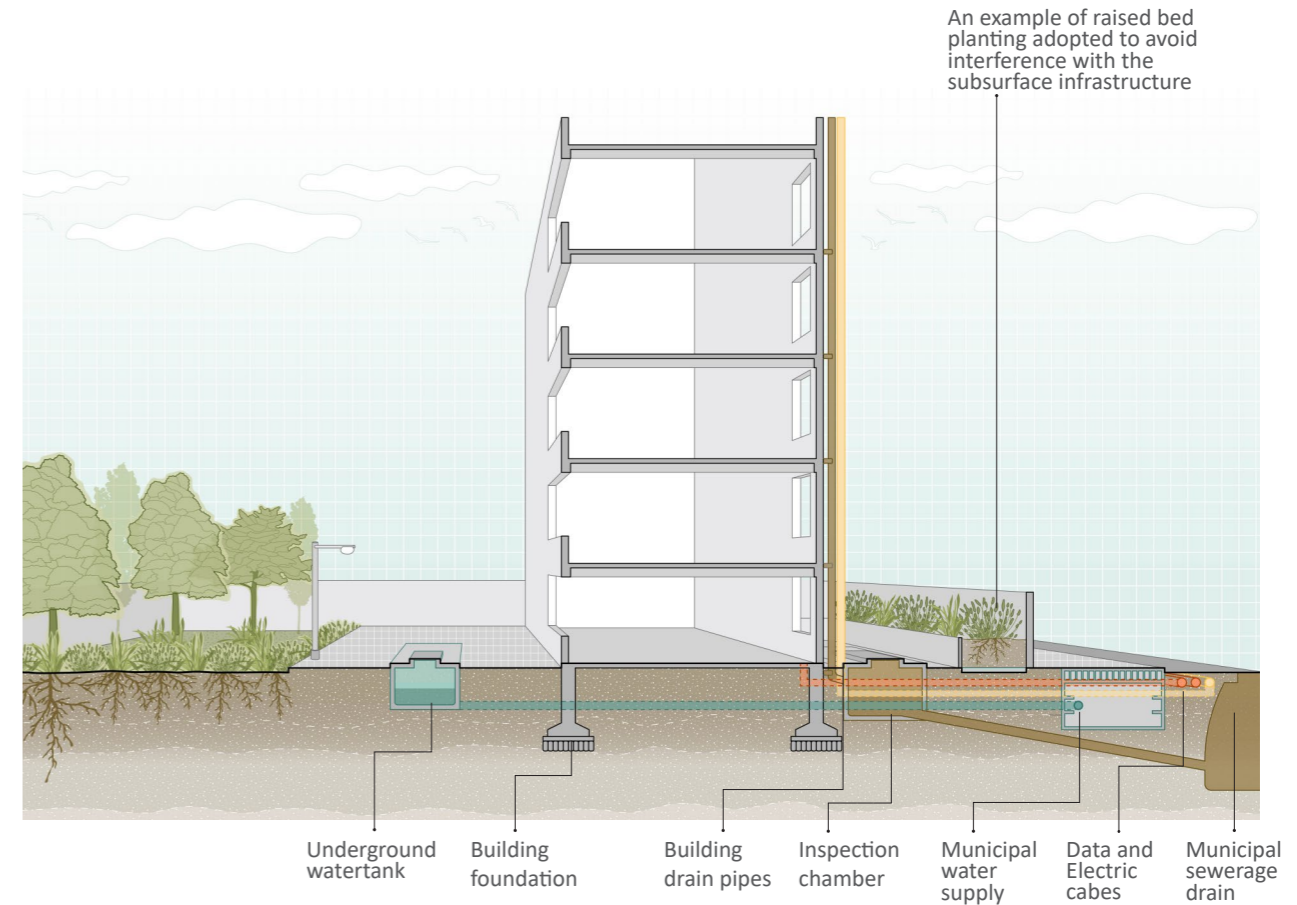
## SUB-SURFACE INFRASTRUCTURE

Consideration towards sub-surface infrastructure to make sure that digging activities do not cause damage to gas pipelines, water pipelines and power lines is necessary. Additionally, when installing sub-surface infrastructure, sufficient space should be left along the ground for trees, ensuring that no roots are exposed.<sup>2</sup>

When planting a tree next to a structure it is crucial to consider the estimated spread of its roots when it reaches full

maturity to ensure that it does not cause damage to the foundations. A distance at least equal to the size of the tree's full-grown canopy should be maintained between the structure and the tree.

Plans can be sourced from the relevant government department, developers, and architects.



Illustrations are diagrammatic for representational purposes only and not to scale.

Figure 3.10: Section showing various kinds of sub-surface infrastructure within a plot

# Social Use/ Accessibility



Figure 3.11: Underutilized space within Lalubhai compound selected for greening

The principles of social inclusion and physical accessibility must be adopted when developing a greening plan. The area/plot identified for greening should be planned so that it is accessible by all, including senior citizens, persons with disabilities, women, and children.<sup>15</sup>

The social value of the land must be taken into cognizance in the plan.

The existing social use of the land during different times of the day, festivals, and seasons, should be taken into consideration. If the land is already being used as a

neighborhood playground, waiting area, gathering space, open space for informal settlements, or livelihood activities such as farming or vending, then it should be mapped and integrated into the greening plan.

The community should be at the heart of the planning process, recognizing the impact on the ground, leveraging community resources, and integrating existing mechanisms of operation.



Figure 3.12: Lalubhai Compound plot after greening through community participation

Existing structures on site of any functionality, cultural significance, or community use, should also be mapped and incorporated in the plan.

The access routes, traffic network and connectivity to the plot should be considered and strengthened through the plan ensuring continuity of access and safety for pedestrians.

These activities and networks can be recognised through observations and communication with the residents and community groups.

The greening plan should incorporate the community's needs and aspirations and should be developed through a participatory planning and governance process, in consultation with diverse stakeholders and multiple actors. The approach should be holistic in terms of social, economic, and safety-related aspects, driven by data-based analysis and community engagement.<sup>22</sup>

# 04

## Creating an enabling environment

When considering greening in small-medium-large spaces with the urban fabric of the city, understanding of systems that govern these spaces can aid the feasibility of the aspired greening initiative. In this section, we discuss crucial steps and permissions to be taken by citizens when greening within a certain site.



Governance and permissions



Working with local communities

By Varad Parulekar

Icons via thenounproject.com



# Governance and Permissions

## For greening initiatives within buildings and society plots:

When planting within buildings, it is important to develop an understanding of building regulations and measures that can support greening within our homes, buildings and neighborhoods.

At the society level, the Development Control Regulation, 2034 [as per Regulation (37) (22)] and the Maharashtra Co-operative Housing Act, 1960, do not prohibit residents from placing potted plants in windows, balconies, terraces, and corridors. Additionally, By-law 159 (a) states that common garden expenses must be borne by the society.<sup>21,23</sup>

Development Control Regulations permit rooftop greening/farming in Regulation (37) (22) and do not disallow the greening of buildings. However, care should be taken to take society permissions where needed. If not properly implemented, greening undertaken by individuals could hurt the building's safety.

Terrace greening is common in our cities. While there are concerns associated with it, especially when greening within old structures or retrofits, if done correctly, it can enhance the local biodiversity and microclimate. Ideally, the terrace slab should be able to withstand the load of the pots, planters, and farming units. However, when retrofitting greening on old structures, certain safety checks and permissions need to be taken to make sure there is no damage to the building's structure and waterproofing.

Taking initiatives to green common areas comes with great responsibility. If that responsibility lies with one person, they should make sure that it is not causing an obstruction or inconvenience to people who share the space. As a collective, the responsibility can be shared or allotted to a dedicated person/gardener through shared resources. In the case of societies, the secretary could create a club/greening group, which will follow a set of rules regarding the planting, maintenance, watering, oversight, and nurturing the green space. Creating a communication plan and awareness about greening will ensure a greater buy-in.

For new developments, builders and developers should abide by the Development Control Regulation mandated by the BMC, to develop 5% of Layout Open Space as a Miyawaki urban forest in plots larger than 3,000 sq.m. Ward-level Garden department can provide assistance and resources for the Miyawaki method of planting.

For citizens' initiatives in larger plots, a registered organization can take up the project on private plots with the support of the ward-level garden department. The organization taking the initiative could prepare a proposal for design and execution along with a maintenance plan in technical consultation with ward level garden department.

## The following measures and permissions should be in place before taking any initiatives:

**Ownership of property** (approach the authorities concerned)

**Plans of services/infrastructure plans/Development Plan for designated land use** (check feasibility of site and sub-surface infrastructure)

**Garden department and authorities concerned** (such as society associations, institutional administrative bodies) for permissions.

**Connect** with adjoining societies, offices, and buildings, to inform and, if possible, to contribute towards shared resources (people, funds, maintenance)

**Advisors needed:** A certified architect, biodiversity expert, landscape designer/ architect. For water-related solutions, include a water management advisor. For waste management, seek advice for recycling and composting.

## Working with Natural Ecosystems

Natural and manmade wetlands (inland and coastal), forest area, steep slopes (above 22.5 degrees), scrub land, rocks along the coast, and dense vegetation (above 0.33 Normalised Difference Vegetation Index<sup>a</sup>) in urban areas are all eco-sensitive and fragile. Any intervention in these areas must be done sensitively to protect the ecosystems.<sup>15</sup>

These are protected areas, hence the departments concerned must be informed and involved in the ecosystem restoration process.

Special planning programs can be carried out in vulnerable neighborhoods to seek support and participation, and to determining priorities for greening decisions.

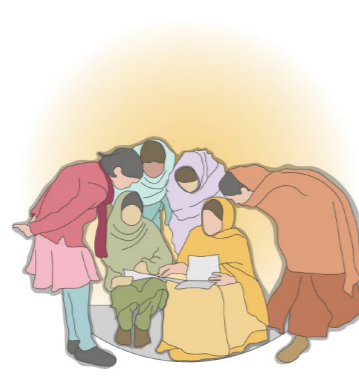
<sup>a</sup> Normalized Difference Vegetation Index (NDVI) is a metric for quantify vegetation density and assessing changes in plant health using remote sensor data. The values range from -1 to +1. Negative indices indicate water bodies, urban areas usually have indices closer to 0, whereas indices closer to +1 indicate dense green leaves.

# Working with Local Communities

Governance guidelines for greening acknowledge and underline the importance of small and micro initiatives to be taken at the level of individuals, groups, and collectives, without letting non-availability of large spaces and limited access to resources restrict their greening initiatives. To promote greening within settlements, it would be helpful to engage with interested community members and to encourage the nature enthusiasts who already contribute through individual greening or community greening initiatives, using the following structure.



Step 1: Formation of the local area greening clubs or 'Sthanik Haritikaran Mandal' through self-registration.



Step 2: Drafting of operating guidelines of the Mandal with a plan for distribution of roles and responsibilities.



Step 3: Identification and mobilization of resources required. Sharing information of Mandal's activities with the community, BMC, and other mandals.



Step 4: Carrying out regular activities and involving other residents of the community in Mandal's activities.



Step 5- Establishment of a routine for planting, watering, pruning, and cleaning.

Figure 4.1: Functioning of Sthanik haritikaran mandal for small scale urban space

## A. Identification/establishment of the community-level greening mandal

1. At the community level, a group of volunteers, such as a 'greening club' or 'sthanik haritikaran mandal', can be formed to create and maintain the small-scale greening spaces.
2. The mandal would have three or more members from the locality.
3. The mandal would work on the basis of volunteerism, where the values of love for nature and shared environmental concern would be the driving force of its activities.
4. The mandal would be open to people of all age groups and genders who are interested in greening activities.
5. Membership of the mandal would be through self-registration. The mandal would be based on the voluntary agreement between the members, with the sole aim of greening in the locality/community space. Similar processes are currently being explored in different neighbourhoods of M/E ward such as Cheeta Camp.

## B. Role of the mandal

1. The role of mandal includes the identification of areas/spaces for the implementation, maintenance and improvement of projects related to planting and greening for the community.
2. The mandal would collaborate with or get the support of the BMC and other authorities for capacity-building and share their knowledge through workshops. The BMC would suggest the varieties of trees, plants, and planting strategies to be deployed in the selected space.
3. To encourage active participation and community-led decision-making in greening activities, the mandal would conduct open discussions to make the design, implementation and management more accessible and inclusive.
4. Community-led decision-making would encourage a sense of ownership and of belonging to the space, and a shared responsibility within the community. This would also ensure an alignment of the greening initiative with the community's vision and values.
5. The mandal would promote sustainable and environ-

ment-friendly practices and ensure low-maintenance elements to accommodate volunteer-led maintenance of the green space.

## C. Resource allocation and funding

1. The BMC would support the mandal as per the existing garden department policies and guidelines.
2. The BMC Garden department will guide and support the activities of the mandal by organizing capacity-building and awareness sessions for its members.
3. The allocation of resources for implementation and maintenance should be planned ahead by the mandal.
4. The mandal can explore partnerships with financial institutions, and creative fundraising initiatives and events. Local sources and donations can be explored as well.
5. The mandal could also approach potential funding sources, including corporate social responsibility allocations and other resources.
6. The mandal should ensure transparency in financial matters and resource allocation decisions.

## D. Maintenance and management

1. The mandal would plan, resource, and implement the maintenance scheme.
2. The mandal should plan to establish a routine for planting, landscaping, cutting, trimming, and waste management and cleaning.
3. Periodic joint assessment and sessions for training and guidance to effectively carry out maintenance can be conducted with the mandal with the help of BMC.

## E. Recognition of the mandal

1. The contributions of volunteers can be celebrated through regular appreciation events that acknowledge their impact on the green space and the community.
2. Sharing success stories and impacts of volunteer-led green spaces can inspire other communities to adopt greening initiatives. They can be showcased at the existing yearly events by the BMC garden department.

# 05

## The basics of planting

The process of planting can take place in numerous ways. To ensure the proper growth and survival of a plant, it is essential to adopt a scientific method of planting. This section delves into the principles and process for planting on the ground and in containers.



Planting principles



Container planting

# Planting principles

## Adopting a holistic approach to greening

**Sustainability:** When designing the greening sites, an approach that integrates existing site conditions and ecology should be adopted (As described in 'Understanding Site Conditions' chapter. The process of greening should not pollute air, water, or soil through any activities.<sup>15</sup>

**Preservation of the character of landscapes of ecological and cultural significance:** Landscape work should be an extension of existing elements such as landscape features like trees, utility lines, curbs, as well as social use.

**Designing for habitat connectivity:** Proposed green spaces should be connected to existing ecosystem patches to increase biodiversity and assure the long-term survival of flora and fauna. This will allow the movement of fauna within these corridors, which in turn will help propagate biodiversity.

**Circularity through waste and water recycling:** Reusing, recycling, or recharging storm and rainwater can reduce the burden on the city's stormwater drainage network. Storing and reusing rain and wastewater on site for irrigation also reduces the burden on city's water supply systems. Similarly, the effective management of wet garbage and leaf litter can help maintain soil health. Construction waste can be recycled for use in hardscaping elements. (For solutions on water and waste management, please refer to Chapter 6, which deals with plant care).

**Civil work/hardscaping:** Civil works on the site should be planned considering their negative impact on ecological processes. Bright lighting, use of materials such as cement and glass, which increase heat, sound pollution in surrounding areas or during construction, and hard paving close to the plants are examples of things that can harm existing ecosystems.

**Site usability:** Landscape elements such as outdoor furniture, lighting, and other required facilities may be placed sensitively along the proposed circulation path, which should have a minimum width of 1.8m, with consideration of use of the space and activities.

**Inclusive access:** Accessibility features need to be integrated when designing greening strategies. This would include signage, vocabulary, ramps, and hand-rails, to give a few examples.

**Ease of maintenance:** Ensure that solutions are low-cost and low maintenance, requiring minimal energy for functioning. This will facilitate long-term ease in the maintenance of the land.

**Program:** Opportunities for play, recreation, sports, and other kinds of activities can be decided collaboratively with the community that benefits from the intervention. Existing site use and needs should be integrated into the design of the site program.<sup>15</sup>



Image 5A: Making pits for planting at a greening site in Prathamesh Sports Complex, K-West Ward



Image 5B: Dried hay mulching after planting of saplings at Nahar Group's Miyawaki Forest site at Chandivali



Image 5C: Nahar Group's Miyawaki forest plantation site at Chandivali planted with native plant species

## SELECTING SUITABLE PLANT SPECIES CAN MAKE A GREAT DIFFERENCE TO THE OVERALL ECOLOGICAL IMPACT OF THE PROJECT. SOME PRINCIPLES INCLUDE:

**Selection of native plant species:** As discussed in the section on Understanding Local Biodiversity, planting diverse native species helps foster biodiversity. Besides, native species are easier to maintain. A list of such plants is available in the Annexure.

**Aligning the ecological needs of the plants to the site conditions:** This will ensure maximum survival rates. Species can also be selected based on functions that need to be addressed, for example:

**Environmental functions:** Improving soil conditions and air quality, providing a habitat for flora and fauna, reducing noise levels, modifying the microclimate, stabilizing the soil on steep slopes such as embankments, offering variety in surface treatment, and shading exposed walls from direct sunlight.<sup>15</sup>

**Design functions:** Using greening elements to demarcate different activity zones, providing fruits for consumption and therapeutic value, framing views, providing visual relief, screening, etc.

**Time of planting:** The survival of plants depends not only on-site conditions but also on the time of year when they are planted and the plant species. An ideal time for planting in Mumbai would be November to February, when the heat is not too harsh, and the rains are a few months away. However, some plants have their own seasonal planting period which is best suited for their survival and should be considered while planting.



Figure 5.1: Different types of design approaches to greening interventions for ecological and social benefits

## PLANTING STEP-WISE ACTIVITIES

### Key steps to follow in planting

**Removal of debris and soil restoration:** Soil should be free of subsoil, stones, earth clods, sticks, roots or other debris. Clear manually or with an excavator such as JCB for larger areas. Dispose of weeds away from the site to prevent regrowth. Ensure that the topsoil is in good condition- typically containing at least 2 percent of decayed organic matter (humus).

**Digging of pits:** Ideally, tree pits should be 1.2 m in diameter and 1.2 m deep, depending on the tree species. The topsoil removed for making the holes can be mixed with the rest of the soil if it is assessed to be in good condition. Excavation for shrubs should be of a depth of 0.75 m. Pit sizes may vary from species to species and the size of the sapling.

**Planting:** Planting should not be carried out in water-logged soil. Plastic and other imperishable waste should be removed before planting. Broken or damaged roots should be removed.

-The bottom of the pit should be covered with 5 cm to 7.5 cm of soil. Bare roots should be spread evenly in the pit.

-Back fill soil should be packed firmly, layer by layer, in the appropriate soil mix, without damaging the roots.

**Staking and tying/tree support:** Newly planted trees should be firmly tied to a stake at two points, one just below its lowest branch and the other just above the ground level. The ties should be adjusted or replaced as the plant grows. The support/stake should be 0.9 m longer than the clear stem of the tree and should be driven at least 0.6 m into the soil.

**Watering:** Allow for adequate watering of trees and shrubs immediately after planting and continue during the following growing season.<sup>15</sup>  
(Please refer to the plant care section for more information on watering and maintenance.)

**TIPS:** Grass lawns are water intensive and hard to maintain, instead use native herbs like brahmi and mint as ground cover. Planting in clusters with a diverse mix of trees, shrubs, and ground cover allow for habitat connectivity for insects, birds, and mammals. For instance, planting trees such as Tamhan, Bahava alongside shrubs like Adulsa and Chitrak, will attract Tailed Jay butterflies and birds like red vented bulbuls, coppersmith barbet, etc.<sup>24</sup>

## CASE STUDY

# Greening in Lallubhai Compound



Image 5D: Workshops held at Lallubhai Compound plot



Image 5E: Greening intervention through community participation

This project is a part of WRI India's urban greening initiatives in partnership with Youth for Unity and Voluntary Action, and the Tata Institute of Social Sciences, to pilot nature-based solutions through community-led processes in socially and environmentally vulnerable neighborhoods of Mumbai. As part of the project, five derelict public spaces were transformed into inclusive and vibrant green open areas.<sup>25</sup>

### **Samruddhi Cooperative Housing Society, behind Building 18, Lallubhai Compound:**

The site was an underused peripheral area in Lallubhai Compound, Mumbai's largest resettlement colony. The goal was to transform the largely concretized and neglected 700 sq. m. plot into an ecologically diverse and accessible space, through place-making activities.

To foster a sense of ownership to sustain the site, diverse community groups and other stakeholders were engaged in the process, including the Brihanmumbai Municipal Corporation and the Mumbai

Metropolitan Region Development Authority for approvals and resource support, local NGOs for community mobilization and engagement, practitioners of nature-based solutions for advice and implementation of scientific greening methods, the society federation (Samruddhi Co-operative Housing Society Association), and community-based groups such as Bal Adhikar Sangharsh Sangathan for site activation, programmatic development and overall project support.

### **Key implementation processes included:**

**Site identification:** The site was identified based on mapping tools and field visits to understand feasibility and social use. Various stakeholders were involved in this process. Small planting initiatives by a group of society members already existed on this site, and the project sought to scale these up.  
**Stakeholder engagement:** Activities to raise awareness and build capacity were conduct-

## CASE STUDY

# Miyawaki Method of Planting

**What is the Miyawaki method:** This approach is based on the understanding that a combination of diverse native plant species forms a cohesive plant community that thrives and adapts effectively to the local climate. Replicating natural processes, such as structured forests are known to lower temperatures, increase local biodiversity, promote carbon sequestration, and reduce air and soil pollution.

**General guidelines suggested by the BMC's Garden Department:** A minimum of 100 sq. m. (approximately 1,000 sq. ft.) of land that gets around eight hours

of sunlight daily is suitable for planting using the Miyawaki method. In this method, seedlings or saplings are planted densely, with 2-3 native plants per square meter, mixing as many tree species that are native to the local habitat as possible. These saplings are stabilized by placing them within existing forests for at least a week to increase their capacity to adapt to a forest environment before planting them on site.

**As per BMC guidelines,** 5% of Layout Open Space should be developed as a Miyawaki urban forest in plots larger than 3,000 sq. m.



Image 5G: Miyawaki urban forest in Dream Park, Kandivli



Image 5F: Community members involved in planting

ed through co-design workshops, focus group discussions, trainings, and meetings. The community shared the need for shaded green spaces that could be accessed by kids, women, and other residents of the area.

**Technical assessment:** Assessments to understand site biodiversity, sub-surface infrastructure, hydrogeology, and topography informed the ecological and sustainable greening approaches to be undertaken for the site. The site was largely concretized and lacked shaded areas for recreation and play.

**Implementation:** Strategic de-paving for soil restoration and construction of planter beds along the compound walls were carried out. Ecologically suitable native species were planted to support local biodiversity. Existing trees were conserved and revived. To activate the site, place-making strategies such as painting of the compound walls, and provision

of kattas for seating around the trees were implemented. The society federation (a group of society associations) provided resource support for water connections to maintain the greening interventions. Local laborers were given contracts for construction activities. A community artist, along with children, painted the compound walls.

**Long-term maintenance:** Roles and responsibilities for maintenance were undertaken proactively by community members to ensure long-term sustenance.

Some 150 native clusters of trees and shrubs were provided to create a green open space, and 400 individuals from the community were directly engaged in processes to activate the site. Youth groups now conduct open-air study sessions in the newly developed green pocket.<sup>26</sup>

## CASE STUDY

# Miyawaki forest at Dream Park, Kandivali (E)<sup>b</sup>

The Miyawaki forest at Dream Park, with 3,900 trees and shrubs of 62 native species, was initiated and implemented by the NGO Nature Forever Society (NFS) in collaboration with the BMC R-South ward.

**Objective:** To increase green cover and enhance local biodiversity.

To initiate the planting process, NFS submitted a letter of interest to the BMC for developing the Miyawaki forest. The garden department identified a suitable land parcel within Dream Park. NFS then prepared a detailed planning document that included the project intent, timeline, funding details, and planting process, and submitted it to the Garden Department at the R/S ward office for approval.

The selected site of 11,000 sq. ft. (approximately 1,000 sq. m.) was previously a lawn. Implementation processes include the following:

After approvals, site surveys were conducted to assess local ecological parameters such as soil health and the amount of sunlight received. Native plants compatible with these parameters were selected for planting. Consultations with experts informed ecological planting processes.

The site was excavated, and stones and debris were removed from the soil. Red soil and organic fertilizing medium were added to the existing soil, to enhance its fertility and water retention capacity.

Planting pits were prepared, and well stabilized plants were planted to improve the odds of species survival. Mulching with paddy hay was practiced after plantation to enhance nutrition and retain soil moisture.

Upon site handover, NFS shared maintenance guidelines with the BMC, including best practices for weeding, watering, and caution against use of pesticides, insecticides and pruning activities. (Please refer to Annexure.)

The implementation started on 3rd December 2021 and was completed on 9th December 2021. Along with providing guidance and labor support during implementation, the BMC has undertaken responsibility for maintenance. Skilled BMC gardeners perform these maintenance practices in a timely manner. NFS implemented the project with assistance from a Miyawaki planting expert. The implementation costs for materials, tools, and stabilized saplings were borne by NFS.

The project demonstrates the Miyawaki method of planting done in collaboration with local administrative bodies to establish an urban forest.

<sup>b</sup> This case study is documented through consultations with Shri. Devendra Jogia, Gardens Department Officer, R/S ward, BMC.

**CAUTION:** An expert consultation is crucial, as they have knowledge of the ecological balance, soil conditions, and maintenance requirements for planting a Miyawaki forest. Improper practices adopted without expert supervision can cause ecological imbalance, overconsumption of resources, and unfulfillment of greening efforts.

## CASE STUDY

# Urban farming in Scouts & Guides District Training Centre, Powai, Mumbai

**Introduction:** Why urban farming? Urban farming is a practice of cultivating, processing, and distributing food within urban areas. This sustainable approach to greening promotes local food security and good health, helps offset emissions, and fosters community engagement in food production.

**Practicing urban farming:** In Mumbai, urban farming can be practiced by setting up kitchen gardens, community gardens, rooftop farms, and vertical planters, and planting can be in-ground, in containers and in raised beds.

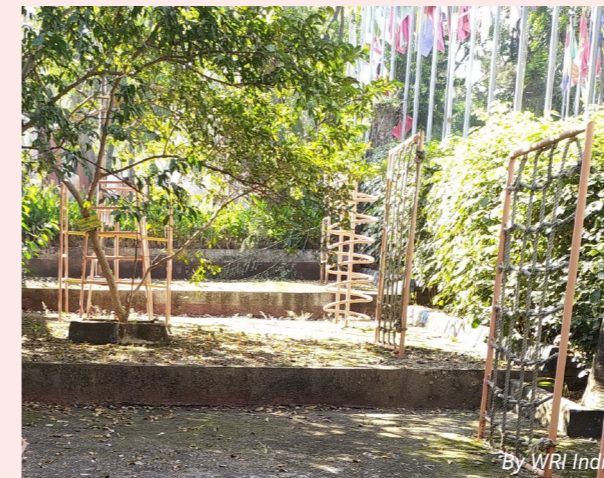


Image 5H: Land parcel before greening

The food garden at a BMC Scouts & Guides District Training Centre in Powai, Mumbai<sup>c</sup> was implemented as a pilot project, through TheCityFix Labs' Accelerating Nature-based Solutions (NbS) initiative. The food garden was developed in 20 raised beds, spread across 2,000 sq. ft., and has 16 species of vegetables.

**Objectives:** BMC school students and teachers from across the city visit the training center for Scouts and Guides camp sessions. The primary aim of the



Image 5I: Developing a food garden

food garden is to provide them opportunities for hands-on experience in organic farming, enhancing local food security, and skill-building. The project also aims to improve the green cover and biodiversity on the campus.

As the solution provider, Edible Routes provided its expertise in developing the food garden. Facilitated by WRI India, the Scouts and Guides





Image 5J | Stakeholder Involvement and training

Training Centre staff, supervisors and gardeners, local laborers were involved in implementation, whereas Brihanmumbai Municipal Corporation assisted by providing land, permissions, and other resources.

Following an assessment of open spaces on the campus to understand sunlight and ground conditions, and proximity to water source, an unused parcel of land was identified for developing the food garden.

The existing trees on the plot were preserved, and underused play equipment was integrated into the garden design as supports for climbers.

Raised bed farming was adopted in order to optimize space, preserve soil health, and clearly separate the growing medium from pathways. With an average length of 18 feet, each bed is 4 feet wide, with 2 feet of circulation space around it, facilitating easy plant care and movement.

To ensure proper drainage and root aeration, the beds are elevated 10 inches from the ground by laying bricks in a stretcher bond to achieve a balanced structure without using cement mortar, leaving tiny gaps between each brick. Additionally, the beds are lined with drain trays and weed cloth to avoid soil

erosion through the gaps.

Drip irrigation has been set up to reduce water consumption and the manual effort of watering.

Crop rotation and companion planting are practiced in order to ensure soil fertility, control pests and diseases naturally, and to improve yield.

To ensure long-term maintenance of the food garden, hands-on training sessions with supervisors and staff at the Centre were conducted by Edible Routes. The curriculum included best practices for pruning, weeding, mulching, composting, and harvesting. The staff members who have been trained can now share learnings with the students and teachers who visit the institute. The project was implemented with the support of 35 participants. Through trainings, and hands-on activities of planting and maintenance practices, the project established a knowledge base among supervisors, teachers, and other stakeholders. The training sessions served as a platform for the participants to understand processes related to sustainable farming and to build their capacity to maintain and develop similar solutions.

The harvest produced is used to prepare food for the 150-300 students and teachers who visit at a time, enhancing nutrition through organic "farm to table" vegetables.

The project is a model for urban farming that can be implemented across the city on a small, medium, or large scale. The insights from this project are expected to empower participants to implement similar sustainable solutions in their homes, communities, and schools.

© This case study is documented in consultation with Harshil Suresh, Senior Program Associate, Urban Innovations, WRI India

## Container Planting

Planting in containers is a common practice in Mumbai. Potted plants can be seen in windows, lobbies of housing societies, schools, shop fronts, community centers, small gardens, etc.

### How to choose a container

Pots and planters made of clay, ceramic, plastic, Fibre-reinforced Plastic (FRP), and concrete are common, and are easily available. Paint buckets, metal cans, plastic bottles, pipes, tires, barrels, etc., can be reused as planters. However, metal containers rust over time, and have to be replaced every four to five years.<sup>20</sup>

Pots used for various cultural celebrations and during festivals like Gathastapana, Navratri garba, Teej, Chhat puja, etc. can be reused for planting as a sustainable practice, while also providing aesthetic value.

The size of the container depends on the root depth of the chosen plant. On average, a depth of 10-12 inches is suitable for vegetables, flowers, and short plants.



1. Hanging planter

Taller plants require greater depth, depending on their root structure. Microgreens and leafy vegetables with short roots grow well in shallow containers such as tin cans, half pipes, plastic bottles, etc.<sup>7</sup> Containers should be easy to handle when filled with soil, and lightweight to safeguard the building structure when on rooftops.<sup>8</sup>

### How to prepare a container for planting

Containers, especially in case of reuse, should be thoroughly cleaned. An adequate number of drain holes should be made at the bottom or on the sides, ensuring proper drainage and root aeration.<sup>6</sup>

Containers with perforations, such as bamboo baskets and fruit trays, should be lined with materials such as jute, non-polymer cotton, geotextile, etc.<sup>7</sup>

A saucer or a drain plate of an appropriate size should be kept under the container to collect any excess water.

## CONTAINER PLANTING ON A MEDIUM OR LARGE SCALE

Container planting is a good option for greening on paved or concretized surfaces that may be available between buildings, in driveways and lobbies, on compound walls, and on streets. Citizens' groups, eco-clubs, NGOs, and building societies can take the initiative to implement container planting in their neighborhood.



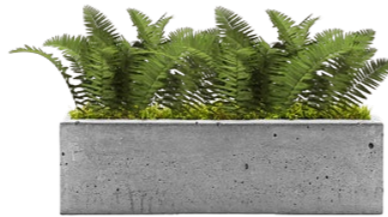
VI. Growbags



II. Planting trays



IV. Plastic bottles



V. Concrete planters



VII. Reused paint buckets



VIII. Reused festival pots



III. Clay pots

Figure 5.2: Commonly used containers for planting

Photo credits: I. Amazon India, II. India Mart, III. Pottery barn, IV. elenaseychelles/ freepik, V. Object Outdoors, VI. India Mart, VII. Practical Whimsy Designs, VIII. Sunil Kadam/ BMC

## STEP-WISE GUIDE TO PLANTING IN POTS

**1. Container selection:** Select the container based on what you plan to grow in it, as discussed above.

**2. Drainage:** Ensure that there are drainage holes at the bottom of the container. Please refer to the section on plant containers.

**3. Planting medium:** Place pebbles, stones, or pieces of brick or pottery over the drainage holes. Then add a layer of leaf mould (dried leaves, softwood chips, twigs, etc). Fill the container with the planting medium<sup>6</sup>

A few planting mediums are recommended below:  
Mix of garden soil, organic compost, and perlite in a 2:1:1 ratio.<sup>6</sup>

Soil, organic compost, and sand in a 1:1:1 ratio  
Soil, organic compost, and cocopeat in 1:1:1 ratio<sup>7</sup>  
Note: Soil mixed with cocopeat helps retain moisture and reduces the weight of the potting mix.<sup>8</sup>

**4. Planting:** the simplest way to sow a seed is to place it at a minimum depth equivalent to seed's size and

cover it with soil.<sup>6</sup>

**5. Watering:** Provide adequate water and avoid overwatering. Please refer to the chapter on watering.

**6. Repotting:** Older potted plants that show signs of frequent wilting, stunting growths, and roots sticking out of drainage holes require repotting.

Care should be taken that the plant's root ball remains intact when it is removed from its old pot.

To remove it, loosen the soil, hold the stem between two fingers, and invert the pot so that the plant comes out easily. The roots should be inspected for damage, and affected parts should be carefully pruned.

The plant can then be repotted in the new container with fresh potting mix, following the same steps mentioned above.



Place pebbles and broken bricks at the base

Add the soil mix soil, compost, cocopeat in 1:1:1 ratio

Place the sapling along with the root ball

Fill the remaining container with the soil mix

Water at the base of the plant and add mulch on top

Figure 5.3 : An example of step-wise planting in a container

Illustration source: Olya Haifisch/ Shutterstock.com

# 06

## How to care for plants

After the planting process is complete and your selected site is greened, it is important to ensure that the plants' needs are met, so that they can grow and thrive. Watering them appropriately, adding compost to the soil to make it more nutritious, amending soils for better soil texture, and using other vital techniques of soil enhancement like mulching, can give the best results in maintaining green spaces. This section elaborates on maintenance practices and techniques.



Watering



Composting



Soil amendments and mulching



Other maintenance practices

By Markus Spiske

Icons via thenounproject.com

# Watering

## IRRIGATION PRACTICES

A plant's water requirement can be determined by checking the moisture content of the soil it is planted in. The easiest way is to dip your finger into the soil before watering it to check if it is moist, soggy, or dry. Dry soil indicates need for watering, whereas sticky soil indicates excessive moisture.<sup>8</sup>

The quantity of water that a plant need depends on its species and on environmental factors such as heat, rain, and humidity.

For most plants, watering 2-3 times a week is sufficient, but it may vary depending on the season. For potted plants and planters, it is advisable to water them daily, as the soil dries quickly due to the shallowness of the container/growing medium.<sup>8</sup>

Plants should be watered either early in the morning or in the evening, to avoid evaporation loss, especially during summer. Watering should be done close to the base of the plant, instead of the foliage. Water should percolate at least 6-8 inches deep into the soil.<sup>7</sup>

In Mumbai, plants may require frequent watering during summer. In the monsoon, indoor plants may require watering once a week, and plants in open/outdoor areas may not require watering. Smaller and newer plants should be provided with an overhead cover or should be kept under a shelter during heavy rains.

## WATER AS A SHARED RESPONSIBILITY

Watering plants at the household level is an individual responsibility. At the society or community level, various practices can be adopted to ensure regular, monitored and efficient watering. In residential societies, the society manager can appoint a person in charge, usually the society gardener or a member of the service staff. To ensure active participation from the residents, society greening clubs, gardening groups, etc. can be formed.

In an informal settlement, this responsibility can lie with the community center or National Service Scheme NSS candidates, volunteers from society and local mandals, or eco-clubs<sup>28</sup> in schools.

In a community, a common watering tank can be maintained, where persons from all households can contribute to collection of water that can be used for watering the plants.

In areas where water availability is limited, societies can adopt water recycling. Also, plants that require less water and drought-resilient species can be chosen areas.

## WATER REUSE AND RECYCLING

At the household level, the run-off from washing of vegetables, pasta water, unwanted ice, etc. can be reused to water plants.

In large-scale plots, a local sewage treatment plant or a grey water treatment plant can be set up collaboratively with adjoining buildings, with the assistance of and permissions from the ward office. This treated grey or wastewater can be used in landscaped areas.<sup>15</sup>

The water demand for landscaping purposes (e.g., lawns) is generally estimated at 6 to 8 litres/m<sup>2</sup>/day. For shrubs and trees, the above value can be reduced considerably.<sup>15</sup>

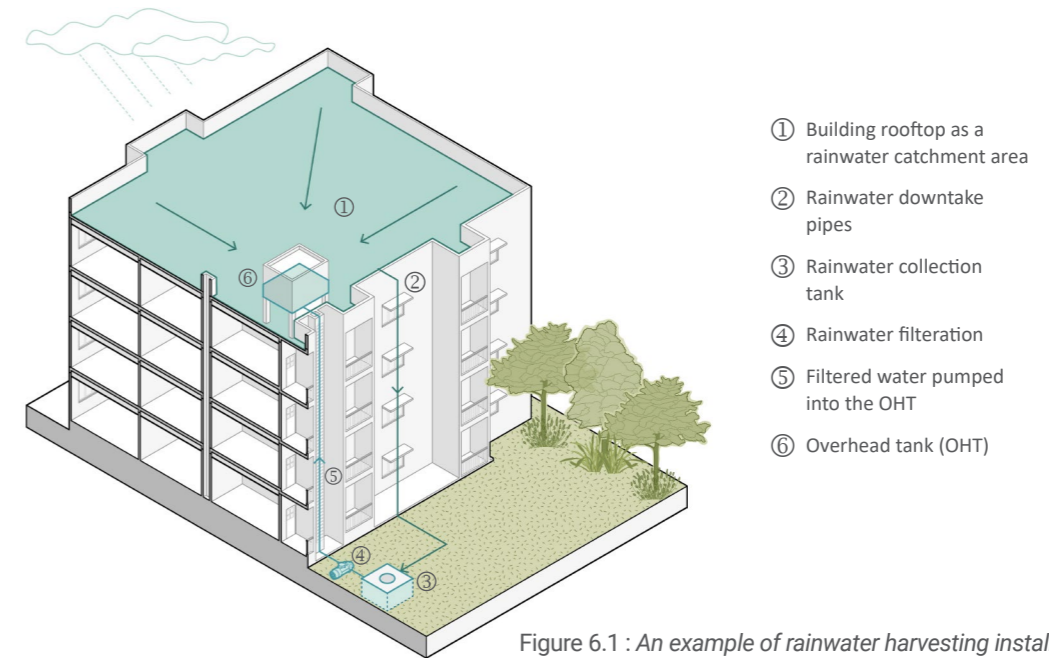


Figure 6.1 : An example of rainwater harvesting installation

## RAINWATER HARVESTING

In Mumbai, a large amount of rainwater which escapes through stormwater drains can instead be harvested. This harvested rainwater can be used to recharge groundwater or collected for reuse.

Structures for rainwater retention, such as infiltration trenches, biofiltration swales, rain gardens, bioswales, permeable pavers, and percolation pits, help recharge groundwater. Water detention facilities for harvested rainwater provide structures for storage in case of reuse.<sup>15</sup> Both systems can be integrated into the greening plan, as illustrated in the planting section of the manual.

Rainwater can be harvested on rooftops or in open spac-

es that can capture the rain. It can be done at the individual and society levels by identifying catchment areas and directing harvested rainwater through pipes or land gradients, into retention or detention structures. On large plots, such structures can be incorporated in the planting plan. For collection and storage, collective efforts can be made by residents, community-based organizations, NGOs, etc., to set up rainwater harvesting systems in the area. Rainwater harvesting can be adopted by schools, commercial complexes, and other organizations for watering purposes. (Refer to the annexure for BMC's Water Conservation and Rainwater Harvesting for Brihanmumbai manual.)

**CAUTION:** Using untreated wastewater for watering may result in soil and groundwater contamination. Adequate treatment of wastewater and rainwater is required before use, ensuring removal of solids or any biological matter and disinfection.

## CASE STUDY

# Little Flower Convent School for the Blind and the Deaf- City of 1000 tanks



Image 6A: Constructed wetlands and hill gardens at the Little Flower Convent School

The water balance pilot project at the 97-year-old Little Flower Convent School for the Blind and the Deaf, Chennai was developed to demonstrate the capacity of the Water as Leverage (WaL) method under the 'City of 1,000 Tanks' project.

The WaL program aims to address the urban water crisis by using water as a lever to drive climate resilience. The City of 1,000 Tanks project focuses

on potential of nature-based solutions in public spaces for water retention, recharge and reuse, to combat Chennai's water insecurity due to floods, droughts, sewage pollution, and overexploitation of water resources.<sup>29</sup>

**Objective:** The project aimed to achieve water security and climate resilience for the school by using



Image 6B: Training the staff for maintenance practices

nature-based solutions to repair broken infrastructure, collect rainwater, and treat wastewater and use it to replenish aquifers.

The project was implemented by OOZE Architects, Rotterdam, in collaboration with local organizations and experts in the fields of urban design, water management, social and cultural engagement, policy, and finance. These included the Chennai Resilience Center, Madras Terrace Architectural Works, and Urayugal Social Welfare Trust, among others.<sup>d</sup> Students and staff at the Little Flower Convent School were involved in the planning process of the project.

The school campus, used by 500 visually and hearing-impaired students, was selected for the pilot, because it mirrors the challenges faced by Chennai, specifically monsoon flooding and inadequate water infrastructure. The interdisciplinary team identified three key challenges at Little Flower Convent: sewage overflow, monsoon flooding, and summer drought.

The wastewater recycling system was designed to process 27,000 liters of wastewater daily. The waste-

water undergoes anaerobic treatment in two underground tanks, and is further purified through constructed wetlands, where it is filtered by aerobic treatment using the root system of halophytic plants.

The treated water is then directed to hill gardens, infiltration gardens, and recharge wells for percolation and recharging aquifers.

The team conducted an operations and maintenance workshop for site owners and staff to create awareness, build capacity, and ensure long-term maintenance.<sup>30</sup>

The system enables approximately 26,998 liters of treated water to be recharged into the groundwater daily. The increase in green cover and permeable surfaces allows rainwater to percolate, thereby reducing flooding.

The project serves as a demonstrative model that is scalable and replicable at the ward, district, and city levels. The implementation process in collaboration with experts, local organizations, institutions, and end-users, helped develop an inclusive, place-based, people-centric model for a nature-based solution for water balance.

*The project is a part of 'Water as Leverage for Resilient Cities Asia' program launched by the Netherlands government and planned in collaboration with the Greater Chennai Corporation and 100 Resilient Cities.*

<sup>d</sup> Details of the project and the project team <https://www.cityof1000tanks.org/team>

# Composting

Soils need to be replenished with nutrition on a regular basis. Adding compost made from kitchen scraps is one of the most common ways to ensure that the nutrient content of the soil is maintained. Composting is the process of recycling organic matter, such as kitchen waste, leaves, branches, twigs, etc., into nutrient-rich material that can be added to soil to fertilize it, enrich its nutrient content, improve soil structure, moderate moisture levels, and aid microbial activity in the soil.<sup>8</sup>

To start composting at home, you need to first segregate your household wet waste from the dry, and

collect dried leaves, branches, twigs, coconut husks, etc. from a nearby garden or street. For composting to be successful, there must be a balance of green and brown matter. Wet waste is known as green matter, and the dried leaves, twigs, and other dry organic matter is called brown matter.<sup>8</sup> Kitchen waste like such as vegetable peels, fruit scraps, tea leaves, and coffee grounds, can be added to the compost. However, adding coconut shells, whole onions, garlic, and meat bones to the compost should be avoided, as they take longer to decompose. Weeds pulled out from your pots, or garden can be used for composting, though an infected pruned part of a plant should not be added.<sup>29</sup>

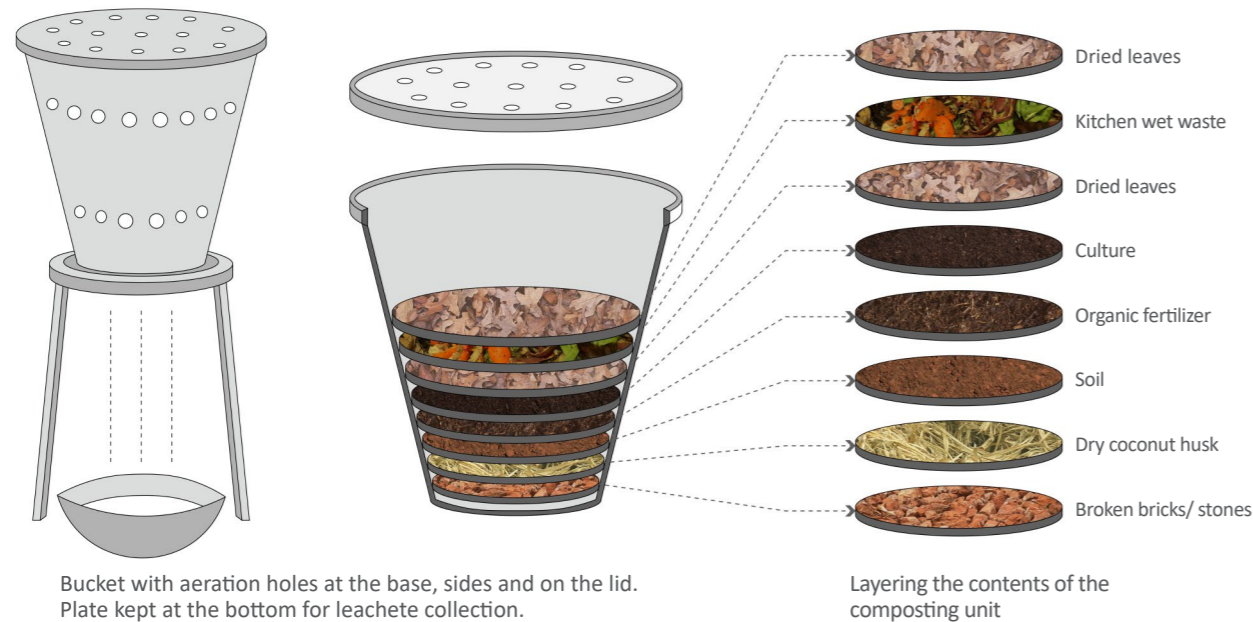


Figure 6.2: Individual household level composting

**TIP :** Periodically check for any blockages in the aeration holes of the composting unit and remove them to ensure good aeration.



By Neem Environs

Image 6C: Rotating composting tumblers

Composting at the society/community level is similar to the household level. The quantity of waste generated by the society should be assessed, and, depending on the amount of wet waste generated, a composting tumbler or a composting pit should be used. As a rule of thumb, a society with 20-40 households can use composting tumblers and one with 40-100 households will require composting pits.<sup>29</sup>

Segregation of wet kitchen waste should happen at the source, i.e., at the household level, to ease the process of waste assessment before adding the waste to the composter.

Society-level composting is encouraged in Section 3.2.8.6 Decentralised Composting of the Municipal Solid Waste Manual by Ministry of Housing and Urban Affairs (MoHUA) under the Swachh Bharat Mis-

**TIP :** Moisture is essential for composting; placing the unit in a well-shaded area away from direct sunlight will help retain the moisture.



By World Enviro

Image 6D: Home composting basket

sion.<sup>32</sup> The initiative of composting at the society level can be supported by BMC's Advanced Locality Management (ALM) society-level waste management manual. The Solid Waste Management Department can be contacted at the ward level for assistance.<sup>33</sup>

The initiative can be taken up by either the society managing committee or by a group of individuals. The managing committee is required to understand the willingness of the society, discuss the initiative at society meetings, and set up a waste assessment and collection system. The group of individuals should take necessary permission from the society managing committee, and a similar process can be adopted by the society to implement composting.

## CASE STUDY

# Composting in Devangini Society, Vile Parle



Image 6E: Monitoring board at Devangini Colony

In 2013, motivated to segregate and manage waste at its source, residents of Devangini Society in Vile Parle, developed a waste management system for all 30 households in the complex. They formed the Devangini Nisarg Mandal to regulate the system, which composts approximately 40 kg of wet waste daily. The resulting nutrient-rich compost is used in the society's garden, which has around 30 trees, and a rooftop farm.

**Objective:** To establish a sustainable waste management system that manages waste at its source, encourages reuse and recycling, and reduces pollution and the strain on landfills.

Devangini Nisarg Mandal was instrumental in initiating the waste management effort. The society helper has been entrusted with the responsibility of collection, monitoring and maintenance of the system. The BMC collects the dry waste and takes it to its dry waste segregation center on MIDC Road, Andheri. E-waste is collected by a local e-waste collector.<sup>34</sup>

The team conducted an initial waste audit to determine the quantity and composition of the waste generated. Based on the findings, they planned to segregate the waste into e-waste, dry waste, and kitchen wet waste. The society helper was trained and assigned the responsibility of monitoring the segregation.

For wet waste management, three vermicomposting spots were identified in the society compound. Each unit serves the society for four months, and all three are used in rotation. The households contributed to the initial cost of dustbins and digging of composting pits. The society helper's monthly payment for his waste management duties is covered by the society maintenance fund.

Wet waste is added to the composting pits daily. The resulting compost is used in the society garden, and the society's rooftop urban farm. Excess compost is sold at Rs. 20 per kilo, and the revenue generated is used for maintenance.

The Mandal has also setup a scoreboard in the building, on which the quantity of waste recycled and composted is updated regularly, to motivate and recognize residents' efforts.<sup>35</sup>

The system achieves waste segregation at source, with zero wet waste disposal, and recycling of dry waste. Through active resident participation and collective efforts, the process is economical, sustainable, and creates a positive environmental impact. Between 2013 and October 2020, the society has converted 32,600 kgs of wet waste into 2,934 kgs of compost.<sup>e</sup>

<sup>e</sup> This case study is documented in consultations with Architect Satish Kolvankar, resident of Devangini Housing Society and composting expert of Devangini Nisarg Mandal.

# Soil Amendments and Mulching

## SOIL AMENDMENT

Soil is the growing medium for plants. It is composed of organic matter (humus), mineral particles, and air. Adding amendments to the soil help restore its quality, as they augment organic matter, enhance microbial communities, and improve the texture, aeration, and water-holding capacity of the soil. The use of compost is a common and low-cost amendment practice.

For potted plants and planters, soil amendments can be made while prepping the soil for planting in the container.

Soil amendments are made to improve soil texture, while fertilizers are used to add nutrients to the soil. Market-bought organic fertilizers and homemade fertilizers such as those made from banana peels, eggshells, and liquid fruit peel can also be classified as organic soil amendments. These fertilizers are a good source of nitrogen, phosphorus, and potassium, which are required for healthier soils and plant growth.<sup>8</sup>



Image 6E: Adding compost to the soil

For ground planting at the medium and largescale, soil amendments can be made after soil testing. Please refer to the section on Soil Testing for details.

The simplest way to amend the soil is to carefully loosen the top 1-2 inches of soil with a garden fork, and then top it with compost at least once a year. Regular amendments can be made to such soils by adding organic fertilizers. Existing soil can be amended using the ring method where the soil around half the diameter of the canopy is dug out, amended with compost and fertilizer, and refilled back.

**CAUTION:** Use of chemical fertilizers and pesticides can severely affect soil organisms and insects, swap these harmful chemicals with homemade organic fertilizers and compost, and plant pest repellent plants like garlic, mint, onion, basil or lemongrass.



Image 6F: Dried leaves mulching

## MULCHING

**Mulching is a practice of covering the soil around plants with certain external materials referred to as 'mulch'. Mulching helps regulate soil temperature, retain soil moisture, and reduce weed growth. Soil organisms thrive in the moisture and darkness created by mulching.**<sup>7</sup>

Materials such as plastic coverings, pebbles, gravel, crushed stones, and sand, are inorganic mulch used for mulching and aesthetics. Easily available organic matter like dried leaves, wood shavings, straw, hay, grass, branches, etc., are commonly used mulching materials, and are known to improve soil fertility and to add nutrients to the soil.<sup>36</sup>

Although mulching helps improve overall soil health, it is important to consider factors such as humidity, shade from the plant canopy, and the amount of mulch required. Mulching around fruit and vegetable plants during the monsoon can encourage slugs and bugs, which can affect the crop. Excessive mulching for a prolonged period may also result in root rot.<sup>8</sup> The layer of mulch should be approximately 3-5 inches for plants in a sunny spot. Summer and winter are the best times to practice mulching.<sup>37</sup>

In residential societies, community spaces, institutions, and public greening spaces, dried leaves from the trees in the area can be collected and layered around the base of the plants.<sup>38</sup>

**TIP :** Natural decomposition of dead branches, leaves, wooden logs, is a cycle of reintroducing nutrients back to the soil, so instead of disposing them off use them as mulch.

# Other Maintenance Practices

## PRUNING

**Pruning plays a vital role in promoting plant growth and maintaining plant health.**

Yellow leaves, dead leaves and leaves from lower parts of the stem should be pruned regularly to avoid diseases, improve air circulation, and ensure even distribution of sunlight for the plants.<sup>7</sup> For seasonal flowering plants, dead flowerheads should be periodically pruned to promote growth of new shoots.

On a household scale, pruning involves removing dead leaves, diseased parts of the plant, and dead branches. At the society/community level, seeking assistance from a gardener is recommended for pruning smaller plants. They possess the expertise to ensure proper maintenance and overall plant health. When dealing with tree-trimming and cutting, it is important to adhere to BMC's tree trimming and cutting permission application process. The society office or any resident can initiate the process to seek permission.<sup>39</sup>

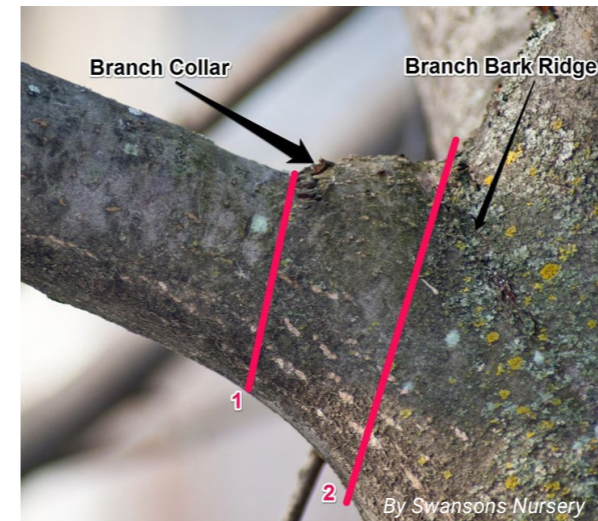


Image 6G: Pruning at the collar of the branch

For large trees, regular trimming during the monsoon is a precautionary measure to prevent falling or other destruction of trees and their surroundings. For public spaces, citizens can apply to BMC through its online portal or at the ward office to request the trimming of weak or unsafe trees.

Citizens can also report improper tree-cutting practices. It is crucial to note that only the BMC is authorized to trim trees in public spaces, as outlined in The Maharashtra (Urban Areas) Protection and Preservation of Trees Act.

To ensure sustainable pruning, consider the following:

1. Only the dead or diseased parts of the tree should be removed. Pruning should be done using clean sharp tools, and the tools and equipment should be adequately cleaned or sterilized after use.
2. The cuts made in the plant should be flat and sharp, without jagged edges.
3. Use the raising technique of removing of the lower branches to provide clearance for buildings, services, vehicles, etc. while pruning.
4. Ensure trees are trimmed to achieve a balanced shape, while taking care not to alter the shape of the tree or the natural habitat of birds and mammals that depend on it. The process should consider the growth pattern of the branches of shrubs and trees. In case of tree branches, pruning back to the collar at the base of the branch is advisable.
5. Avoid excessive trimming of trees, as it can cause tree stress, decay, and the risk of falling/uprooting.<sup>2</sup>
6. Always ensure that trees are trimmed/cut by experienced vendors.<sup>15,41</sup>

By following these practices, we can contribute to the health and longevity of our plants while maintaining the urban ecosystem responsibly.





Image 6H: Yellowing of leaves



Image 6I: Leaf wrinkling and leafminers



Image 6J: Aphids on leaves

## PEST AND DISEASE MANAGEMENT

Spotting signs of disease or pests in plants is crucial for timely intervention. Symptoms such as wilting, yellowing leaves, persistent dryness despite watering, leaf wrinkling, rotting, colored spots, and leaf malformations indicate potential issues.

At the individual level, organic insecticides such as neem oil or sour curd spray can be used to control pests and diseases. Pruning the diseased part of the plant can further help in disease control.<sup>8</sup> In addition, pest repellent plants such as mint, garlic, basil, sage, and coriander can be planted.<sup>7</sup>

On the society/community scale, pest and disease control is a collective responsibility carried out by eco-clubs, community groups, or society managing committees. The assistance of gardeners or helpers and the use of organic insecticides and termiticides, whether homemade or store-bought, are recommended.

For public trees, the BMC takes initial preventive measures by painting the base with Sinopia (red geru) and lime to prevent fungal diseases. If any indication of termite infestation, such as appearance of mud tubes at the base of the tree, bark or branches, is observed in trees in public spaces, citizens should report it to the ward office. The trees department will take the necessary measures, such as laying termiticide rings around the trees, termite foam treatment, or pruning.<sup>42</sup>

To access forms for permissions, applications, and reporting issues related to tree maintenance, please refer to Garden Department's list of documents available on the BMC website under Department manuals.<sup>43</sup>

**TIP :** Grey or white winding trails on leaves is an indication of leaf miners, simply remove the affected leaves and spray your plants with neem oil. Yellow leaves, leaf curls or damage to new shoots are a few indications of the presence of plants lice, small bugs that feed on plant sap. Physically displace them from the plant using a garden spray, hose, or chilli-garlic spray.<sup>7</sup>

## TREE GUARDS

Protecting plants and crops from external factors is essential for their well-being. Measures such as guarding against animals and bugs, preventing wind damage, and protecting against trampling or physical damage are crucial. In informal settlements, grazing can pose a significant concern.

Creating a physical barrier around plants using tree guards can be highly effective, especially for young saplings.<sup>15</sup> Wire mesh or shade nets wrapped around bamboo supports can be adopted at the household and society/community scale. Reusable materials such as fishnet, pigeon net, cloth, jute matting, or gunny bags can also be encouraged through participatory efforts involving residents, community groups, citizen groups, community organizations, and NGOs.

Tree guards should be removed after 3-5 years, depending on tree growth. In urban farming, crop guards should be removed after harvesting.

## PRESERVATION OF EXISTING VEGETATION

Protection of existing vegetation (including trees, shrubs, grasses and other plants) where possible, by preventing disturbance or damage to specified areas

during planning the greening initiative, is recommended. All existing vegetation should be marked on a site plan, and efforts should be made to conserve it.

Trees should not be used as a support for any structure, and their trunks should not be damaged by carving, nailing advertisements, or any other material. Using inflammable materials or lighting fires should be strictly prohibited in the greening spaces.<sup>15</sup>

When developing the area around existing trees, a tree basin should be created, and concretization should be avoided. Tree basins promote healthy root growth and aeration.

Under the Maharashtra Tree Preservation Act, every citizen has a right to object to felling, cutting of any tree. They can raise a complaint regarding the same using the BMC complaint portal, details of which are shared in the pruning section of the manual.<sup>40</sup>

If a person cuts down a tree, or is responsible for its removal, or fails to adhere to the guidelines established by the Tree Authority, as outlined in section 21 of the Maharashtra (Urban Area) Protection and Preservation of Trees Act 1975, they will incur penalties.<sup>40</sup>



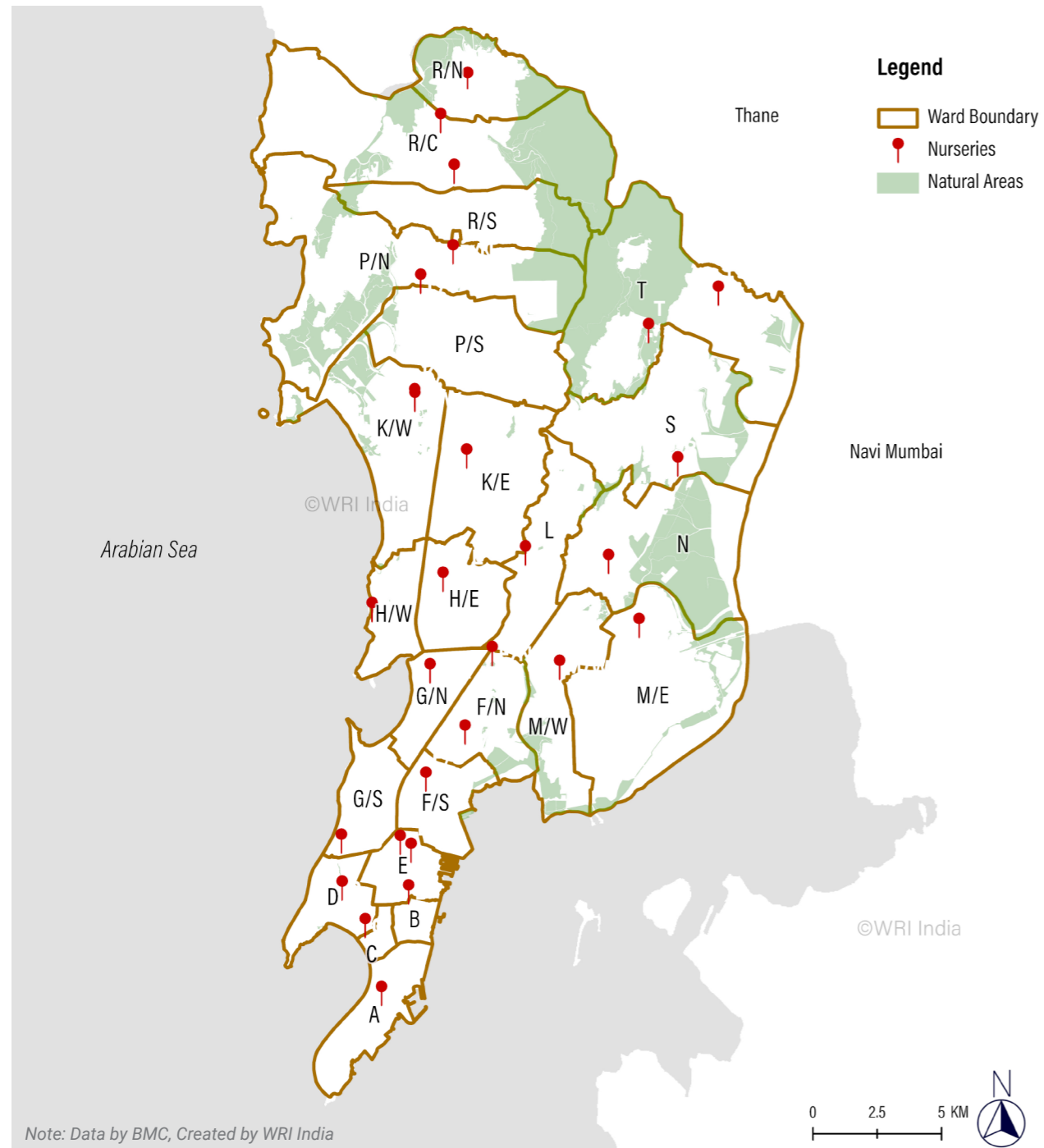
Image 6K: Metal tree guard



Image 6L: Bamboo guard



Image 6M: Shade net



# 07 Annexure

Scan the QR code or [click here](#) to access the interactive map for the BMC wardwise nurseries in Mumbai.



## BMC wardwise nurseries

Sr. No	Ward	Location and address of Nursery
1	A	Cooperage Garden , Near Mantralay, M.K.Road, Mumbai- 400020
2	B	Sitaram Shenoy garden, Navroji hill Rd no 7, near Sandhurst road railway station, Mumbai- 400009
3	C	S. K. Patil garden, Charni Road, Thakurdwar, Kalbadevi, Mumbai- 400002
4	D	D Ward office Nursery, Jobanputra compound,, Mumbai- 400007
5	E	Poddar nursery Sant Sawata Marg Byculla East, Mumbai- 400027
6	E	Veer mata Jijabai Bhosale Botanical Udyan and Zoo Nursery, Mumbai- 400027
7	F/S	Nursery at Dean banglow, S. S. Rao road parel, Mumbai- 400012
8	F/N	Maharshi Karve Park Garden, David barreto road, Wadala, Mumbai- 400031
9	F/N	Pandit Jawaharlal Nehru Udyan(Sion Killa), Sion, Mumbai- 400022
10	G/S	Haji ali nursery, Lala Lajapatrai road , Hajiali, Mumbai- 400034
11	G/N	Nursery at Didhi tank garden, MMC road, mahim, Mumbai- 400016.

Sr. No	Ward	Location and address of Nursery
12	L	Nursary at Sonapur cementry , LBS road, Khetani compound, Kurla W, Mumbai- 400070
13	M/E	MEast ward office building terrace 4 th floor, M T Kadam Marg, Govandi (West), Mumbai-400043
14	M/W	Municipal nursury, near Nanak Bhojwani garden, Ram tekdi, Chembur camp, Chembur, Mumbai- 400074
15	H/E	Christian cemetery, Teachers colony,Bandra East, Mumbai- 400051
16	H/W	Jmashediji Hasnaji Katrak garden, Perry cross road,Bandra West, Mumbai- 400050
17	K/E	CTS NO 294 Chintamani Plaza, Near Chakala, Andheri East, Mumbai- 400053
18	K/W	Plot reserved as Garden and RG developed as sport complex bearing CTS no. 1A/3, 1A/3/1 to 1A/3/15 1A/4,I of village Ambivali and CTS no.737/9/12A/3 & 737/9/12A/4 of village Oshiwara at junction of Captain Samant Marg and Veera Desai Road Andheri West in K West Ward
19	P/S	Aai Ekveera Udyan, Ahimsa marg, near D.G khetan school, Goregaon (West), Mumbai-400064
20	P/N	Behind Ramleela maidan, Goshala lane, Malad (East), Mumbai- 400097
21	N	Gopinath Munde Traffic Training Park, M. G. Road, Ghatkopar (East), Mumbai- 400077
22	S	Plot no 23, Kannamwar nagar, Vikrholi (East), Mumbai- 400083
23	T	Nursery at Murar road, Behind Kalidas Natyagruh, Mulund (West), Mumbai- 400080
24	T	Bhandup complex nursery, Khindipada, Mulund (West), Mumbai- 400078
25	R/S	Nursery Plot near Rajiv Gandhi udyan, Poisar gymkhana road, Kandivali (West), Mumbai-400092
26	R/C	Shyamaprasad Mukherjee Udyan Boriwali (West), Mumbai- 400091
27	R/N	Loknete Gopinath Munde Shakti Maidan, Dahisar (West), Mumbai- 400103

# Native Plant List for Mumbai

Contributed by oikos for ecological services

## A. Plantation and Beautification

### TREES

Sr No	Botanical name	Marathi name	Local name
1.	<i>Actinodaphne angustifolia</i>	पिसा	Pisa
2.	<i>Aegle marmelos</i>	बेल	Bel
3.	<i>Ailanthus excelsa</i>	महारुख	Maharukh
4.	<i>Albizia lebbek</i>	शिरीष	Shirish
5.	<i>Albizia odoratissima</i>	चिंचवा	Chinchva / Chichora
6.	<i>Albizia procera</i>	किन्हई	Kinhai
7.	<i>Alstonia scholaris</i>	सप्तपर्णी ,सातवीण	Saptaparni, Satwin
8.	<i>Anogeissus latifolia</i>	धावडा	Dhawada
9.	<i>Aphanamixis polystachya</i>	रोहितक	Rohitak
10.	<i>Artocarpus hirsutus</i>	रान फणस	Ran phanas
11.	<i>Atalantia racemosa</i>	माकड लिंबू	Makad Limbu
12.	<i>Barringtonia acutangula</i>	तीवर, नेवर	Tiwar, Nevar
13.	<i>Bauhinia malabarica</i>	पाचवा , आमली	Pachawa, Amlī
14.	<i>Bauhinia purpurea</i>	कांचन, रक्त कांचन ,कचनार	Kanchan, Rakta Kanchan, Kachnar
15.	<i>Bauhinia racemosa</i>	आपटा	Apta
16.	<i>Bombax ceiba</i>	काटे सावर / सावर	Kate Sawar / Sawar

Sr No	Botanical name	Marathi name	Local name
17.	<i>Bombax insigne</i>	देव सावर	Dev Sawar
18.	<i>Borassus flabellifer</i>	ताड	Taad
19.	<i>Boswellia serrata</i>	सालई	Salai
20.	<i>Bridelia retusa</i>	आसाणा	Asana
21.	<i>Buchanania cochinchinensis</i>	चारोळी	Charoli
22.	<i>Butea monosperma</i>	पळस, पलाश, धाक	Palas, Palash, Dhak
23.	<i>Callicarpa tomentosa</i>	ऐसर , बोख	Aisar, Bokh
24.	<i>Calophyllum inophyllum</i>	उंडी / उंडल	Undi / Undal
25.	<i>Canthium dicoccum</i>	तुपा	Tupa
26.	<i>Carallia brachiata</i>	फणशी	Phanshi
27.	<i>Careya arborea</i>	कुंभा	Kumbha
28.	<i>Caryota urens</i>	भेरली माड	Bherali Mad
29.	<i>Cassia fistula</i>	बहावा , अमलतास	Bahava, Amaltas
30.	<i>Cassine glauca</i>	भूत्या	Bhutyā/ Bhutyakes
31.	<i>Catunaregam spinosa</i>	गेळा	Gela
32.	<i>Cinnamomum verum</i>	दालचिनी	Dalchini
33.	<i>Cordia dichotoma</i>	भोकर	Bhokar
34.	<i>Crateva adansonii</i>	वरुण, वायवर्ण	Varun, Vayavarna
35.	<i>Dalbergia lanceolaria subsp. lanceolaria</i>	फाशी	Phanshi / Dandus

Sr No	Botanical name	Marathi name	Local name
36.	<i>Dalbergia latifolia</i>	शिसम, बिल्वा	Shisam, Bilwa
37.	<i>Dillenia pentagyna</i>	करमळ / पिवळा करमळ	Karmal / Piwla Karmal
38.	<i>Diospyros melanoxylon</i>	तेंदू, टेंभूर्णी	Tendu, Tembhurni
39.	<i>Diospyros peregrina</i>	टेमु, टेंभूर्णी	Temru, Tembhurni
40.	<i>Dolichandrone falcata</i>	मेढशिंगी	Medhshingi
41.	<i>Ehretia laevis</i>	अजान	Ajaan
42.	<i>Erinocarpus nimmonii</i>	चेर	Cher
43.	<i>Erythrina stricta</i>	रान पांगारा, काटेपांगारा	Ran Pangara, Kate Pangara
44.	<i>Erythrina suberosa</i>	पांगारा(बूच)	Pangara
45.	<i>Erythrina variegata</i>	पांगारा	Pangara
46.	<i>Excoecaria agallocha</i>	गेवा	Geva
47.	<i>Ficus amplissima</i>	पिपर, पिपरी	Pipar, Pipri
48.	<i>Ficus arnottiana</i>	पायर	Payar
49.	<i>Ficus benghalensis</i>	वड	Wad
50.	<i>Ficus drupacea</i>	बुरली वड	Burali Wad
51.	<i>Ficus exasperata</i>	खारोटी, खरवत	Kharoti, Karvat
52.	<i>Ficus hispida</i>	काळ उंबर	Kal Umbar
53.	<i>Ficus microcarpa</i>	नांदूक	Nandruk
54.	<i>Ficus racemosa</i>	उंबर	Umbar

Sr No	Botanical name	Marathi name	Local name
55.	<i>Ficus religiosa</i>	पिंपळ	Pimpal
56.	<i>Ficus virens</i>	प्लक्ष	Plaksha
57.	<i>Firmiana colorata</i>	कौशी	Kaushi
58.	<i>Flacourtia indica</i>	तांबट	Tambat
59.	<i>Flacourtia latifolia</i>	तांबट	Tambat
60.	<i>Flacourtia montana</i>	अटक, रान तांबट	Atak, Ran Tambat
61.	<i>Garcinia indica</i>	कोकम	Kokam
62.	<i>Gardenia resinifera</i>	डिकेमाळी	Dikemali
63.	<i>Garuga pinnata</i>	काकड	Kakad
64.	<i>Gmelina arborea</i>	शिवण	Shivan
65.	<i>Grewia asiatica</i>	फालसा	Phalsa
66.	<i>Grewia tiliifolia</i>	धामण	Dhaman
67.	<i>Haldina cordifolia</i>	हेदू	Hedu
68.	<i>Heterophragma quadriloculare</i>	वारस	Waras
69.	<i>Holoptelea integrifolia</i>	वावळ	Wawal
70.	<i>Hydnocarpus pentandrus</i>	कडू कवठ	Kadu Kavath
71.	<i>Ixora brachiata</i>	खुरी / राय कुडा	Khuri / Raikuda
72.	<i>Kydia calycina</i>	वारंग	Warang
73.	<i>Lagerstroemia microcarpa</i>	नाणा	Nana

Sr No	Botanical name	Marathi name	Local name
74.	<i>Lagerstroemia parviflora</i>	बोंडारा	Bondara
75.	<i>Lagerstroemia speciosa</i>	ताम्हण	Tamhan
76.	<i>Lansea coromandelica</i>	मोई	Moi
77.	<i>Limonia acidissima</i>	कवठ	Kawath
78.	<i>Macaranga peltata</i>	चांदवा	Chandava
79.	<i>Madhuca longifolia var. latifolia</i>	मोह	Moha
80.	<i>Madhuca longifolia var. longifolia</i>	दक्षिण मोह	Dakshin Moha
81.	<i>Magnolia champaca</i>	सोनचाफा	Sonchapha
82.	<i>Mallotus nudiflorus</i>	पेटारी	Petari
83.	<i>Mallotus philippensis</i>	कुंकू / शेंदरी	Kunku / Shendri
84.	<i>Mallotus polycarpus</i>	पेटारी	Petari
85.	<i>Mammea suriga</i>	सुरंगी	Surangi
86.	<i>Mangifera indica</i>	आंबा	Amba
87.	<i>Manilkara hexandra</i>	खिरणी , रायण	Khirni, Rayan
88.	<i>Melia dubia</i>	लिंबारा / कडू खजूर	Limbara/ Kadu Khajur
89.	<i>Memecylon umbellatum</i>	अंजनी	Anjani
90.	<i>Mesua ferrea</i>	नागचाफा	Nagchapha
91.	<i>Meyna laxiflora</i>	आळू	Aalu
92.	<i>Milusa tomentosa</i>	हूम / हुंब	Hoom / Humb

Sr No	Botanical name	Marathi name	Local name
93.	<i>Mimusops elengi</i>	बकुळ	Bakul
94.	<i>Mitragyna parvifolia</i>	कळम	Kalam
95.	<i>Morinda pubescens</i>	बारतोंडी	Bartondi
96.	<i>Murraya paniculata</i>	पांढर / कुंती	Pandhar/Kunti
97.	<i>Neolamarckia cadamba</i>	कदंब	Kadamb
98.	<i>Olea dioica</i>	पार जांभूळ	Par Jambhul
99.	<i>Oroxylum indicum</i>	टेदू	Tetu
100.	<i>Phoenix sylvestris</i>	शिंदी	Shindi
101.	<i>Phyllanthus emblica</i>	आवळा	Awala
102.	<i>Piliostigma foveolatum</i>	कांचन सुगंधी , चामोळी	Kanchan sugandhi, Chamoli
103.	<i>Pongamia pinnata</i>	करंज	Karanj
104.	<i>Pterocarpus marsupium</i>	बिजा / बिवळा	Bija/ Bivala
105.	<i>Pterocarpus santalinus</i>	रक्तचंदन	Raktachnadan
106.	<i>Putranjiva roxburghii</i>	पुत्रन्जीव	Putranjiva
107.	<i>Radermachera xylocarpa</i>	खडशिंगी	Khadshingi
108.	<i>Sageraea laurifolia</i>	सागेरी	Sageri
109.	<i>Salvadora persica</i>	पीलू	Pilu
110.	<i>Sapindus laurifolius</i>	रिठा	Ritha
111.	<i>Sapium insigne</i>	हुरा	Hura

Sr No	Botanical name	Marathi name	Local name
112.	<i>Saraca asoca</i>	सीता अशोक	Sita Ashok
113.	<i>Schleichera oleosa</i>	कुसुम	Kusum
114.	<i>Schrebera swietenoides</i>	मोखा	Mokha
115.	<i>Semecarpus anacardium</i>	बिब्बा/ गोडंबी / रातांबी	Bibba / Godambi
116.	<i>Senegalia catechu</i>	खैर	Khair
117.	<i>Senegalia polyacantha</i>	पांदरा खैर	Pandhara Khair
118.	<i>Spondias pinnata</i>	अंबाडा	Ambada
119.	<i>Sterculia guttata</i>	कुकेर	Kuker
120.	<i>Sterculia urens</i>	करू / कहांडोळ	Karu / Kahandol
121.	<i>Stereospermum colais</i>	पाडळ	Padal
122.	<i>Stereospermum tetragonum</i>	पाडळ	Padal
123.	<i>Strychnos nux-vomica</i>	काजरा	Kajra
124.	<i>Syzygium cumini</i>	जांभूळ	Jambhul
125.	<i>Tamilnadia uliginosa</i>	पेंढरा	Pendhara
126.	<i>Tectona grandis</i>	साग / सागवान	Sag/ Sagwan
127.	<i>Terminalia arjuna</i>	अर्जुन	Arjun
128.	<i>Terminalia bellirica</i>	बेहेडा	Beheda
129.	<i>Terminalia chebula</i>	हिरडा	Hirda
130.	<i>Terminalia elliptica</i>	ऐन	Ain

Sr No	Botanical name	Marathi name	Local name
131.	<i>Terminalia paniculata</i>	किंजळ	Kinjal
132.	<i>Terminalia phillyreifolia</i>	महाधावडा	Mahadhawda
133.	<i>Thespesia populnea</i>	भेंड / परस भेंड	Bhend / Paras Bhendi
134.	<i>Trema orientale</i>	खरळ/ घोळ	Kharal / Ghol
135.	<i>Vachellia leucophloea</i>	हिवर	Hivar
136.	<i>Vachellia nilotica</i>	बाभूळ	Babhul
137.	<i>Vitex leucoxydon</i>	शेरस	Sheras
138.	<i>Wrightia tinctoria</i>	काळा कुडा	Kala Kuda
139.	<i>Xantolis tomentosa</i>	कोंभळ	Kombhal
140.	<i>Xylia xylocarpa</i>	जांभा	Jambha / Yerul / Surya
141.	<i>Zanthoxylum rhetsa</i>	तिरफळ	Tirphal
142.	<i>Ziziphus mauritiana</i>	बोर	Bor

### SHRUBS

Sr No	Botanical name	Marathi name	Local name
1.	<i>Acanthus ilicifolius</i>	मारांडी	Marandi
2.	<i>Allophylus cobbe</i>	तिपण	Tipan
3.	<i>Barleria prionitis</i>	खोलेटा/ कोरांटी	Kholeta/ Koranti

Sr No	Botanical name	Marathi name	Local name
4.	<i>Calotropis gigantea</i>	मांदार	Mandar
5.	<i>Calotropis procera</i>	रुई	Rui
6.	<i>Capparis spinosa</i>	कबर	Kabar
7.	<i>Capparis zeylanica</i>	वाघाटी, गोविंदफळ	Waghathi / Govind-phal
8.	<i>Carissa congesta</i>	करवंद	Karwand
9.	<i>Clerodendrum inerme</i>	कोयनेल / वनजाई	Koynel / Vanjai
10.	<i>Clerodendrum serratum</i>	भारंगी	Bharangi
11.	<i>Clerodendrum viscosum</i>	भंडीरा	Bhandira
12.	<i>Costus speciosus</i>	कोष्टा/ पेव	Koshta/ Pev
13.	<i>Embelia tsjeriam-cottam</i>	वावडिंग	Wawding
14.	<i>Euphorbia antiquorum</i>	तीनधारी निवडुंग	Tindhari Nivdung
15.	<i>Euphorbia ligularia</i>	निवडुंग	Niwadung
16.	<i>Euphorbia nivulia</i>	निवडुंग	Nivdung
17.	<i>Ficus heterophylla</i>	वेली खारुती	Veli Kharuti
18.	<i>Flemingia strobilifera</i>	कानफुटी	Kanphuti
19.	<i>Flueggea virosa</i>	पांढरफळी	Pandharphali
20.	<i>Gnidia glauca</i>	रामेठा	Rametha
21.	<i>Helicteres isora</i>	मुरुडशेंग	Murudsheng
22.	<i>Holarrhena pubescens</i>	कुडा/ पांढरा कुडा	Kuda/ Pandhara Kuda

Sr No	Botanical name	Marathi name	Local name
23.	<i>Ixora coccinea</i>	बकोरा / देव्हारी	Bakora / Dewhari
24.	<i>Justicia adhatoda</i>	अडुळसा	Adulasa
25.	<i>Leea indica</i>	दिंडा	Dinda
26.	<i>Lumnitzera racemosa</i>	किर्पा	Kirpa
27.	<i>Maytenus senegalensis</i>	हेंकळ	Henkel
28.	<i>Murraya koenigii</i>	कडीपत्ता	Kadhipatta
29.	<i>Nilgiranthus warreensis</i>	वारी कारवी	Wari Karwi
30.	<i>Opuntia elatior</i>	फड्या निवडुंग	Phadya Niwdung
31.	<i>Pandanus odoratissimus</i>	केवडा	Kewada
32.	<i>Plumbago zeylanica</i>	चित्रक	Chitrak
33.	<i>Premna corymbosa</i>	अग्निमंथ	Agnimanth
34.	<i>Rauwolfia serpentina</i>	सर्पगंधा	Sarpagandha
35.	<i>Reinwardtia indica</i>	नेवाळी / पिवळी अबयी	Newali / Piwali Abai
36.	<i>Rotula aquatica</i>	मचीम	Machim
37.	<i>Solanum anguivi</i>	रिंगणी	Ringni
38.	<i>Solanum indicum</i>	चिचार्डी / रान वांग / डोरली	Chichardi / Ran Wanga / Dorali
39.	<i>Spermedictyon suaveolens</i>	जीतसाया / गिडेसा	Jeetsaya / Gidesa
40.	<i>Tamarix ericoides</i>	शेरणी	Sherani



Sr No	Botanical name	Marathi name	Local name
41.	<i>Thespesia lampas</i>	रान भेंडी	Ran Bhendi
42.	<i>Vitex negundo</i>	निरगुडी	Nirgudi
43.	<i>Wendlandia heynei</i>	उखस	Ukhas
44.	<i>Woodfordia fruticosa</i>	धायटी	Dhayati
45.	<i>Ziziphus rugosa</i>	तोरण	Toran

#### CLIMBERS

Sr No	Scientific name	Marathi name	Local Name
1	<i>Acacia concinna</i>	शिकेकाई	Shikekai
2	<i>Argyrea nervosa</i>	समुद्रशोक	Samudrashok / Gugguli
3	<i>Asparagus racemosus</i>	शतावरी	Shatawari
4	<i>Caesalpinia bonduc</i>	सागरगोटा	Sagargota
5	<i>Capparis species</i>	कपॅरीस जाती	Capparis
6	<i>Celastrus paniculatus</i>	ज्योतिष्मती / मालकांगुणी	Jyotishmati/ Malkanguni
7	<i>Gloriosa superba</i>	कळलावी	Kal lawi
8	<i>Gymnema sylvestre</i>	मधुनाशिनी	Madhunashini
9	<i>Hemidesmus indicus var. indicus</i>	अनंतमूळ / सरीव	Anantamul / Sariva
10	<i>Ipomoea pes-caprae</i>	मर्यादवेल	Maryadvel

Sr No	Botanical name	Marathi name	Local name
11	<i>Passiflora foetida</i>	कृष्ण कमळ / वेल घाणी	Krushna Kamal / Vel Ghani
12	<i>Rubia cordifolia</i>	मंजिष्ठ	Manjistha
13	<i>Tinospora cordifolia</i>	गुळवेल	Gulvel
14	<i>Wattakaka volubilis</i>	हरणदोडी	Harandodi / Ambri

#### LIANA/ WOODY CREEPERS

Sr No	Scientific name	Marathi name	Local Name
1	<i>Bauhinia vahlii</i>	कांचनवेल / चामूळ	Kanchanwel / Chamul
2	<i>Combretum albidum</i>	पिळूकी	Piluki

## B. Terrace Garden

Note: T – Tree; S – Shrub; H – Herb; Cl – Climber; G – Grass; F – Fern; WA- Wetland associated ; WR - Wetland Rooted ; WF- Wetland Floating

Non-native / Cultivated plants which are non-invasive are included in the list, they are marked by star (\*)

Sr No	Botanical Name	Marathi Name	Local name	Habit
1.	<i>Abrus precatorius</i>	गुंज	Gunj	Cl
2.	<i>Achyranthes aspera</i>	आघाडा	Aghada	H
3.	<i>Acorus calamus</i>	वेखंड	Wekhand	H
4.	<i>Agave amica</i> *	निशिंगंध *	Nishigandh *	H
5.	<i>Alocasia indica</i> *	अळू ( शोभेचा ) *	Alocasia *	H
6.	<i>Aloe vera</i> *	कोरफड *	Korphad *	H
7.	<i>Alpinia purpurata</i> *	अल्पिनिया *	Alpinia *	H
8.	<i>Asparagus species</i>	शतावरी	Asparagus	Cl
9.	<i>Bacopa monnieri</i>	नीर ब्राह्मी	Neer Brahmi	WR
10.	<i>Barleria species</i> *	कोरांटी*	Barleria*	S
11.	<i>Bauhinia racemosa</i>	आपटा	Apta	T
12.	<i>Bauhinia tomentosa</i>	पिवळा कांचन	Piwala Kanchan	S

Sr No	Botanical Name	Marathi Name	Local name	Habit
13.	<i>Begonia species</i> *	बेगोनिया*	Begonia*	H
14.	<i>Buddleja asiatica</i>	बटरफ्लाय बुश	Butterfly bush	S
15.	<i>Calotropis procera</i>	रुई	Rui	S
16.	<i>Canna species</i> *	कर्दळ*	Kardal*	H
17.	<i>Carica papaya</i> *	पपई*	Papai*	T
18.	<i>Celosia argentea</i>	कुई	Kurdu	H
19.	<i>Centella asiatica</i>	मंडूकपर्णी / ब्राह्मी	Mandukaparni / Brahmi	H
20.	<i>Chrysanthemum morifolium</i> *	शेवंती*	Shevanti*	H
21.	<i>Chrysopogon zizanioides</i> *	वाळा*	Wala / Vetiver*	G
22.	<i>Citrus limon</i> *	लिंबू*	Limbu*	S
23.	<i>Clitoria ternatea</i>	गोकर्ण	Gokarna	Cl
24.	<i>Coleus amboinicus</i> *	ओवापान*	Ova pan*	H
25.	<i>Crossandra infundibuliformis</i> *	अबोली*	Aboli*	H
26.	<i>Curcuma longa</i> *	हळद*	Halad*	H
27.	<i>Cymbopogon citratus</i> *	गवती चहा*	Gavati chaha*	G
28.	<i>Cynodon dactylon</i>	दुर्वा	Durva	G
29.	<i>Dyopsis lutescens</i> *	अरेका पाम*	Areca palm*	P
30.	<i>Eclipta prostrata</i>	माका	Maka	H
31.	<i>Eranthemum pulchellum</i> *	एरॅन्थेमम*	Eranthemum*	H

Sr No	Botanical Name	Marathi Name	Local name	Habit
32.	<i>Evolvulus glomeratus*</i>	विष्णुक्रांत*	Vishnukrant*	H
33.	<i>Flemingia strobilifera</i>	कानफुटी	Kanphuti	S
34.	<i>Gardenia jasminoides*</i>	अनंत*	Anant*	H
35.	<i>Hedychium coronarium*</i>	सोनटक्का*	Sontakka*	WA
36.	<i>Heliconia rostrata*</i>	हेलीकोनिया*	Heliconia*	H
37.	<i>Hemidesmus indicus</i>	अनंतमूळ	Anantamul	Cl
38.	<i>Hibiscus species*</i>	जास्वंद*	Jaswand*	S
39.	<i>Hippeastrum or Liliium*</i>	स्पीकर लिली*	Speaker lily*	H
40.	<i>Hymenocallis littoralis*</i>	स्पायडर लिली*	Spider lily*	H
41.	<i>Impatiens species</i>	तेरडा	Terada	H
42.	<i>Ixora species*</i>		Ixora*	S
43.	<i>Jacquemontia pentanthos*</i>		Jacquemontia*	Cl
44.	<i>Jasminum auriculatum*</i>	जुई*	Jui*	Cl
45.	<i>Jasminum grandiflorum*</i>	जाई*	Jai*	Cl
46.	<i>Jasminum laurifolium var. laurifolium*</i>	चमेली*	Chameli*	Cl
47.	<i>Jasminum multiflorum*</i>	कुंदा*	Kunda*	Cl
48.	<i>Jasminum sambac-1*</i>	मदन बाण*	Madan Baan*	S
49.	<i>Jasminum sambac-2*</i>	मोगरा*	Mogara*	S

Sr No	Botanical Name	Marathi Name	Local name	Habit
50.	<i>Justicia adhatoda</i>	अडुळसा	Adulasa	S
51.	<i>Macrotyloma uniflorum</i>	कुळीथ / हुलगे	Kulith	H
52.	<i>Manilkara zapota*</i>	चिकू*	Chiku*	T
53.	<i>Mentha arvensis*</i>	पुदिना*	Pudina*	H
54.	<i>Microstegium vimineum*</i>	बांबू ग्रास*	Bamboo Grass*	G
55.	<i>Murraya exotica*</i>	कुंती / कामिनी / पांढर*	Kunti/ Kamini/Pandhar*	S
56.	<i>Murraya koenigii</i>	कडीपत्ता	Kadhipatta	S
57.	<i>Nephrolepis*</i>	फर्न*	Ferns*	F
58.	<i>Nerium species*</i>	कण्हेर*	Kanher*	S
59.	<i>Nymphaea species</i>	कुमुद (वॉटर लिली)	Kumud (Water Lily)	WF
60.	<i>Nymphoides hydrophylla</i>	कुमुदिनी 1	Kumudini	WR
61.	<i>Nymphoides indicum</i>	कुमुदिनी 2	Kumudini	WR
62.	<i>Ocimum americanum</i>	रान तुळस	Ran tulas	H
63.	<i>Ocimum tenuiflorum</i>	तुळस	Tulas	H
64.	<i>Ophiopogon japonicus*</i>	ओफिओपोगॉन*	Ophiopogon*	H
65.	<i>Origanum majorana</i>	मरवा	Marwa	H
66.	<i>Pennisetum setaceum var rubrum*</i>	फॉन्टन ग्रास*	Fountain Grass*	G
67.	<i>Pennisetum species*</i>	पंपास ग्रास*	Pampas grass*	G
68.	<i>Piper betel*</i>	नागवेल/ विडा*	Nagwel/Vida*	Cl

Sr No	Botanical Name	Marathi Name	Local name	Habit
69.	<i>Piper longum</i>	पिंपळी	Pimpali	H
70.	<i>Plumbago capensis*</i>	प्लंबॅगो*	Plumbago*	H
71.	<i>Plumbago zeylanica</i>	चित्रक	Chitrak	S
72.	<i>Psidium guavaja*</i>	पेरू*	Peru*	T
73.	<i>Reinwardtia indica</i>	नेवाळी / पिवळी अबयी	Newali / Piwali Abai	S
74.	<i>Rosa species-1*</i>	गुलाब फ्लोरीबंडा*	Floribunda rose*	H
75.	<i>Rosa species-2*</i>	गुलाब गावठी*	Gulab-Gavathi*	H
76.	<i>Rubia cordifolia</i>	मंजिष्ठ	Manjistha	Cl
77.	<i>Sesbania grandiflora*</i>	हादगा*	Hadga*	T
78.	<i>Spathiphyllum sp. *</i>	नागफणी *	Peace lily*	H
79.	<i>Stachytarpheta indica*</i>	स्टॅचीटारफेटा*	Stachyterphata*	S
80.	<i>Strelitzia reginae*</i>		Bird of Paradise*	H
81.	<i>Tabernaemontana divaricata-1 *</i>	डबल तगर*	Double tagar*	S
82.	<i>Tabernaemontana divaricata-2*</i>	मिनी तगर*	Mini Tagar*	S
83.	<i>Tabernaemontana divaricata-3*</i>	तगर*	Tagar*	S
84.	<i>Tagetes erecta*</i>	झेंडू*	Zendu *	H
85.	<i>Thysanolaena latifolia*</i>	कुंचा गवत*	Kuncha*	G
86.	<i>Tinospora cordifolia</i>	गुळवेल	Gulvel	Cl
87.	<i>Various vegetables*</i>	विविध भाज्या*	Various vegetables*	H

Sr No	Botanical Name	Marathi Name	Local name	Habit
88.	<i>Verbena species*</i>	व्हर्बिना*	Verbena*	H
89.	<i>Zingiber officinale*</i>	आले*	Aale*	H
90.	<i>Ziziphus mauritiana</i>	बोर	Bor	T

### C. Household level/ Balcony

Note: T – Tree; S – Shrub; H – Herb; Cl – Climber; G – Grass; F – Fern

Non-native / Cultivated plants which are non-invasive are included in the list, they are marked by star (\*)

Sr No	Botanical name	Marathi name	Local name	Habit
1.	<i>Abrus precatorius</i>	गुंज	Gunj	Cl
2.	<i>Achyranthes aspera</i>	आघाडा	Aghada	H
3.	<i>Acorus calamus</i>	वेखंड	Wekhand	H
4.	<i>Agave amica *</i>	निशिंगंध *	Nishigandh *	H
5.	<i>Alocasia indica *</i>	अळू (शोभेचा) *	Alocasia *	H
6.	<i>Aloe vera *</i>	कोरफड *	Korphad *	H
7.	<i>Barleria species*</i>	कोरांटी*	Barleria*	S
8.	<i>Begonia species*</i>	बेगोनिया*	Begonia*	H
9.	<i>Centella asiatica</i>	मंडूकपर्णी / ब्राह्मी	Mandukaparni / Brahmi	H
10.	<i>Chrysanthemum morifolium *</i>	शेवंती*	Shevanti*	H
11.	<i>Clitoria ternatea</i>	गोकर्ण	Gokarna	Cl

Sr No	Botanical Name	Marathi Name	Local name	Habit
12.	<i>Coleus amboinicus</i> *	ओवापान*	Ova pan*	H
13.	<i>Crossandra infundibuliformis</i> *	अबोली*	Aboli*	H
14.	<i>Curcuma longa</i> *	हळद*	Halad*	H
15.	<i>Cymbopogon citratus</i> *	गवती चहा*	Gavati chaha*	G
16.	<i>Cynodon dactylon</i>	दुर्वा	Durva	G
17.	<i>Eclipta prostrata</i>	माका	Maka	H
18.	<i>Eranthemum pulchellum</i> *	एरॅन्थेमम*	Eranthemum*	H
19.	<i>Evolvulus glomeratus</i> *	विष्णुक्रांत*	Vishnukrant*	H
20.	<i>Flemingia strobilifera</i>	कानफुटी	Kanphuti	S
21.	<i>Hedychium coronarium</i> *	सोनटक्का*	Sontakka*	H
22.	<i>Hemidesmus indicus</i>	अनंतमूळ	Anantamul	Cl
23.	<i>Hibiscus species</i> *	जास्वंद*	Jaswand*	S
24.	<i>Impatiens species</i>	तेरडा	Terada	H
25.	<i>Jasminum auriculatum</i> *	जुई*	Jui*	Cl
26.	<i>Jasminum grandiflorum</i> *	जाई*	Jai*	Cl
27.	<i>Jasminum sambac-2</i> *	मोगरा*	Mogara*	S
28.	<i>Justicia adhatoda</i>	अडुळसा	Adulasa	S
29.	<i>Mentha arvensis</i> *	पुदिना*	Pudina*	H
30.	<i>Murraya koenigii</i>	कढीपत्ता	Kadhipatta	S

Sr No	Botanical Name	Marathi Name	Local name	Habit
31.	<i>Nephrolepis</i> *	फर्न*	Ferns*	F
32.	<i>Ocimum americanum</i>	रान तुळस	Ran tulas	H
33.	<i>Ocimum tenuiflorum</i>	तुळस	Tulas	H
34.	<i>Origanum majorana</i>	मरवा	Marwa	H
35.	<i>Piper betel</i> *	नागवेल/ विडा*	Nagwel/Vida*	Cl
36.	<i>Piper longum</i>	पिंपळी	Pimpali	H
37.	<i>Plumbago zeylanica</i>	चित्रक	Chitrak	S
38.	<i>Reinwardtia indica</i>	नेवाळी / पिवळी अबयी	Newali / Piwali Abai	S
39.	<i>Rosa species-1</i> *	गुलाब फ्लोरीबंडा*	Floribunda rose*	H
40.	<i>Rosa species-2</i> *	गुलाब गावठी*	Gulab-Gavathi*	H
41.	<i>Rubia cordifolia</i>	मंजिष्ठ	Manjistha	Cl
42.	<i>Tabernaemontana divaricata-2</i> *	मिनी तगर*	Mini Tagar*	S
43.	<i>Tagetes erecta</i> *	झेंडू*	Zendu *	H
44.	<i>Zingiber officinale</i> *	आले*	Aale*	H

#### D. Butterfly attracting plants

Note: T – Tree; S – Shrub; H – Herb; Cl – Climber; G – Grass; F – Fern; WA- Wetland associated

Non-native / Cultivated plants which are non-invasive are included in the list, they are marked by star (\*)

Sr No	Botanical name	Marathi name	Local name	Habit
1.	<i>Abrus precatorius</i>	गुंज	Gunj	Cl
2.	<i>Abutilon species</i>	अब्युटीलोन जाती (मुद्रा)	Abutilon	H
3.	<i>Achyranthes aspera</i>	आघाडा	Aghada	H
4.	<i>Aegle marmelos</i>	बेल	Bel	T
5.	<i>Albizia lebeck</i>	शिरीष	Shirish	T
6.	<i>Albizia odoratissima</i>	चिंचवा	Chinchva / Chichora	T
7.	<i>Albizia procera</i>	किन्हई	Kinhai	T
8.	<i>Alstonia scholaris</i>	सप्तपर्णी ,सातवीण	Saptaparni, Satwin	T
9.	<i>Artemesia species</i>			H
10.	<i>Artocarpus heterophyllus</i>	फणस	Phanas	T
11.	<i>Asclepias curassavica</i>	हळद कुंकू	Halad kunku	WA
12.	<i>Atalantia racemosa</i>	माकड लिंबू	Makad Limbu	T

Sr No	Botanical name	Marathi name	Local name	Habit
13.	<i>Bambusa bambos</i>	बांबू कळक	Bamboo kalak	G
14.	<i>Barleria species*</i>	बारलेरिया (कोरांटी) जाती*	Barlerias*	S
15.	<i>Bauhinia racemosa</i>	आपटा	Apta	T
16.	<i>Bombax ceiba</i>	काटे सावर / सावर	Kate Sawar / Sawar	T
17.	<i>Buddleja asiatica</i>	बटरफ्लाय बुश	Butterfly bush	S
18.	<i>Butea monosperma</i>	पळस, पलाश, धाक	Palas, Palash, Dhak	T
19.	<i>Caesalpinia species</i>	सिसलपिनिया जाती	Caesalpinia	S
20.	<i>Calotropis gigantea</i>	मांदार	Mandar	S
21.	<i>Calotropis procera</i>	रुई	Rui	S
22.	<i>Canavalia gladiata</i>	अबई	Abai	Cl
23.	<i>Capparis species</i>	कपॅरीस जाती	Capparis	Cl
24.	<i>Capparis zeylanica</i>	वाघाटी, गोविंदफळ	Waghati / Govind-phal	S
25.	<i>Caryota urens</i>	भेरली माड	Bherali Mad	P
26.	<i>Cassia fistula</i>	बहावा , अमलतास	Bahava, Amaltas	T
27.	<i>Cassia tora</i>	टाकळा	Takla	H
28.	<i>Costus speciosus</i>	कोष्टा/ पेव	Koshta/ Pev	S

Sr No	Botanical name	Marathi name	Local name	Habit
29.	<i>Crateva adansonii</i>	वरुण, वायवर्ण	Varun, Vayavarna	T
30.	<i>Cryptolepis buchananii</i>	सुपर्णिका / कावळी	Suparnika/Kawali	Cl
31.	<i>Dendrophthoe falcata</i>	बांडगुळ	Bandgul	H
32.	<i>Dioscorea bulbifera</i>	कडू कारंदा	Kadu Karanda	Cl
33.	<i>Diospyros melanoxylon</i>	तेंदू, टेंभूर्णी	Tendu, Tembhorni	T
34.	<i>Dregea volubilis</i>	हिरणदोडी	Hirandodi	Cl
35.	<i>Eranthemum roseum</i>	दशमुळी/ जंगली अबोली	Dashmuli/ Jungli Aboli	H
36.	<i>Ficus benghalensis</i>	वड	Wad	T
37.	<i>Ficus racemosa</i>	उंबर	Umbar	T
38.	<i>Ficus religiosa</i>	पिंपळ	Pimpal	T
39.	<i>Flacourtia indica</i>	तांबट	Tambat	T
40.	<i>Flacourtia montana</i>	अटक , रान तांबट	Atak, Ran Tambat	T
41.	<i>Flemingia strobilifera</i>	कानफुटी	Kanphuti	S
42.	<i>Gnidia glauca</i>	रामेठा	Rametha	S
43.	<i>Helicteres isora</i>	मुरुडशेंग	Murudsheng	S
44.	<i>Hemidesmus indicus</i>	अनंतमूळ / सरीव	Anantamul / Sariva	Cl
45.	<i>Holarrhena pubescens</i>	कुडा/ पांढरा कुडा	Kuda/ Pandhara Kuda	S
46.	<i>Hygrophila auriculata</i>	तालीमखाना	Talimkhana	WA
47.	<i>Lagerstroemia microcarpa</i>	नाणा	Nana	T

Sr No	Botanical name	Marathi name	Local name	Habit
48.	<i>Lagerstroemia speciosa</i>	ताम्हण	Tamhan	T
49.	<i>Leea indica</i>	दिंडा	Dinda	S
50.	<i>Magnolia champaca</i>	सोनचाफा	Sonchapha	T
51.	<i>Mallotus nudiflorus</i>	पेटारी	Petari	T
52.	<i>Mallotus polycarpus</i>	पेटारी	Petari	T
53.	<i>Mangifera indica</i>	आंबा	Amba	T
54.	<i>Milusa tomentosa</i>	हूम / हुंब	Hoom / Humb	T
55.	<i>Mitragyna parvifolia</i>	कळम	Kalam	T
56.	<i>Murraya paniculata</i>	पांढर/कुंती	Pandhar/Kunti	T
57.	<i>Murraya koenigii</i>	कडीपत्ता	Kadhipatta	S
58.	<i>Neolamarckia cadamba</i>	कदंब	Kadamb	T
59.	<i>Ocimum tenuiflorum</i>	कृष्ण तुळस	Krishna Tulas	H
60.	<i>Oxalis corniculata</i>	आंबुशी	Ambushi	H
61.	<i>Passiflora foetida</i>	कृष्ण कमळ / वेल घाणी	Krushna Kamal / Vel Ghani	Cl
62.	<i>Plumbago zeylanica</i>	चित्रक	Chitrak	S
63.	<i>Pogostemon benghalensis</i>	पांगळी	Pangali	H
64.	<i>Pongamia pinnata</i>	करंज	Karanj	T
65.	<i>Portulaca oleracea</i>	घोळू / घोळ	Gholu / Ghol	H
66.	<i>Premna corymbosa</i>	अग्निमंथ	Agnimanth	S

Sr No	Botanical name	Marathi name	Local name	Habit
67.	<i>Putranjiva roxburghii</i>	पुत्रन्जीवा	Putranjiva	T
68.	<i>Saraca asoca</i>	सीता अशोक	Sita Ashok	T
69.	<i>Schleichera oleosa</i>	कुसुम	Kusum	T
70.	<i>Sida acuta</i>	बला	Bala	H
71.	<i>Sorghum species</i>	रान ज्वारी	Ran jwari	G
72.	<i>Spermadictyon suaveolens</i>	जीतसाया / गिडेसा	Jeetsaya / Gidesa	S
73.	<i>Terminalia bellirica</i>	बेहेडा	Beheda	T
74.	<i>Terminalia paniculata</i>	किंजळ	Kinjal	T
75.	<i>Tinospora cordifolia</i>	गुळवेल	Gulvel	Cl
76.	<i>Urena lobate</i>	वन भेंडी	Van Bhendi	S
77.	<i>Vitex negundo</i>	निरगुडी	Nirgudi	S
78.	<i>Wendlandia heynei</i>	उखस	Ukhas	S
79.	<i>Woodfordia fruticosa</i>	धायटी	Dhayati	S
80.	<i>Wrightia tinctoria</i>	काळा कुडा	Kala Kuda	T
81.	<i>Xantolis tomentosa</i>	कोंभळ	Kombhal	T
82.	<i>Xylia xylocarpa</i>	जांभा	Jambha / Yerul / Surya	T
83.	<i>Ziziphus mauritiana</i>	बोर	Bor	T
84.	<i>Ziziphus rugose</i>	तोरण	Toran	S
85.	<i>Zornia gibbosa</i>	लांडगु	Landgu	H

### E. Riparian and Wetland plants

Note: T – Tree; S – Shrub; H – Herb;

#### RIPARIAN VEGETATION/ नदीकाठची झाडी

Sr No	Botanical Name	Marathi Name	Local Name	Habit
1.	<i>Barringtonia acutangula</i>	तीवर, नेवर	Tiwar, Nevar	T
2.	<i>Ficus heterophylla</i>	वेली खारुती	Veli Kharuti	S
3.	<i>Ficus hispida</i>	काळ उंबर	Kal Umbar	T
4.	<i>Ficus racemosa</i>	उंबर	Umbar	T
5.	<i>Lagerstroemia speciose</i>	ताम्हण	Tamhan	T
6.	<i>Neolamarckia cadamba</i>	कदंब	Kadamb	T
7.	<i>Pongamia pinnata</i>	करंज	Karanj	T
8.	<i>Rotula aquatic</i>	मचीम	Machim	H
9.	<i>Syzygium cumini</i>	जांभूळ	Jambhul	T
10.	<i>Tamarix ericoides</i>	शेरणी	Sherani	S
11.	<i>Terminalia arjuna</i>	अर्जुन	Arjun	T
12.	<i>Vitex leucoxyton</i>	शेरस	Sheras	S



## WETLAND PLANTS

Sr No	Botanical Name	Marathi Name	Local Name
1.	<i>Acorus calamus</i>	वेखंड	Wekhand
2.	<i>Azolla species</i>	अँझोला	Azolla
3.	<i>Bacopa monnieri</i>	नीर ब्राह्मी	Neer Brahmi
4.	<i>Coix lacryma-jobi</i>	कशेड / रान जोंधळा	Kashed / Ran jondhala
5.	<i>Crinum species</i>	लिली	Lilies
6.	<i>Cyperus rotundus</i>	बारीक मोथा / नागरमोथा	Barik Motha / Nagarmotha
7.	<i>Hedychium coronarium</i>	सोनटक्का	Sontakka
8.	<i>Hydrilla species</i>	हायड्रीला	Hydrilla
9.	<i>Hygrophila auriculata</i>	तालीमखाना	Talimkhana
10.	<i>Hygrophila schulli</i>	तालीमखाना / विखार	Talimkhana / Vikhar / Kate kolsunda
11.	<i>Ipomea aquatic</i>	नळीची भाजी	Nalichi bhaji
12.	<i>Lemna species</i>	डकवीड	Duckweed
13.	<i>Limnophila</i>	लिम्नोफायला	Limnophylla
14.	<i>Limnophyton obtusifolium</i>	नळकुट	Nalkut
15.	<i>Ludwigia adscendens</i>	पोकळ लवंग	Pokal Lawang

Sr No	Botanical Name	Marathi Name	Local Name
16.	<i>Ludwigia octovalvis</i>	पाणलवंग	Paan Lawang
17.	<i>Marsilea quadrifolia</i>	वॉटर क्लोव्हर	Water Clover
18.	<i>Monochoria vaginalis</i>	मोर पाकळी	Morpakli
19.	<i>Nelumbo nucifera</i>	कमळ	Kamal
20.	<i>Nymphaea nouchali</i>	ब्लू लिली / नलिनी	Blue Water Lily / Nalini
21.	<i>Nymphaea pubescens</i>	व्हाईट लिली / हिमानी	White Water Lily / Himani
22.	<i>Nymphaea rubra</i>	रेड लिली / लाल कमळ	Red Water Lily / Lal Kamal
23.	<i>Nymphoides hydrophylla</i>	कुमुदिनी 1	Kumudini
24.	<i>Nymphoides indicum</i>	कुमुदिनी 2	Kumudini
25.	<i>Ottelia alismoides</i>	भात कमळ	Bhat Kamal
26.	<i>Pandanus odorifer</i>	केवडा	Kewada
27.	<i>Persicaria glabra</i>	शेरळ	Sheral
28.	<i>Phragmites karka</i>	बोरू	Boru
29.	<i>Pogostemon deccanensis</i>	जांभळी मंजिरी	Jambhali Manjiri
30.	<i>Polygonum glabrum</i>	शेरळ / परळ	Sheral / Paral
31.	<i>Sagittaria sagittifolia</i>	अँरो हेड	Arrow head
32.	<i>Trapa natans</i>	शिंगाडा	Shingada
33.	<i>Typha domingensis</i>	पाण कणीस	Paan Kanis
34.	<i>Vallisneria species</i>	व्हॅलीस्नेरीया	Vallisneria

## F. Mangroves

### MANGROVES/ कांदळवनातील झाडे

Sr No	Botanical Name	Marathi Name	Local Name
1.	<i>Avicennia marina</i>	तीवर	Tivar
2.	<i>Avicennia officinalis</i>	तीवर	Tivar
3.	<i>Bruguiera cylindrica</i>	कांदळ	Kandal
4.	<i>Bruguiera gymnorhiza</i>	झुंबर	Zambar
5.	<i>Ceriops tagal</i>	किरकीरी / चौरी	Kirkiri / Chauri
6.	<i>Rhizophora mucronata</i>	कांदळ	Kandal
7.	<i>Sonneratia alba</i>	पांढरी चिपी	Pandharai Chipi
8.	<i>Sonneratia apetala</i>	चिपी	Chipi

### MANGROVES ASSOCIATES/ कांदळवन परसिरातील वनस्पती

Sr No	Botanical Name	Marathi Name	Local Name
1.	<i>Acanthus ilicifolius</i>	मरांडी	Marandi
2.	<i>Aegiceras corniculatum</i>	काजळा	Kajala
3.	<i>Excoecaria agallocha</i>	गेवा	Geva
4.	<i>Derris trifoliata</i>		
5.	<i>Salvadora persica</i>	पीलू	Pilu
6.	<i>Achrosticum aureum L</i>		Mangrove fern

## Other resources

Sr No.	Resource	QR code
1.	<a href="#">The Maharashtra(Urban Areas) Protection and Preservation of Trees Act, 1975</a>  <a href="#">Maharashtra Act No. IX of 2021 Amended to The Maharashtra(Urban Areas) Protection and Preservation of Trees Act, 1975</a>	  
2.	Biodiversity survey i. <a href="#">Biodiversity Audit – University of Mumbai</a>  ii. <a href="#">Baseline survey including Rapid Biodiversity Survey by Ladybird Environmental Consulting LLP survey</a>	  
3	<a href="#">Water Conservation and Rainwater Harvesting guidelines, BMC</a>	

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