Guidelines for Plantation in the Industrial Parks of Telangana

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Contents

1. Background: Telangana ku Haritha Haaram

National Forest Policy of India envisages a minimum of 33% of the total geographical area under forest / tree cover to maintain environmental stability and ecological balance; that are vital for sustenance of all life-forms, human, animal and plants[1].

Telangana Ku Haritha Haaram, a flagship programme of the Telangana Government envisages to increase the present 24% tree cover in the State to 33% of the total geographical area of the State. The thrust areas to achieve the above are two-fold; one, initiatives in notified forest areas, and the other, initiatives in areas outside the notified forest areas[1].

The first objective is sought to be achieved by a multi-pronged approach of rejuvenating degraded forests, ensuring more effective protection of forests against smuggling, encroachment, fire, grazing and intensive soil and moisture conservation measures following the watershed approach[1].

Major fillip is sought to be given to Social Forestry for achieving the second objective. In the areas outside the notified forest, massive planting activities will be taken up in areas such as; road-side avenues, river and canal bank, barren hill, tank bunds and foreshore areas, institutional premises, religious places, housing colonies, community lands, municipalities, industrial parks, etc.

230 Crore seedlings are proposed to be planted in the State during the next three years. Out of this, 130 crores seedlings are proposed to be planted outside the notified forest areas (10 crore within HMDA limits, and the remaining 120 Crores in rest of the State). It is also proposed to plant, and rejuvenate the viable rootstock to achieve 100 crore plants inside the forest areas by way of intensive protection of the forests.

Industries Department, Telangana's INITIATIVE :

Under this programme, Telangana State Industrial Infrastructure Corporation (TSIIC) has to prepare a detailed micro-plan for undertaking plantation in each industrial park. For this purpose, the Government of Telangana has proposed to supply 1 Crore samplings to TSIIC and individual industries in the industrial parks of TSIIC to achieve the plantation target at individual industry and also at industrial park level.

TSIIC (formerly part of APIIC) is established in the year 2014, after the AP state bifurcation, for identifying and developing potential growth centres in the State fully equipped with developed plots/sheds, roads, drainage, water, power and other infrastructural facilities. There are about 148 industrial parks spread over 6 zones and 10 districts of Telangana.

[1] www.tkhh.org

Under Indo-German Development Cooperation, Deutsche Gesellschaftfür Internationale Zusammenarbeit (GIZ) is undertaking “Climate Change Adaptation (CCA Project) in Industrial Areas” project in the Telangana State. The consortium of consultants INTEGRATION Environment and Energy GmbH, Adelphi consult and Ifanos concept & planning of Germany with support from SPACES, a local planning firm has prepared these guidelines for the TSIIC.

2. Checklist for pre- planting, during planting and post planting phases

2.1 Pre-planting :

a. Survey of site and Identification of locations for planting.
b. Location- wise selection of suitable plants, also considering other criteria such as soil, height and crown, etc. refer Table No 2
c. Identification of water source, in the surrounding area and planning for post planting irrigation system for the plants.
d. Clearing of site of unwanted material, and wild / jungle growth.
e. Demarcation of planting area and digging tree pits of 3'X3'X3' (1 m.X1 m.X1 m.) to ensure aeration of the soil and space for healthy growth of roots to allow sufficient aerated and porous soil area for the plant to settle down in the new place easily without much shock. .However in rocky areas pits have to be bigger. Trees are planted 5 to 15 m apart depending upon the space they are expected to occupy when mature. The pits have to be dug 2 to 3 weeks earlier to planting, preferable before the rainy season.
f. Transport and stacking of red soil, manure and pesticides.
g. The excavated soil should be kept near the pit in two heaps, one containing the top soil up to 50 cm depth and another from the lower part of the pit .Both pit and the excavated soil should remain exposed to weathering effects for 2 to 3 weeks. All unwanted growth of algae, fungi gets eliminated, and heat generated from the maure gets settled.)
h. Peg mark the pit and leave the pit for 15 days (Fallow period).

2.2 During planting :

a. Circular weeding up to two feet radius from the stem of the plant .(Refer to Fig.1)
b. Internal distribution of plants on site and planting. Soil working up to 2 feet radius -6 inches deep using crow bars around the plant.
c. Application of pest control items.
d. Refill mix:
    i. 2:1:1:1 Ratio of dug out soil, red soil, farm yard manure, sand.
    ii. Application of vermi compost or fertilisers-2kg/pit
    iii. 20 grams/pit. FOLIDOL chemical for controlling white ants.
e. Identification of areas requiring tree guards, getting them made and fixing tree guard.
f. Staking or fixing the support sticks with "8" knot .(Refer to Fig .2)

Figure 1-Circular weeding

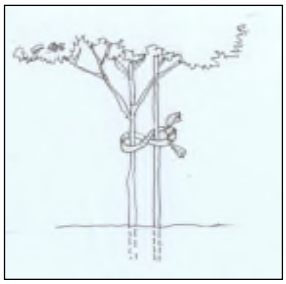


Figure 2–"8" knot

g. After a few showers the soil of the pit settles down making a cavity. This cavity should be filled up with more soil and planting be done in the center of the pit. Only that much part of the sapling will go down which was under the soil in the nursery.
h. All side shoots should be removed from the seedling at the time of planting.
i. Watering the plant

2.3 Post Planting:

a. Watering the plant as required.
b. Protection of sapling from stray cattle is important in tree plantations so maintenance of the tree guards is important.
c. Removal and re-fixing of tree guards to facilitate soil working whenever required. depending upon the soil type where the planting is done.
d. Circular weeding regularly for many times - to a radius of 2 feet around the plant. (Refer to Fig.3)
e. Application of chemicals, fertilizers/neem cake etc. regularly.
f. Cutting back of coppice growth and removal of weeds in the plantation area. (Refer to Fig.4)
g. Given proper attention, the sapling will reach a height of nearly 2-3 m in the first year itself depending on tree species and thus its crown will rise beyond the reach of the cattle. The fence, however, should not be dismantled. It should be allowed to remain for three years or more till the stem is thick enough to stand any damage.
h. To make a plant tall and stately, proper pruning of branches should be done from early stage of growth. Pruning of branches lower than 6 feet 6 inches.(Refer to Fig.5)
i. Other such shoots that would develop afterwards from the elongated stem should be cut away for several years till the contemplated height of the stem is reached .Pruning of unwanted growth will help in utilization of nutrients (micro and macro) and water for better growth of remaining parts, thereby making them strong and healthy.
j. Sometime the main stem bifurcates before reaching the required height. In such case the weaker branch should be removed; if both are of equal vigour, the one towards the sun should be retained.
k. While cutting a branch no stump should be left. The cut surface must be painted with coal tar or a fungicide to avoid attack of diseases.

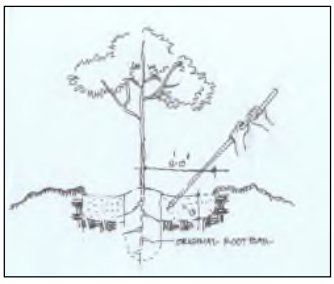


Figure 3 –Weeding around stem

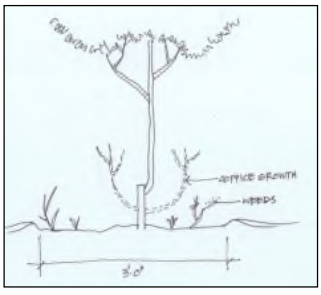


Figure 4 –Cutting coppice growth

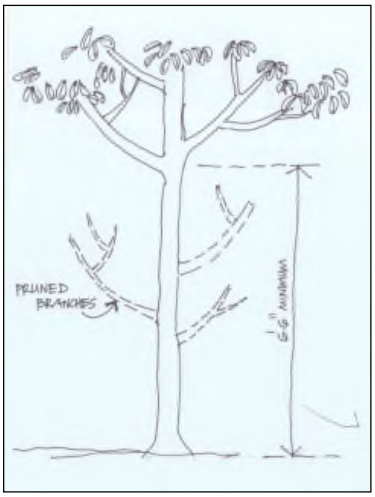


Figure 5-Pruining

l. Nitrogen at the rate of 20 g per plant in the form of ammonium sulphate urea or other nitrogenous fertilizer should be applied during the first irrigation inside the basin.
m. The tree should be kept free from weeds for at least two years to avoid competition and promote growth.
n. When the plant attains a height of 4 to 5 m, not much care except pruning is needed.

3. Identification of areas for plantation

Major areas for plantation in industrial areas are as follows:

A. Street plantation

A.1 36 m. and more wide roads.

A.2 24 m. wide roads

A.3 18 m. wide roads

A.4 12 m. wide and less roads

A.5 Central median

B. Common open spaces and amenity areas

B.1 Block plantation

B.2 Boundary plantation

C. Unit (individual industry) level plantation

C.1 Plantation at entry and exit

C.2 Boundary plantation

C 3 Incidental open spaces

D. Plantation in and around water bodies

4. Guidelines for plantation in the identified areas.

4.1 Street plantation

4.1.1 Guidelines : Avenue plantation-general concerns

1. Clash between avenue trees and an overhead electric line is an omnipresent problem. To allow proper growth of trees, and to avoid periodic pruning, either the electric supply lines should go underground or overhead electric lines should be insulated. (eg : Bauhinia species, lagerstroemia species)

2. Street lighting:

    a. Effectiveness of street lighting is reduced because of the position and height of the street light in relation to that of the trees.

    b. Trees and street light positions should be staggered. On the other hand, street lighting affects the night life of trees and ultimately effects its life cycle. In order to restore night life to trees, preferably in residential areas, lighting can be at low level.

3. Underground services cable, drainage and storm water systems: care should be taken in plant species selection and planting distances from underground lines so that the root system of plant do not clog drains and do not damage the underground infrastructure and service lines.

4. Most of the avenue planting happens between the property line and road edge. There is hardly any soil area left over for aeration resulting in poor development of root zone. Trees fall down for the whirl winds effect and sudden outburst of rain and disrupt urban life pattern

5. Possibility of providing appropriate soil area around tree shall be considered.

6. Using trees for commercial purposes like nailing of name plates, advertisement boards etc. shall be avoided.

7. Where road side development is still to come, plan for multiple rows of trees on either side to protect it from uprooting by sudden gush of winds and outburst of rains.

8. Except in situations where specific function is expected, trees should be planted at a distance where only 10% of the crown is generally overlapped.(crown width should be considered at the trees mature stage)

4.1.2 Criteria for selection of plant material for roads/avenue planting

1. Type (ever green or deciduous)
2. Growth rate and age of vegetation.
3. Physical character of the tree like form, (fastegiate form, broad canopy, spreading canopy, etc.)

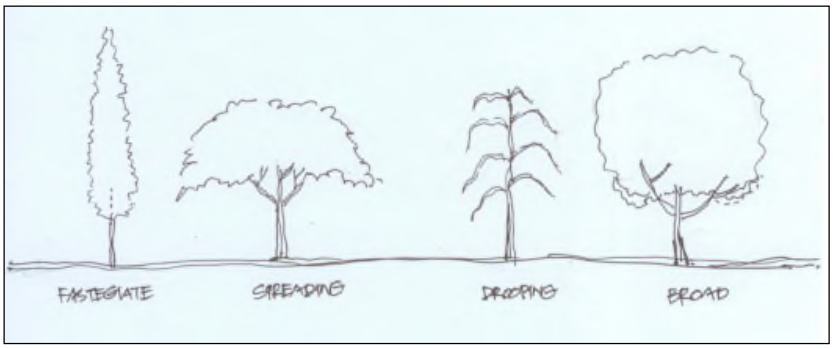


Figure.6 : Physical form of the tree

4. Ultimate height and spread of tree,
5. Crown clearance from ground, etc
6. Flowering season, color, flower density.
7. Leaf size, leaf texture, leaf, and foliage color, foliage density and distribution.

4.1.3 Note on clearance for planting trees

For tree planting, the clearances required may be noted as::

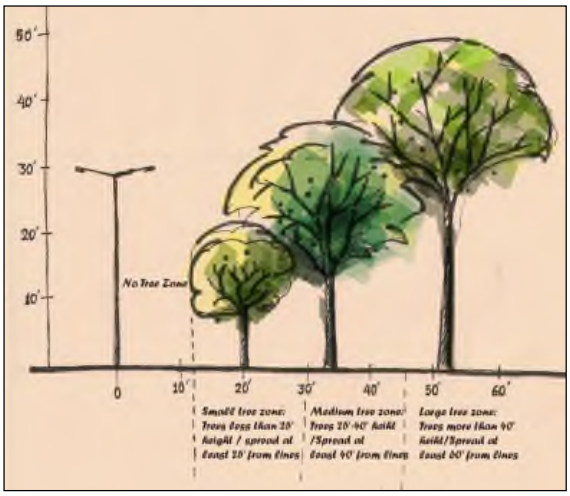


Figure 7: Planting near electrical poles

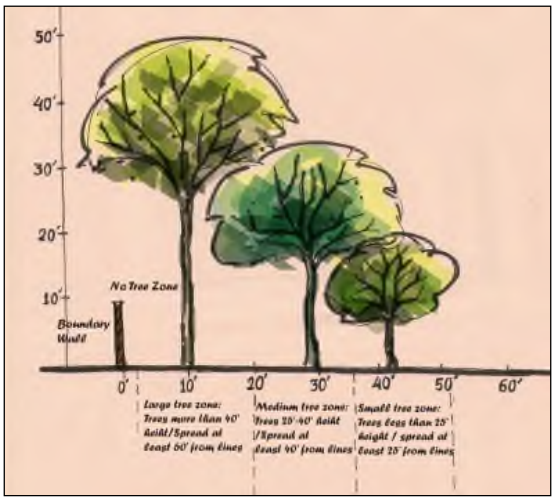


Figure.8 : Planting near boundary walls

4.2 Open spaces plantation

4.2.1 Guidelines : Open spaces plantation -general concerns

Open space planting can happen in two categories.

1. Open space boundary planting
2. Open space block planting.

General concerns.

1. Plantation in unprotected open spaces requires fencing or tree guards.
2. Boundary can have a minimum of 3 rows where possible, with height hierarchy, to withstand strong winds.
3. Species variation can be maintained to avoid monoculture and improve resilience and diversity.

4.2.2 Criteria for selection of plant material for open space planting

1. Preference for local and adopted species,
2. Species that have thorns like Prosopis species
3. Species that attract birds and insects, like Acacia nilotica
4. Species that have fruiting like Mangifera indica
5. Species with better sustainability can have preference.
6. Species with low visual appeal, insignificant flowering lanky form and lactation can also be preferred for open space block planting.

4.2.3 Landscaping in open areas

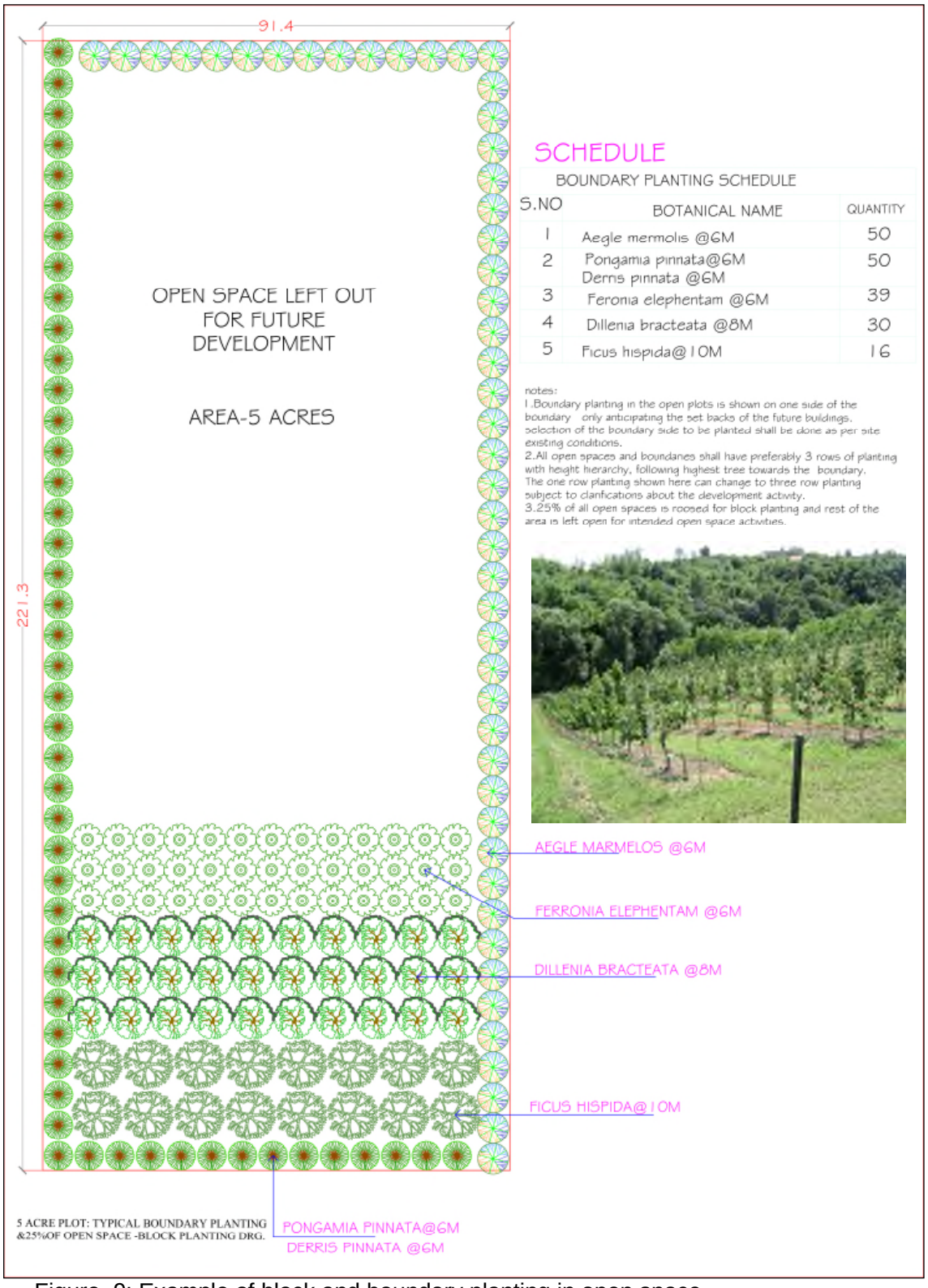


Figure 9: Example of block and boundary planting in open space

4.3 Unit (individual industry) level plantation

4.3.1 Guidelines : Unit plantation -general concerns

1. Unit boundary plantation should have similar character to that of the front boundary and inside plantations to establish homogeneity in the total unit area.
2. Plantations should be at a distance of minimum of 3m. From boundary wall and buildings so that the roots do not damage the structures.
3. Trees that display a stark contrast to the avenue and opposite side unit planting can be avoided.
4. On the front side of the unit boundary, trees with similar Form, growth rate, habit and foliage density can be preferred.

4.3.2 Selection criteria unit/industry boundary

For three sides of the industrial plot excepting the front side:

1. Plants that are sturdy and having defined form to delineate the edge as a green edge.
2. That easily associate with other species of plants. like Peltophorum pterocarpum and Cassia siamia.
3. That can survive in the pollution caused by the industry.
4. Plants that can sustain medium drought conditions and medium soil nutrient availability (usually local species and adapted –naturalized species.)
5. That adds to the homogeneity of green cover continuity of the industry and the total area in totality.

4.3.3 At entry and exits-guidelines

Plants that :

1. Have very less leaf fall, Alstonia scholaris.
2. Have very strong visual effect with vibrant flowering in terms of color and flower density,
3. Provide shade throughout the year,
4. Reduce visuals glare.
5. Provide aesthetic quality to space and intellectual stimulation that elevates human spirits.
6. Complements the architectural forms
7. Establishes visual comfort areas.
8. Forms overhead and ground space definition.
9. Induce scale.
10. Forms a framing element, gives foreground and backdrop effect.
11. Reduce visual pollution.
12. Introduces ornamental effect.

4.4 : Water body plantation

4.4.1 Guidelines : Water body -general concerns

1. Trees having character to frame views and enhance visual quality.
2. Entire shore area need not be planted considering the scenic value of the place.
3. Plant height hierarchy can be maintained keeping the smallest height plant nearer to the shore.
4. Planting in feeder nalas and monsoon time intermittent nalas can be avoided.

4.4.2 Criteria for selection of plant material for water body planting

Following types of species can be considered for water body shore planting

1. Species that survive partial submergence like Acacia suma…
2. Trees that can provide habitat for avi fauna population.
3. Trees with drooping character like weeping willow, that visually associate with water.
4. Trees with less leaf fall
5. Trees that sustain high moisture levels.
6. Trees that have characteristics of mangrove species.

4.5 : List of trees for the different identified areas :

The following table 1 lists the recommended trees / plants suitable for planting in the different areas identified within the industrial parks.

Table 1.: List of trees for different identified areas.

S.No.	Scientific Name	Common Name	36 m. road	24 m. road	18 m. road	12 m. road	Foot path	Service roads	Central median	Open space - boundary	Open space - block	Unit - boundary	Unit - entry exit	Unit - incidental spaces	Water body boundary
1	Acacia auriculiformis	Acacia auriculiformis	■	■	■	■		■							■
2	Acacia nilotica	Babul,Nalla Tumma													■
3	Acacia suma	Tellachandra									■				■
4	Achras sapota	Sapota, chikku								■	■	■		■	
5	Adina cordifolia	Bandaru, Haldi	■	■											
6	Aegle marmelos	Maredu		■	■	■		■				■			
7	Aglaia elaeagnoides	Yerra Adugu				■									
8	Ailanthus excelsa	Pedda Manu	■		■										
9	Albizia amara	Nalla regi, Narlingi	■	■											
10	Albizia chinensis	Bandi Chinduga	■	■						■					
11	Albizia lebbeck	Dirisinal, sirisamu	■	■											
12	Albizia odoratissima	Chinduga, Ganara	■	■											
13	Alstonia scholaris	Eddakla Pala	■	■											
14	Albizia procera	Tellachin duga	■	■											
15	Anacardium occidentale	Cashew nut												■	
16	Anogeissus latifolia	Tiruman			■					■					
17	Artocarpus heterophyllus	panasa												■	
18	Avicennia officinalis	Nalla mada				■		■							
19	Azadirachta Indica	Neem,vepa	■	■											
20	Bahuhinia malabarica	Bauhinia malabarica							■						
21	Bahuhinia racemosa	Bahuinia racemosa												■	
22	Bauhinia purpurea					■									
23	Bauhinia variegata	Aare				■			■						
24	Baringtonia Acutangula	Kadimi, Kurpa			■										■
25	Bixa orellana					■									
26	Bombax ceiba	Buruga,Semal		■						■		■			
27	Boswellia serrata	Gandru-chettu												■	
28	Butea monosperma	Flame of the forest												■	
29	Callistemon viminalis	Bottle Brush							■						■
30	Capparis grandis	Reguti							■						
31	Careya arborea	Budadharimi				■		■							
32	Carica papaya	Boppai,Paringi,Papaya	■												
33	Cassia auriculata													■	
34	Cassia fistula	Rela,Golden-shower	■										■		
35	Cassia nodosa	Cassia nodosa	■												
36	Cassine glauca	Cassine glauca/Neridi		■		■									
37	Cassia siamea	Seema tangedu			■		■								

S.No.	Scientific Name	Common Name	36 m. road	24 m. road	18 m. road	12 m. road	Foot path	Service roads	Central median	Open space - boundary	Open space - block	Unit - boundary	Unit - entry exit	Unit - incidental spaces	Water body boundary
38	Ceiba pentandra	Buruga							■						
39	Chloroxylon swietenia	Billudu	■												
40	Chikrasia tabularis	Konda Vepa			■										
41	Cochlospermum religiosum	Konda Gogu						■							
42	Commiphora berryi							■			■				
43	Dalbergia latifolia	Rose-Wood, Jitregi		■						■	■	■			
44	Dalbergia paniculata	Pachari,Porla-pachari		■	■		■								
45	Dalbergia sissoo	Sissoo		■	■										
46	Dalbergia spinosa	Chillangi Limonia elephantum												■	
47	Dendrocalamus strictus	Bamboo, Gatti veduru													■
48	Delonix elata	White gulmohar											■		
49	Delonix regia	gulmohar			■								■		
50	Derris indica	Derris indica				■				■					
51	Dillenia pentagyna	Revada, Dog Teak			■				■						
52	Dillenia bracteata	Kalli Teak		■											
53	Diospyros chloroxylon	Kalli Teak									■				
54	Diospyros ferrea	Chinna ulinja									■				
55	Dodonaea viscosa	Bandam,pulivavilli							■						
56	Dolichandrone falcata	oddi								■	■	■			
57	Eeretia acuminata .											■			
58	Ehretia laevis	Tella pisini				■							■		
59	Erythrina indica	Badida				■									
60	Erythrina suberosa	Muni mudugu				■							■		
61	Ficus arnottiana	Kalla ravi									■				
62	Ficus hispida	Bommudu, kaki medi											■		
63	Ficus mollis	Marri,banyan tree									■				
64	Ficus mysorensis	Goni chettu									■				
65	Ficus religiosa	Ashvatham, Bodhy								■	■	■			
66	Ficus racemosa		■								■			■	
67	Feronia limonia	velega												■	
68	Gmelina arborea	Gummadi-teku	■	■											
69	Grevillea robusta	Silver oak,Parana		■											
70	Hydnocarpus alpina	Yeru tunki										■			
71	Hardwickia binata	Nara yepi,Anjan	■	■											
72	Jacaranda mimosaefolia	Jacaranda		■											
73	Lagerstroemia parviflora	Chennangi,Nandi			■								■		

S.No.	Scientific Name	Common Name	36 m. road	24 m. road	18 m. road	12 m. road	Foot path	Service roads	Central median	Open space - boundary	Open space - block	Unit - boundary	Unit - entry exit	Unit - incidental spaces	Water body boundary
74	Lagerstroemia speciosa				■								■		
75	Limonia elephantum	Velga, wood apple												■	
76	Lumintzera racemosa	Thanduga													■
77	Madhuca Indica	Ippa,Gul-Mohwa	■							■		■			
78	Madhuca longifolia	Madhuca longifolia		■											
79	Mangifera indica	Mamidi, Mango								■				■	
80	Millingtonia hortensis	Akasa malli	■	■											
81	Mimusops elengi	Pogada			■	■			■						
82	Melia azedarach	Turka Vepa			■										
83	Murraya koenigii	Karivepaku, Curry leaf								■				■	
84	Parkia biglandulosa	Badminton Ball			■	■									
85	Peltophorum pterocarpum	Pacha sunkesula		■	■	■				■		■			
86	Phyllanthus distichous	Racha usiri				■									
87	Phyllanthus emblica	Usiri				■									
88	Pithocolobium dulci	Sima chinta													
89	Polyalthia longifolia	Ashoka,Naramamidi		■	■	■	■						■		
90	Pongamia pinnata	Kanuga		■	■					■					
91	Putranjiva roxburghii	Yenki,Venki,Danthi			■	■		■							
92	Sapindus emarginatus	Kunkudu, Soap nut				■									
93	Saraca asoka	Asokamu			■	■									
94	Samanea saman	Rain tree, Nidra	■												
95	Simarouba glauca	Simarouba				■		■							
96	Syzygium alternifolium	Jinna		■											
97	Syzygium cumini	Neredu, Jamun,Black		■											
98	Syzygium jambos	Alla Neredu	■	■											
99	Spathodea companulata	Spathodea			■	■				■		■	■		
100	Swietenia mahogani	Mohogany	■												
101	Tabebuia heterophylla	Pink Trumpet tree			■	■									
102	Tabernaemontana divaricata	Nandivardanum							■						
103	Tamarindus Indica	Chinta, Imli	■												
104	Tecoma stans	Suvarna ganneru							■						
105	Tectona grandis	Teak, Sagwan	■	■											
106	Teminalia alata	Dudamaddi		■											
107	Terminalia arjuna	Arjuna,Enamaddi	■	■											
108	Terminalia bellerica	Tani, Thandra,Behere		■	■							■			
109	Terminalia catappa	Adavibadam			■	■									
110	Thespesia populnea	Umbrella Tree			■	■						■			
111	Wrightia tomentosa	Tella Pala	■												

5. Selection of suitable tree species based on criteria as soil, water requirement, aesthetics, etc

Table 2 : Matrix for selection of trees

S.No.	Scientific Name	Common Name	Type	Growth rate	Height	Spread	Water .RQ	Drought Tolerance	Soil Moisture	Function	Attract birds	Attract insects	Shedding of leaves	Red loamy soil	Red sandy soil	Stoney morrum soil	Shallow water edge	Sandy soil	Mixed soil(red and black)	Black cotton soil	Salane
1	Acacia auriculiformis	Acacia auriculiformis	E	F	15	7	L	H	WD	S,FL,A											
2	Acacia nilotica	Babul,Nalla Tumma	D	S	10		H	L	WD	FL		Y									
3	Acacia suma	Tellachandra	D	F	15	8	L	H	ATS	FL	Y										
4	Achras sapota	Sapota, chikku	E	S	15	12	L	H	WD	F/FL		Y									
5	Adina cordifolia	Bandaru, Haldi	D	F	15	7	L	H	WD	FL	Y	N	M								
6	Aegle marmelos	Maredu	D	S	12	6	H	L	W	S,FL		Y									
7	Aglaia elaeagnoides	Yerra Adugu	E	M	10	6	M	M	MD	S,FL											
8	Ailanthus excelsa	Pedda Manu	D	F	18	10	M	M	MD	S											
9	Albizia amara	Nalla regi, Narlingi	D	M	6m	6	L	H	WD	A,FL	Y	N	M								
10	Albizia chinensis	Bandi Chinduga	D	F	20	15	L	H	WD	S,A			M								
11	Albizia lebbeck	Dirisinal, sirisamu	D	F	20	20	H	H	W	S,FL		Y									
12	Albizia odoratissima	Chinduga, Ganara	D	F	20	15	M	M	M	A,FL			M								
13	Alstonia scholaris	Eddakla Pala	E	F	20	7	M	M	WD	A,FL											
14	Albizia procera	Tellachin duga	sD	F	10	8	L		WD	A											
15	Anacardium occidentale	Cashew nut	E	S	12		L	H	WD	F/FL											
16	Anogeissus latifolia	Tiruman	D	S	7	4	M	M	MD	FL											
17	Artocarpus heterophyllus	panasa	E	F	12	8	L	M	W	F/FL											
18	Avicennia officinalis	Nalla mada	E	F	8	6	M	M		F/FL											
19	Azadirachta Indica	Neem,vepa	D	S	16	12	L	H	WD	S,F	Y	Y									
20	Bauhinia purpurea	peda aare	D	F	5	4	M	M	wd	FL/A											
21	Bahuhinia malabarica	Bauhinia malabarica	D	M	15	8	L	H	WD	F/FL											
22	Bahuhinia racemosa	Bahuinia racemosa	D	S	5	4	M	M	WD												
23	Bauhinia variegata	Aare	D	M	8	6	M	M		A/FL											
24	Baringtonia Acutangula	Kadimi, Kurpa	E	S	8	6	L	M	M	A,FL											
25	Bixa orellana	Large shrub	E	F	6	4	M	L	WD	FL											
26	Bombax ceiba	Buruga,Semal	D	F	30	8	M	M	WD	FL											
27	Boswellia serrata	Gandru-chettu	D		20			H	WD	F/FL											
28	Butea monosperma	Flame of the forest	D	S	12	6	L	M	WD	F/FL											

Deciduous =D, Evergreen=E, Semi Deciduous=sD ; F=Fast , M=medium , S=slow ; H=High , M=Medium , L=Less ; Y= Yes , N=No

Wet drained=WD , Medium drained= MD , Wet=W ; Flowering = FL , Fruit = F , Aesthetics= A, Shade= S

Most suitable = Second preference =

S.No.	Scientific Name	Common Name	Type	Growth rate	Height	Spread	Water .RQ	Drought Tolerance	Soil Moisture	Function	Attract birds	Attract insects	Shedding of leaves	Red loamy soil	Red sandy soil	Stoney morrum soil	Shallow water edge	Sandy soil	Mixed soil(red and black)	Black cotton soil	Salane
29	Callistemon viminalis	Bottle Brush	E	F	8	4	M	M	WD	FL			M								
30	Capparis grandis	Reguti	D	F	5	3	M	M	WD	FL											
31	Careya arborea	Budadharimi	D	M	15	8	M	M	MD	FL,FRT											
32	Carica papaya	Boppai,Paringi,Papaya		F	4	3.5		L	WD		Y										
33	Cassia auriculata	Tangedu small shrub/State flower	e	M	1.5	1	L	H	WD	FL											
34	Cassia fistula	Rela,Golden-shower	E	M	10	7	L	H	MD	FL											
35	Cassia nodosa	Cassia nodosa	sD	F	16	10	M	M	MD	FL											
36	Cassine glauca	Cassine glauca/Neridi	E	S	5	4	M	M	WD	FL		Y									
37	Cassia siamea	Seema tangedu	E	F	14	8	M	M	MD	FL											
38	Ceiba pentandra	Buruga	D	M	20	7	H	L	W	F/FL											
39	Chloroxylon swietenia	Billudu	D	S	16	8	L	H	WD	FL											
40	Chikrasia tabularis	Konda Vepa	D	M	12	8	M	M	MD	FL											
41	Cochlospermum religiosum	Konda Gogu	D	S	7.5	5	M	M	WD	F/FL											
42	Commiphora berryi	thorney small tree	D	M	8	5	L	M	WD												
43	Commiphora caudata	Konda mamidi	D	M	10	6	L	M	ATS	FRT											
44	Dalbergia latifolia	Rose-Wood, Jitregi	D	S	25	12	M	M	WD	FL											
45	Dalbergia paniculata	Pachari,Porla-pachari	D		14	10	M	M	MD	FL											
46	Dalbergia sissoo	Sissoo	D	F	20	15	H		MD												
47	Dalbergia spinosa	Chillangi Limonia elephantum	E	M	6	4	M	M	MD	FL											
48	Dendrocalamus strictus	Bamboo, Gatti veduru	D	F	8M	2	H	L	WD												
49	Delonix elata	White gulmohar	D	S	20	16	M	L	MD	FL	Y										
50	Delonix regia	Gulmohar	D	F	10	8	M	L	WD	FL											
51	Derris indica	Derris indica	E	S	12	8	L	H	WD	FL											
52	Dillenia pentagyna	Revada, Dog Teak	D	S	15	7	M	M		F,FL		Y									
53	Dillenia bracteata	Kalli Teak	E	M	20	8	M	M	MD	FL	Y	Y									
54	Diospyros chloroxylon	Kalli Teak	D	M	5	4	M	M	MD												
55	Diospyros ferrea	Chinna ulinja	D	M	10	6	L	H	WD	FL											
56	Dodonaea viscosa	Bandam,pulivavilli	E	F	4	3	M	M	WD	FL											

S.No.	Scientific Name	Common Name	Type	Growth rate	Height	Spread	Water .RQ	Drought Tolerance	Soil Moisture	Function	Attract birds	Attract insects	Shedding of leaves	Red loamy soil	Red sandy soil	Stoney morrum soil	Shallow water edge	Sandy soil	Mixed soil(red and black)	Black cotton soil	Salane
57	Dolichandrone falcata	oddi	D	M	7	5	M	M		FL,A											
58	Eeretia acuminata .		D	F	10	8	M	M	MD	F/FL	Y										
59	Ehretia laevis	Tella pisini	E	F	10	6	M	M													
60	Erythrina indica	Badida	D	F	12	8	M	M	MD	FL											
61	Erythrina suberosa	Muni mudugu	D	F	10	8	M	M	MD	FL											
62	Ficus arnottiana	Kalla ravi	D/E	M	10	8	L	H	ATS	FL											
63	Ficus hispida	Bommudu, kaki medi	E,D	S	15	12	L	M	MD	FL											
64	Ficus mollis	Marri,banyan tree	D/E	M	15	12	L	H	WD	FL											
65	Ficus mysorensis	Goni chettu	E	S	7	5	L	H	WD	S/F/FL											
66	Ficus racemosa	MEDI	D	S	20	12	L	H	MD	FRT											
67	Ficus religiosa	Ashvatham, Bodhy	E	M	20	15	L	H	WD	S											
68	Feronia limonia	velega	D	S	9	6	M	H	MD	F			M								
69	Gmelina arborea	Gummadi-teku	D	F	14	8	M	M	MD	FL		Y									
70	Grevillea robusta	Silver oak,Parana	E	F	25	8	M	M	WD	A,FL											
71	Hydnocarpus alpina	Yeru tunki	E	M	8	6	M	M	MD	F/FL											
72	Hardwickia binata	Nara yepi,Anjan	D	S	15	8	M	M	MD	FL			M								
73	Jacaranda mimosaefolia	Jacaranda	D	S	15	10	L	H	WD	A,FL											
74	Lagerstroemia parviflora	Chennangi,Nandi	D	F	15	8	M	M,H	WD	FL											
75	Lagerstroemia speciosa		D	M	20	10	M	M	MD	A,FL											
76	Lumintzera racemosa	Thanduga	E	S	8	6	H	L	MD	FL											
77	Madhuca Indica	Ippa,Gul-Mohwa	E	F	20	10	M	M	MD	FL											
78	Madhuca longifolia	Madhuca longifolia	D	M	20	10	M	M	WD	FL											
79	Mangifera indica	Mamidi, Mango	E	M	25	18	M	M	WD	A/F											
80	Millingtonia hortensis	Akasa malli	E	F	20	6	L	H	WD	A,FL	Y										
81	Mimusops elengi	Pogada	E	S	15	3	M	M	MD	A,FL											
82	Melia azedarach	Turka Vepa	E	M	12	6	M	M		A,FL	Y										
83	Murraya koenigii	Karivepaku, Curry leaf			8					A											

S.No.	Scientific Name	Common Name	Type	Growth rate	Height	Spread	Water .RQ	Drought Tolerance	Soil Moisture	Function	Attract birds	Attract insects	Shedding of leaves	Red loamy soil	Red sandy soil	Stoney morrum soil	Shallow water edge	Sandy soil	Mixed soil(red and black)	Black cotton soil	Salane
84	Parkia biglandulosa	Badminton Ball	E	F	20	12		M	MD	FL											
85	Peltophorum pterocarpum	Pacha sunkesula	D	F	20	15	M	M	MD	S,A,FL											
86	Phyllanthus distichous	Racha usiri	D	F	9	4	L	H	WD	FL											
87	Phyllanthus emblica	Usiri	D	F	10	7	L	H	WD	FL		Y									
88	Pithocolobium dulci	Sima chinta	E	M	15	10	M	H	WD	F			M								
89	Polyalthia longifolia	Ashoka,Naramamidi	E	F	10	2.5	L	H	WD	A,FL											
90	Pongamia pinnata	Kanuga	E	S	12	8	L	H	WD	FL											
91	Putranjiva roxburghii	Yenki,Venki,Danthi	E	S	15	7	M	M	MD	FL											
92	Sapindus emarginatus	Kunkudu, Soap nut	D	S	10	6	L	H	WD	F											
93	Saraca asoka	Asokamu	E	M	8	5	L	H	WD	A,FL											
94	Samanea saman	Rain tree, Nidra	D	F	25	20	L	H	WD	FL											
95	Simarouba glauca	Simarouba	E	F	15	9	M	M	WD												
96	Syzygium alternifolium	Jinna	E	S	10	7	M	M	WD	F											
97	Syzygium cumini	Neredu, Jamun,Black	E	S	20	12	M	M	WD	F											
98	Syzygium jambos	Alla Neredu	E	S	15	10	M	M	WD	F	Y	Y									
99	Spathodea companulata	Spathodea	E	F	20	10	L	H	WD	A											
100	Swietenia mahogani	Mohogany	D	S	25	12	L	H	WD	FL											
101	Tabebuia heterophylla	Pink Trumpet tree	D	M	8	5	M	M	WD												
102	Tabernaemontana divaricata	Nandivardanum	SE	F	3	3	M	M	WD	FL											
103	Tamarindus Indica	Chinta, Imli	D	S	25	20	L	H	WD	FRT											
104	Tecoma stans	Suvarna ganneru	E	F	5	4	M	M	WD	FL											
105	Tectona grandis	Teak, Sagwan	D	F	25	6	M	M	WD	FL											
106	Teminalia alata	Dudamaddi	D	S	20	12	M	M													
107	Terminalia arjuna	Arjuna,Enamaddi	D	S	20	10	L	H	WD	FL											
108	Terminalia bellerica	Tani, Thandra,Behere	D	M	20	10	M	M	MD	FL											
109	Terminalia catappa	Adavibadam	D	F	12	8	M	M	WD	FL											
110	Thespesia populnea	Umbrella Tree	E	M	10	8	L	H	WD	S,FL											
111	Wrightia tomentosa	Tella Pala	D	S	10	8	L	H	WD	FL											

6. Selection of tree species for environmental (pollution resistance) aspects

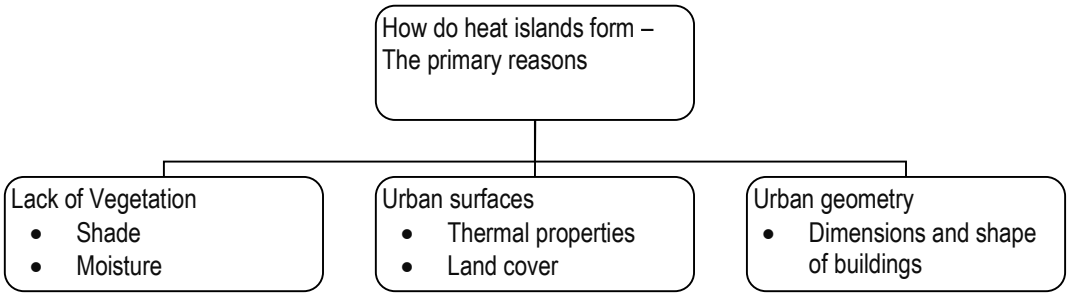
Table 3: Pollution resisting trees

POLLUTION RESISTING TREES			POLLUTION					
S.No	Scientific name	Local name	SPM	SO2	NOx	CO	Noise	Salinity resistance
1	Albizia lebbeck	Dirisinal, sirisamu, lebbeck tree	■	■	■			■
2	Alstonia scholaris	Eddakla Pala	■	■	■	■	■	
3	Ailanthus excelsa	Pedda Manu,Ailanthus excelsa	■				■	
4	Azadirachta Indica	Neem,vepa	■	■	■	■	■	■
5	Bauhinia variegata	Bauhinia variegata	■	■	■	■	■	
6	Butea monosperma	Moduga chettu,Palas	■	■	■			■
7	Callistemon citrinus	Bottlebrush	■					
8	Cassia siamea	Seema tangedu, Niala tangedu	■	■				■
9	Cassia fistula	Rela,Golden-shower,Indian	■					
10	Dalbergia sissoo	Sissoo	■	■	■			
11	Delonix regia	Gulmohar,Turayi,Erraturai	■	■				
12	Diospyros melonoxylin		■	■	■			
13	Erythrina variegata	Erythrina variegata,Baridapu	■					
14	Eucalyptus citriodora	Lemon scented Eucalyptus citriodora	■	■	■			
15	Ficus benghalensis	Marri, pedda marri, banyan tree	■	■	■			
16	Ficus benjamina		■					■
17	Ficus infectoria		■	■	■			
18	Ficus religiosa	Ravi, Ashvatham, Bodhy	■	■	■		■	
19	Lagerstroemia flos reginae	Lagerstroemia flos reginae	■	■				
20	Madhuca Indica	Ippa, Mahwa, Mowa, Gul-Mohwa	■	■				
21	Mangifera indica	Mamidi, Mango	■		■			
22	Millingtonia hortensis	Akasa malli, punnaga malli	■				■	
23	Peltophorum pterocarpum	Pacha sunkesula, Konda chinta	■					
24	Polyalthia longifolia	Ashoka,Naramamidi,Devadaru	■	■	■			
25	Pterospermum acerifolium			■	■			
26	Parkia biglandulosa	Badminton Ball	■				■	
27	Pongamia glabra	Kanuga	■				■	
28	Swietenia mahogani	Mahogany	■					
29	Samanea saman	Rain tree, Nidra	■				■	
30	Syzygium cumini	Neredu, Jamun,Jinna	■				■	
31	Spathodea companulata	Spathodea	■				■	
32	Tamarindus Indica	Chinta, Imli, tamarind tree	■	■	■		■	
33	Tecoma alata	Tecoma spp	■				■	
34	Tecoma argentina	Tecoma spp	■				■	
35	Tabubia avlandia	Tabubia Spp	■				■	
36	Tectona grandis	Teak, Sagwan	■	■				

Note: The boxes marked green indicate tolerance to the specific pollutant .In case of noise they reduce noise pollution.

7. Planting and climate change adaptation : Reducing urban heat island effects

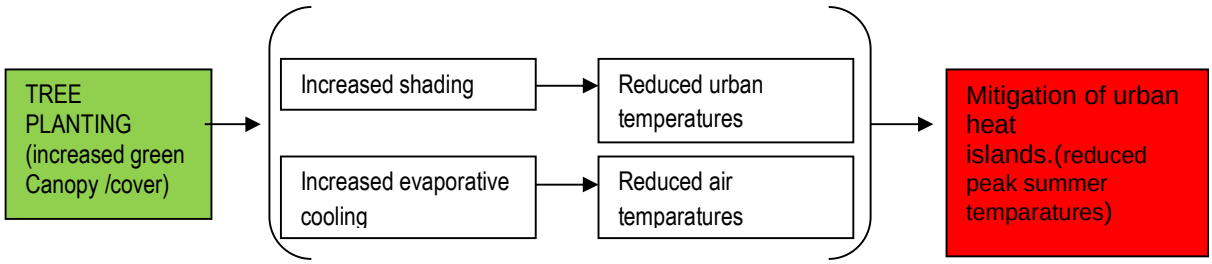
Areas in and around cities are generally warmer than comparable rural areas.Urban development reduces vegetative cover and adds heat absorbing surfaces such as rooftops, buildings, and paving.Heat is also added from other sources in cities such as fuel combustion and air conditioning units.This result is an urban heat island.

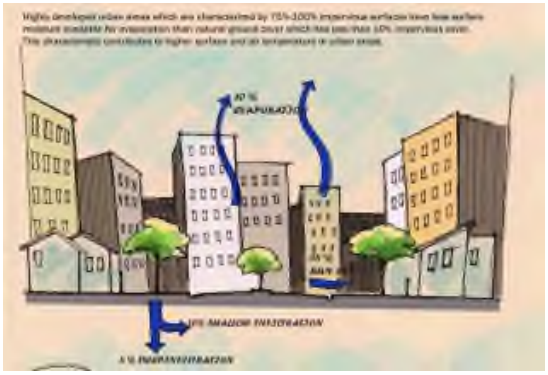


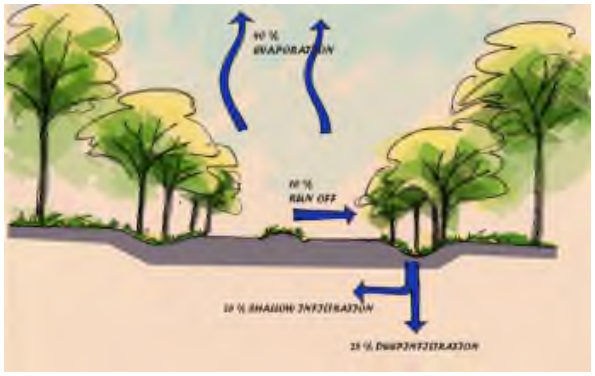
One of the most fundamental methods of reducing urban heat islands effects is to increase the tree cover. This shades the ground, pavements, roads and building surfaces, which otherwise usually absorb the solar radiation and result in increased surface temperatures and re-radiation of long wave heat at the pedestrian level.

The other benefit of increasing the tree cover is increased evaporative cooling.

Vegetation intercepts radiation and produces shade that also contributes to reduce urban heat trapping. Trees and vegetation provide shade which helps lower surface temperatures. They also release water to the air (evapotranspiration), which helps cool the area.





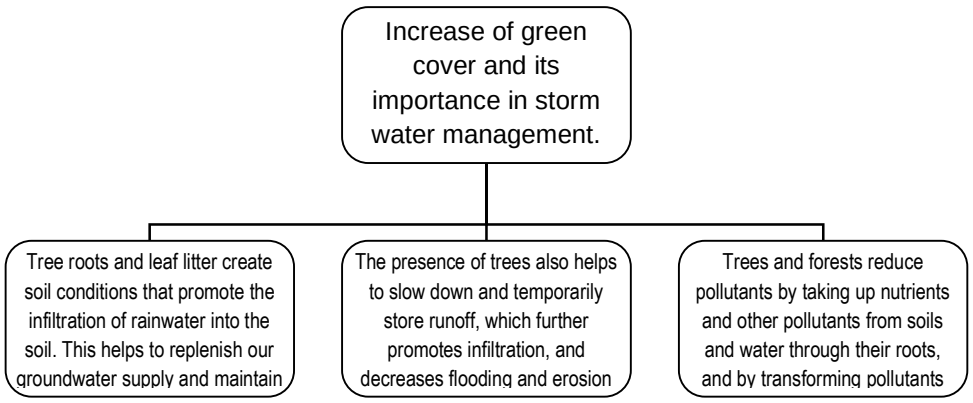


8. Integration of storm water management with plantation

a. Stormwater runoff is rainfall that flows over the ground surface. It is created when rain falls on roads, driveways, parking lots, rooftops and other paved surfaces that do not allow water to soak into the ground Stormwater runoff also picks up and carries with it many different pollutants .Managing the quantity and quality of stormwater is termed, "Stormwater Management."

b. Preserving undisturbed vegetative cover during land development is a much more cost effective approach than destroying these features and having to construct new stormwater management practices to replace the functions they originally provided. Trees and forests reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration.

c.



d. In addition to this the other methods of storm water management includes :

- Maximize permeability introduction of permeable hard surfaces wherever possible
- Minimize offsite discharge by introducing routing to local depressions, rain water harvesting pits and areas.
- Use storm water channels as design elements and increase infiltration by making bio swales